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LIGHTING OF STREETS—LIGHTNING.

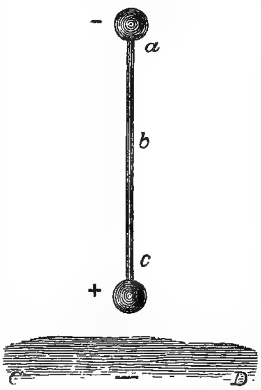
Lighting of Streets. Though both the Greeks and the Romans used to illuminate their cities at the occasion of public festivals, it is doubted whether any system of lighting the streets for simple, every-day convenience ever developed among them. It seems probable that Antioch was lighted by artificial means in the third century, and an order is still extant issued by the governor of Edessa, dating from 505, and demanding that lamps shall be kept burning during the night. However this may be, it is certain that any system of lighting the thoroughfares in use in the large metropolitan cities in antiquity was completely lost during the Middle Ages. In the mediæval town it was not only difficult, but dangerous, to venture out into the streets in a dark night; a man of standing never did so without being accompanied by a guard of friends or servants carrying lanterns and torches. Paris is said to have been the first modern city in which the streets were lighted. Orders to the inhabitants to keep lights burning after nine in the evening were issued in 1524, 1526, and 1543; Maitland contends, however, that similar orders were issued in London as early as 1414. In 1662, Abbé Laudati secured a privilege (for twenty years) of letting out torches and lanterns for hire in Paris; by 9 George II. c. 2 (1736) authority was granted for lighting the streets of London by contract. Lighting of the streets was introduced at The Hague in 1553, at Amsterdam in 1669, at Hamburg in 1672, at Berlin in 1679, at Copenhagen in 1681, at Vienna in 1687, at Hanover in 1696, at Leipsic in 1702, at Dresden in 1705, at Brunswick in 1765, and at Zurich in 1778. A new chapter of the history of street-lighting begins by the introduction of gas. The first gasworks were erected in London, at Boulton and Watt's Soho foundry, in 1798, and at the peace-rejoicings in 1802 the light was publicly exhibited with great success; the first employment of gas in Paris also occurred in 1802. Gas was first used to light Pall Mall Jan. 28, 1807. The Westminster Bridge was lighted by gas Dec. 31, 1813, and use of gas for street-lighting purposes became general in London in 1816. The objection to the lighting of streets by oil—or, rather, to any street-lighting at all—was the unnaturalness of the affair: how could people sleep in the houses when the streets were lighted? The objection to gas was its danger. Both objections, however, passed out of hearing. Another new chapter was opened by the introduction of the electric light.

Lightning. Lightning consists in an electrical discharge between cloud and cloud, or between a cloud and the earth, and sometimes between the upper and lower parts of the same cloud. To explain the phenomena of lightning on the established principles of electrical action, it is necessary to first treat of atmospheric electricity, and we shall under the present head give a brief exposition of the facts which have been established, and the hypotheses which have been advanced, in regard to this branch of electricity.

It is well established that the air is almost continuously in a state of electrical excitement differing from that of the earth. To account for this fact various hypotheses have been advanced; among them that which considers the electricity of the atmosphere as due to the friction of the winds on each other and on the surface of the earth; but it has been shown by decisive experiments that the friction of air on itself, or on solids or liquids, does not develop electricity. Another hypothesis refers the electricity of the air to the evaporation of water, but electricity is only evolved in the evaporation of water under a clear sky; and this result is best explained by the inductive action of the electricity of the atmosphere itself; and hence we should consider the electricity produced by the evaporation of water as a consequence, and not a cause, of the electricity of the air. The accidental discovery of a great amount of electricity evolved in blowing off steam from the boiler of an engine appeared at first to afford a ready explanation of the electrical condition of the atmosphere, which was then attributed to the condensation of invisible vapor. Faraday, however, conclusively proved that the electricity developed in the above-mentioned case was due entirely to the friction of the water which escapes with the steam, and that in the act of condensation of invisible vapor no electricity is developed. If the lower end of a bar of iron be plunged into a source of heat while the upper end remains cool, the positive electricity of the conductor will be repelled, as it were, from the heated to the cold end, the former becoming minus electrified, and the latter plus. A column of air resting on the surface of the earth and extending to the height of the atmosphere is in a similar condition as to heat, and is similarly electrified. It is, however, difficult to see how this explanation can apply to the air, which is a non-conductor of electricity.

After an attentive study of these hypotheses we have been obliged to reject them all as insufficient, and are compelled in the present state of science to adopt the theory of Peltier, which appears to offer a logical explanation of all the phenomena in question. This theory refers them not to an original excitement of the air, but to the *induction of the earth primarily electrified.* That the earth, as a whole, is a great insulated conductor charged with free negative electricity, is a fact in accordance with analogy. Since the earth is known to be a great magnet having attracting and repelling poles, and as magnetism and electricity are co-ordinate powers, we might almost infer *a priori* that it would also be charged with free electricity. The existence of this condition of the earth, however, does not rest on mere analogy, but is established by direct experiments made at points on the surface of the globe widely separated from each other. Since electricity repels similar electricity, the free charge of a body electrified must exist at the surface, and in a greater degree at salient points on that surface. Now, when the spray which is blown from the top of a high fountain is caught on the plate of an electrometer, it is always found, in clear weather, to be negatively electrified; and also when an insulated globe is touched to the top of any high projecting body, and then brought down to the level of the earth, it is found to be electrified negatively. Hence we infer that the earth itself is negatively charged with electricity, and, moreover, that this charge is of great intensity, since the manifestations of electricity in the cases above mentioned are merely the difference in intensity of the electricity of the globe and that of a salient point on its surface. Again: if during clear weather we elevate a kite in the string of which a fine wire is entwined, and from the upper side of which metallic points project, powerful sparks of electricity may be obtained, even when not the slightest cloud can be seen. This result, which flows directly from the inductive action of the electricity of the earth, would be produced were the air in a neutral condition, since the electricity of the earth would tend to render the upper part of the wire highly negative, and consequently it would attract to itself the positive electricity of the particles of the atmosphere previously in a neutral condition. The electricity of the earth may be considered as acting on each particle of the wire throughout its whole length, and hence the greater the perpendicular height of the kite the greater will be the action. A similar result may be shown by means of a balloon by letting down a long wire, having a metallic ball at the end, from an insulated reel. The upper end of this wire will indicate negative electricity, while the ball itself, could it be inspected, would show positive electricity. In this experiment the natural positive electricity of the wire is drawn down by the attraction of the earth, leaving the upper end minus while the lower end is plus. This condition is exhibited in Fig. 1, in which C D represents a portion of the surface of the earth negatively charged, and *a b c* a perpendicular conductor terminated above and below by a bulb. In this condition the negative electricity of C D, or, rather, of the whole globe, will act upon each atom of the fluid in the conductor, and tend to draw it down to the lower bulb; the atom *c* will not only be attracted downward by the action of the earth on itself, but also pressed downward by the attraction of the earth on all the atoms above it; and hence

FIG. 1.



the intensity of the lower part of the conductor will be increased by an increase in the perpendicular length of the rod. Now, if we connect the lower bulb of the rod with the earth by means of a good conductor, the redundant electricity of the lower end will be drawn off into the earth, and will no longer react by its repulsion on the electricity of the rod to drive it back into the upper bulb, but the whole will become negative. If, while the conductor is in this condition, we should touch the upper ball with an electrometer, and then bring the latter down to the general level of the earth, it would exhibit a negative charge. If we remove the upper ball, leaving a point in its place, and the positive electricity be drawn off from the lower ball in the form of a spark, the whole will become negative for a moment, and the point, strongly attracting the positive electricity of the air, will receive a new charge and be ready to give off another spark, and so on continuously. Such is the explanation of the result of the experiment with the kite.

For studying the electricity of the atmosphere we may use a long wire galvanometer, but to render this instrument effective the number of turns around the needle must be very great, at least 50 to 100, and the wire well insulated with waxed silk to prevent the passage of electricity from spire to spire, instead of passing continuously through the wire. To ensure connection with the earth, one end of this galvanometer should be placed in connection with the gas or water pipes of the city, and the other attached to an insulated wire supported on a tall mast, a tower, or church-steeple, and terminating above in a tuft of fine wire. The difficulty in using this apparatus, however, consists in keeping the insulation perfect, especially during rain; the brackets by which it is attached to supports should be of glass enclosed in hollow tubes, slanting downward to shed the water. But the apparatus may be used with effect in studying the electrical condition of the atmosphere in clear and dry weather.

The instrument employed by Saussure consisted of an electrometer formed of two wheat straws, at the upper end of each of which was a loop of fine wire attached to a metallic stem passing through the neck of a bell-glass, as shown in Fig. 2. On the top of this was screwed a pointed rod, to the lower end of which was attached a convex plate of metal to shed the rain. A scale was attached to the instrument to indicate the degrees of divergency of the two straws, and in order to determine the quantity of electricity indicated by the degrees of this divergency a series of preliminary experiments were made. The rod and rain-screen being removed, the knob of the electrometer was touched by a ball suspended from a silk thread and previously electrified, and the degree of divergence was noted. This ball was then touched with another ball, of an equal size and similarly insulated, in its neutral condition, which reduced the quantity of electricity one-half. The electrometer having been previously discharged, its knob was again touched by the ball thus reduced in intensity, and the divergency in this case again noted; a charge of only one-half that of the previous trial was indicated. If the second ball were reduced to neutrality and again touched the first ball, the quantity of electricity of the latter would be reduced to one-fourth, and the degree of divergency in this case, whatever it might be, would indicate one-fourth the original charge. From these experiments a table could be formed by interpolation which would give approximately the value of the several degrees of divergency in relative measures. To use this instrument in measuring the quantity of electricity from day to day, Saussure attached a small leaden ball to the end of a fine wire, the lower end of which rested upon the knob. He threw this perpendicularly upward, carrying the fine wire with it, and finally detaching it from the electrometer. As the lead bulb rose in the atmosphere by the induction of the earth, it became negatively electrified, or, in other words, the positive electricity of the leaden bulb was drawn down into the electrometer, the leaves of which diverged with positive electricity. But the method most generally employed by Saussure was that of affixing to the top of the electrometer a pointed rod, as shown in Fig. 2, and to the top of this again a burning match. When this instrument was held above the head, it scarcely ever failed in clear and dry weather to indicate an electrical excitement. The *rationale* of the burning match is not difficult to understand on the theory of induction. Let us suppose a series of hollow pointed cones placed on the top of the rod and thrown off upward one by one through some explosive agency; each cone as it left the rod would leave its positive electricity behind it, on account of the attraction of the earth below, and each would therefore impart an additional quantity of electricity to the rod, which would be indicated by the divergency of the electrometer. The heated air and smoke which continue to arise from the match, since they are partial conductors, would perform the same office as the cones. Another way of using the same instrument consists in placing a polished ball, say six inches in diameter, on the end of a glass rod which is held in the hand. If this be elevated by ascending a step-ladder, say eight or ten feet, but generally less, and touched by the hand or a metallic conductor in its position of greatest elevation, then brought down to near the level of the earth in an insulated condition, and applied to the knob of the electrometer, the pointed wire being removed, the stems will diverge with negative electricity. The attraction of the negative electricity of the earth will draw the positive electricity of the ball to its lower surface, and when this is touched will pass through the body of the observer to the earth. The greater the divergence of the stems of the electrometer, the greater will be considered the positive electricity of the atmosphere, although a similar effect might be produced by a change in the electrical condition of the earth.

Fig. 2.

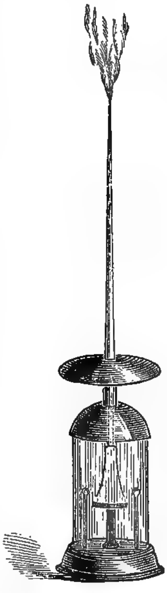


Fig. 3.

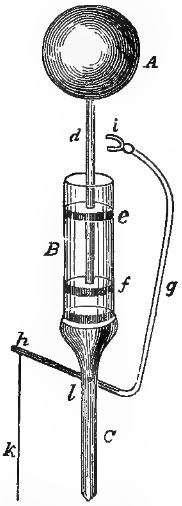
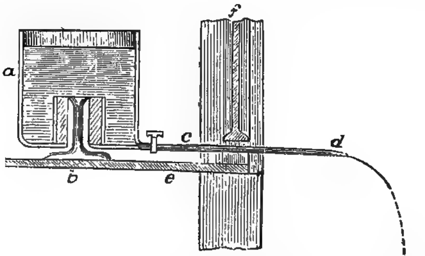


Fig. 4.



But a more convenient form of arrangement for studying the electrical condition of the atmosphere is that invented by M. Dellman, and shown in Fig. 3. A is a brass ball supported on a glass tube and passing through corks of gum-shellac. The apparatus is fastened to the upper end of a pole which is elevated by a windlass or the hand above the top of a house. When at the height intended the wire *k*, connected with the earth below, is pulled; the end of the bent metallic lever *g h*, pivoted at *l*, is depressed, and the fork *i* brought into contact with the stem of the globe, and thus a metallic connection is formed between the ball and the ground. The wire *k* is then released, the lever falls back, and the ball, the connection of which with the earth is severed, is brought down and applied to an electrometer. Another instrument, perhaps still more simple, was introduced by Sir William Thompson. It consists in allowing a fine stream of water to flow from an insulated metallic vessel through a pipe which projects below, but without touching, the sash of a window, which is raised a few inches for the purpose, or through some other aperture in the wall of the house. This apparatus, which is called "the water-dropping collector," is represented in Fig. 4. A is the metallic can containing water, which can be discharged through the pipe *cd* by turning a tap. It is supported on a glass stem at *b*, which is surrounded without contact by a cylinder of pumice-stone moistened with sulphuric acid. The pumice-stone is separated from the metal by a coating of gutta-percha. The acid needs renewal only once in about two months, and by absorbing the moisture produces an excellent insulation; *e* is a shelf on which the apparatus is supported, *f* the window-sash. As this instrument is insulated, any increase or diminution in the inductive action of the earth or in the electricity of the air will be manifested by a change in its electrical state, since as the drops flow off they carry with them the electricity of that point. The operation of this instrument may be understood by considering that the stream of water which flows from the nozzle is the upper end of an insulated conductor, which, breaking off, carries away with it the negative electricity, leaving the upper part of the stream, as well as the insulated reservoir connected with it, positive. An electrometer in the same room with the reservoir will be in a neutral condition, since it is, as it were, below the surface of the earth, the exterior of which is the roof of the house. The reservoir being touched with a carrier ball—that is, a globe of metal an inch or two in diameter suspended by a silk thread—and this again brought in contact with the knob of the electrometer, the divergency of the stems gives the quantity of electricity. During cold weather, when the water would be frozen, a burning match may be attached to the end of the spout with the same results as the dripping of the water. This match or fuse is made by rolling up into a cylindrical form a slip of blotting-paper previously saturated with a solution of nitrate of lead, and afterward dried.

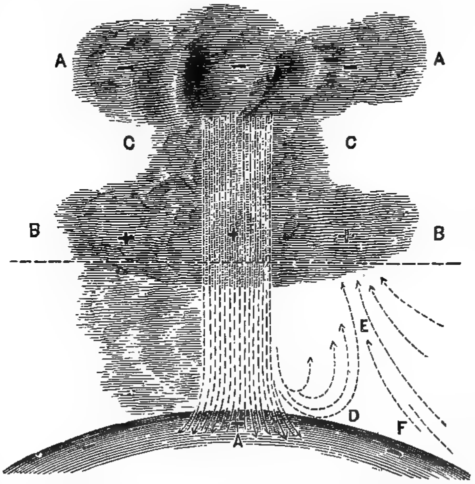
The electrometer generally used with the instrument of Dellman is that of Peltier, and that used with the dripping collector is the electrometer of Thompson (both of which are described in the first volume, under the head of ELECTRICITY), but either, or the electrometer of Saussure, may be employed. When observations are carefully made with these instruments, a change is observed in the electrical indications from day to day, from hour to hour, and in some cases even at shorter intervals in clear weather, while by a series of observations continued through the year, monthly and daily maxima and minima are established. In cloudy weather, and especially during thunderstorms, the excitement will sometimes entirely cease, and then again reverse its sign. These variations are intimately connected with the quantity of moisture in the atmosphere. This is seen from observations made at Brussels by M. Quetellet, and also at the Kew Observatory by Prof. Stewart, from which it appears that the minimum quantity of electrical excitement above the earth in clear weather occurs in the hottest part of the year, and the maximum in the coldest. We can explain this phenomenon on the supposition that the air when charged with a great amount of vapor becomes a partial conductor, and permits the negative electricity of the earth to extend higher up into the atmosphere, and thus, as it were, partially neutralizes the positive tendency of the air. The diurnal changes may also be influenced by the greater or less quantity of moisture in the atmosphere, but it is not impossible that they may be the result of changes in the electrical condition of the earth itself; for since the sun and moon are known to influence the magnetism of the earth, it is not improbable that they also affect inductively the distribution of its electricity. We think if the air were entirely devoid of moisture, its normal condition would be that of neutrality, but through the partial conducting property of the moisture by the induction of the earth the atmosphere as a whole becomes electrified.

The Electrical Phenomena of Thunderclouds.—What we have thus far stated relates to the electrical phenomena above the earth during clear weather. From the effect produced by elevating above the surface of the earth a comparatively small metallic conductor, we may readily conclude that the suspension in the atmosphere of even a partial conductor, such as a cloud of comparatively great magnitude, would exhibit electrical excitement of commensurate intensity and quantity. Let us suppose a warm, dry day in midsummer, with a high dew-point, and consequently the lower stratum of the atmosphere in an unstable condition, too light for its present position, and ready to rush up into a higher and colder station; and let us further suppose that the equilibrium is disturbed in a given spot by greater heat or by the configuration of the ground, and that a column actually begins to ascend. As soon as its top reaches the elevation at which the temperature is below the dew-point, condensation of a part of the invisible vapor will begin, and a cloud will be formed which will continue to elongate upward until the latent heat is all evolved and the vapor condensed. Let us suppose for a moment that the rushing up of moist air ceases, and consider the electrical condition of the cloud which has been formed. It is evident from what has been said that the upper part will tend to become negative and the lower part positive by the attraction of the negative electricity of the earth on the natural electricity of the vapor. This distribution of electricity will not take place instantaneously or gradually, but by a series of discharges between the upper and lower part of the cloud. On one occasion the writer of this article watched at a distance the flashes which took place between the upper and lower portions of a high cumulus cloud, and observed that after five or six flashes between the top and bottom had taken place, a single intense discharge passed between the base of the cloud and the earth.

We have supposed in this case that the ascent of moist air ceased after the first formation of the column, but this is not the case. A new cloud is constantly being formed, from which rain continues to fall. The inductive effects we have described are constantly repeated, and hence a thundercloud, the base of which is enclosed in a space of perhaps two or three miles in diameter, will pass several hundred miles over the surface of the country, continually pouring down rain and giving out discharges of lightning. It is in this way that the cloud does not exhaust itself, the rain which falls from it being due to the condensation of vapor which a few minutes before existed at or near the surface of the earth in an invisible state, and the lightning which it continues to discharge being produced by the natural electricity of the condensed vapor developed by the induction of the negative electricity of the earth. We need not be surprised at the quantity and intensity of the electrical discharge when we consider the effect produced by the elevation of so small a conductor as the metallic string of a kite during perfectly clear weather.

We have given in Fig. 5 an ideal representation of a typical electrical cloud in a stationary condition, in which we have endeavored to exhibit the remarkable currents of air which are observed during a thunder-storm below the cloud. The particles of the upper and lower cloud, being charged with free electricity, tend to repel each other, and hence the cloud will spread out horizontally above and below. The greatest amount of condensation will be produced in the centre of the uprising column, and hence the rain will pour down through the axis of the cloud. As it begins to descend it will be negatively electrified, but passing through the lower portion of the cloud its electricity will be diminished, become neutral, and finally positive. As it falls it tends to bring down the air with it, thus producing a wind at the surface of the earth outward in every direction from the axis of the storm, less perhaps on the western side on account of the eastern movement of the cloud and the exhaustion of the aqueous vapor on that side. The intensity of this wind will depend not upon the depth of rain at any one point, but upon the quantity which falls on the whole area covered by the rain. This wind is met by a current in the opposite direction rising up under the base of the cloud, and hence a conflict is produced having an upward resultant, which is represented by the arrows in the sketch. This motion of the wind is not a mere deduction from a hypothesis, but an actual representation of facts. During thunder-storms, as the writer has frequently observed them at Washington, the first appearance is that of a dark cloud in the W., with perhaps a gentle wind blowing from the opposite quarter. As the cloud approaches a curtain of dust will be seen to arise almost to the base of the cloud. At this time at the position of the observer there is an entire stillness of the air. A few minutes afterwards this stillness is broken by a violent wind from the W., provided the axis of the storm is approaching the point of observation. This wind, though moving perhaps at the rate of 50 miles an hour, is not felt a few hundred rods to the E.; in fact, the small portion of it which passes over the observer may be considered as revolving through the arc of a cylinder the axis of which is horizontal. After this the rain continues for a

FIG. 5.

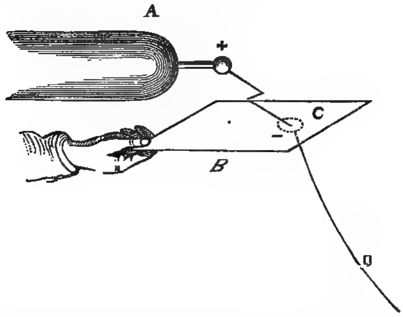


while, and gradually ceases, with a mistiness on the western portion of the storm. These phenomena are definitely represented in the figure. The violent wind rushing out at the base of the falling current of rain is checked and turned upward by the wind drawn in under the base of the cloud. While the storm is passing from D to F there will be a calm; the wind at the surface blowing outward catches the dust, which is carried upward in the resultant direction of the two opposing currents, as at E. The cloud is fed with vapor principally on its eastern side, since in its passage eastward it exhausts, as it were, the moist air on its western border. The cloud therefore not only moves eastward—probably on account of the prevailing current from the W. in the higher regions—but it also grows in that direction, if we may use the expression, by the ascent of fresh vapor, while it diminishes on the opposite side. After the upward rush of vapor has ceased, and the cloud is left insulated in the atmosphere, its upper part will in some cases dissolve away, on account of the greater dryness of the air above, and a partial conductor will remain charged with positive electricity, which by induction will materially affect the electricity of the earth as indicated by the electrometers previously described.

If the compound cloud of which we have given a description in its course passes over a mountain-peak or gives a discharge to the earth without receiving a new access of vapor, it may then as a whole become negatively electrified, and in this condition would exert an opposite influence upon the instruments. An electrified cloud will also produce an effect upon the air immediately around, especially if it contains a certain degree of moisture, not enough to render it a perfect conductor. In this case a stratum of negative electricity will exist around the cloud, and around this an outer cloud of positive electricity. This condition of the atmosphere is often exhibited by the indications of the electrometers, which as the cloud approaches the zenith of the observer shows first positive, then negative, and again positive electricity, the same phenomena in a reversed order appearing as the cloud passes away.

Effects of Lightning.—Since a lightning discharge is, in reality, an immense electrical spark, the effects which it produces differ only in degree from those which are manifested by the electrical machine. In a discharge from the cloud the electricity traverses the line of least resistance, and therefore frequently deviates much from a straight line, its course being marked out by the induction of an opposite condition in the material through which it is to pass. If on the lower side of a thin board B (Fig. 6), a foot or more in extent, a plate of metal C, an inch or two in diameter, is fastened, and to the lower surface of this again is soldered a wire D, leading down to the earth, and sparks from the knob of the prime conductor of an electrical machine be thrown upon the upper surface of this board, they will always strike it in a point immediately above the plate of metal. In like manner, if a good conducting material exist beneath the surface of the ground at any place, such as metal, water, or damp earth, the induction of the cloud will render it negative, and a strong attraction will arise between the two, and a discharge will sometimes take place, when if such a conductor did not exist the air would not be ruptured. If a thundercloud highly charged with positive electricity project over a given place, the earth underneath will become abnormally negative, and the body of any animal standing under the cloud will partake of this influence. If in this condition a discharge takes place from a distant edge of the cloud, the restoration of the equilibrium will be so sudden and violent—or, to use the language of hypothesis, the fluid will rush up into the body with such force—as to produce death. Accidents of this kind are referred to what is called the principle of the return stroke, of which many examples are given in the books. Dynamical effects are also produced in the vicinity of the path of the discharge; instantaneous currents are excited in all conductors; sparks are frequently seen in various parts of a house between isolated pieces of metal or other conductors in the vicinity of a powerful discharge; and persons are shocked, although the discharge has traversed an adjacent tree or passed innoxiously down a lightning-rod. The dynamic effect of a lightning discharge at a distance is perhaps best shown by soldering one end of a copper wire to the tin roof of a house, and the other end to the water or gas pipe in a lower story. A break in this wire, the two ends of which terminate in small balls brought within a short distance of each other, will exhibit a spark at the instant of a discharge, although it may be at a considerable distance. If the break in the conductor be closed by a spiral consisting of many turns of insulated fine wire, and a sewing needle be placed in its axis, it will become magnetic by the discharge, and the polarity of it may be determined by a toy compass, such as is used on a watch-chain, consisting of a needle of half an inch in length. To render the sewing needle more manageable, the sharp end is stuck into a small cork, which serves as a handle. With an arrangement of this kind the writer of this article has obtained inductive effects from a discharge of lightning at a distance of eight or ten miles. A similar effect has been produced by the writer from machine electricity. For this purpose a wire several hundred yards in length was stretched horizontally between the upper stories of two buildings, across a campus, the two ends terminating in plates of metal which dipped into a well at each extremity. A second wire was stretched between two poles parallel to the first, its ends terminating in metallic plates buried in the earth. Inductive effects were obtained by this arrangement from the discharge of a battery of nine Leyden jars, each of the capacity of a gallon, when the two wires were separated from each other at least 150 yards, a long building intervening. Effects might probably have been obtained at a greater distance had the parallel portions of the wires been of greater length. This dynamic induction frequently produces accidents in the telegraph-office, and a peculiar arrangement is necessary to transmit the induced current to the earth.

FIG. 6.



When the electrical discharge from a Leyden battery is transmitted through a small brass wire, the atoms of the component metals are separated, in a metallic state, into an impalpable powder, and may be made to impress a metallic stain on glass. This effect, therefore, is not due primarily to heat, but to the repulsive energy communicated to the atoms. Similar effects produced by lightning are recorded by the older electricians under the name of cold fusion. In like manner, when a discharge of lightning takes place in the atmosphere a tremendous repulsive energy is excited in the particles of air in the line of its path, and to this action we attribute many of the mechanical effects exhibited by atmospheric electricity. In one instance which fell under our observation a powerful discharge of lightning took place between two chimneys of a house, traversing the space under the rafters called the cockloft; such was the repulsive energy given to the air that the whole roof was lifted off. We attribute to the same action the throwing off of the clapboards of a house when the discharge takes place between them and the interior plastering. A similar effect takes place when a discharge from a Leyden jar is passed between two bulbs in a tube filled with water: the glass is broken into pieces. An analogous effect has been observed when a discharge of lightning has passed through a conduit-pipe of stoneware transmitting a current of water. The intensity of the repulsive energy appears to be greatest in the line of the axis of the discharge, and at the place of rupture of a conductor, or, in other words, at its two ends, the most energetic effects are manifested. This is illustrated by the old experiment of passing the discharge of a Leyden jar through a card, a burr being raised on both sides. A tree is sometimes found broken transversely about the middle of the trunk, as if pulled asunder or the parts separated by a violent repulsion in the direction of the axis. Trees are, however, generally splintered longitudinally, and the parts thrown off to a considerable distance laterally. This effect is generally attributed to the sudden evaporation of the sap, but it may also be a direct result of the repulsive action of the particles of wood. In the case of a discharge of lightning between a cloud and the surface of the earth covered with a pavement, the stones are frequently found thrown out so as to form a hole like an inverted cone. When the discharge passes through a wall a conical hole is produced on both sides. Cases are on record of a row of boys on a bench in school, in which only the two extreme ones were killed by a discharge which passed through the row. This is an illustration of the fact previously mentioned, that the effect is greatest at the points where the electricity enters and leaves a conductor.

It is probable that the noise of thunder is due to the repulsive energy with which the air is thrown apart along the path of the discharge of lightning. Were the discharge to take place in a perfect circle, the ear being in the centre, a single explosion would alone be heard. But inasmuch as the discharge is approximately in a right line, if the ear be placed near one end of this a series of sound-waves will reach it in succession from points at different distances, and hence a prolonged sound will be the result. The increase in the loudness of the report which is sometimes observed towards the end of the sound is probably due to the greater consolidation of the discharge as it leaves the cloud, which frequently afterward branches out into various streams. JOSEPH HENRY.

Lightning-Rods. The utility of the invention of our illustrious countryman, Dr. Franklin, for the protection of buildings from lightning has sometimes been called in question, but no one who has studied the subject, and is capable of a proper appreciation of scientific principles, can doubt its importance. An edifice supplied with lightning-rods of a proper character—that is, embracing all the requisites indicated by a scientific knowledge of the laws of electrical action—may be considered as entirely protected from the disastrous effects of discharges of lightning; but in order to this the conductor must be constructed on definite scientific principles, and not on loose analogies or untenable hypotheses, as is too frequently the case with the products of the vendors of improved lightning-conductors.

The perfect lightning-rod is one which attracts the descending bolt to itself, and transmits the discharge harmlessly to the earth. (1) To ensure this quality the rod should terminate above in a single point, and to preserve this from the weather, as well as to prevent its being melted by a slight discharge, it should be encased in a hollow cone of platinum. One point is found by experiment to attract electricity from a charged conductor at a greater distance than a number, for several points projecting from the same stem near each other approximate in action a spherical surface, and by interference each lessens the effect of the other. (2) The rod should consist of round iron not less than three-fourths of an inch in diameter; a larger size is preferable to a smaller one. Iron is preferred, because it can be readily procured, is cheap, a sufficiently good conductor, and, when of the size mentioned, cannot be melted by a discharge from a cloud. The conductor should be round—or, in other words, cylindrical—because electricity repels itself, and tends to escape into neighboring bodies from points or sharp edges; and, as we shall see, the rod at the moment that the discharge is passing through it is in the condition of a charged conductor; hence flat or twisted rods are imperfect conductors, as they tend to give off lateral sparks from the sharp edges during the passage of the discharge, which might, in some cases, set fire to very combustible materials. A rod may be formed of ordinary gas-pipe, since it is a well-established fact that electricity passes at the surface, unless the charge be exceedingly large in reference to the capacity of the rod. If a discharge of electricity be sent through a wide ribbon of copper or iron placed in a horizontal position, and over the surface of which at intervals pieces of sewing needles of a quarter of an inch in length are placed at right angles to its length, it will be found that only those pieces of needle which are near the edge are magnetized, while those near the middle remain unaffected. This experiment conclusively proves that electricity repels itself while in transmission, as well as in a statical condition, and shows the absurdity of substituting for a cylindrical form of rod that of a twisted ribbon. (3) The rod throughout its whole length should be in perfect continuity; for this purpose it should, if possible, be made of one piece of iron; and when joinings are unavoidable the parts should be firmly screwed together by a coupling ferule. (4) To secure it from rust the rod should be covered with a coating of black paint, which will not sensibly interfere with its power of conduction. (5) The shorter and more direct the rod is in its course to the earth the better; acute angles made by bending the rod at any point along its course should be avoided. (6) In case of powder-houses, where extreme precaution is required against sparks of induction within the edifice, several rods should be used, and these supported on masts at some distance from the four sides of the building. But in case of a dwelling-house, where inductive action of this kind could scarcely ever produce serious consequences, the rod may be fastened to the side of the house by iron eyes, driven or screwed into the wall; the extreme point of these eyes, being buried in non-conducting masonry or wood, will not tend to give off electricity at the time of a discharge. The rod may be insulated by glass cylinders intervening between it and the eyes, but we do not attribute much importance to this insulation, since it is immediately destroyed by the rain. (7) The lower end of the rod should be connected with the earth in the most perfect manner possible; and in cities nothing is better for this purpose than to unite it in good metallic connection with the gas-mains or water-pipes in the street; and, indeed, such a connection is absolutely necessary if the house is furnished with gas and water. If a cloud highly charged with positive electricity be floating over a city, the gas and water pipes will become highly negative, and therefore strongly attract the electricity of the cloud, and may thus induce a discharge which would not otherwise take place. If in such a case a proper conductor is not provided on the outside of the building to transmit the discharge to the earth, a serious accident might ensue. In the country, where gas and water pipes are not accessible, the rod should terminate below the surface of the water in a well, or, if this is impossible, it should be extended out from the house under ground for fifty to sixty feet, and then sunk perpendicularly till it reaches, if possible, moist earth. The perpendicular as well as horizontal part of the excavation may be filled advantageously with scraps of metal from the shop of the tinman or with powdered charcoal, to render the connection with the earth more perfect. To afford a still better connection with the earth, in some cases the rod is made to terminate in a number of branches, each buried as above described; but the necessity of branches will depend upon the degree of dryness of the earth. The mistake should not be made, as has frequently been done, of terminating the end of the rod in a cistern, the water of which may be considered as insulated from the earth by the lining of cement. (8) If within the house there are masses of metal, such as iron girders, water-tanks, or bathing-tubs, they should be placed in metallic connection with each other and with the rod by slips of iron or copper, otherwise they are liable to emit sparks by induction during the instant of a discharge, and, though serious effects are not often produced by this action, it serves at least to alarm the inmates of the house. As an example of this, if in any case a water-pipe approaches within an inch or two of a gas-pipe, a spark will usually be seen to traverse the space, accompanied by a loud report, when an electric discharge passes down the rod. (9) The rod should be placed in preference on the W. side of the house, since the thundercloud usually comes from a western direction; but for a stronger reason it should be placed on the side of a chimney from which a current of heated air ascends during the summer season; the ascent of warm and rarefied air tends, as we have seen, to intensify the action of the conducting soot of the chimney. (10) In case of a small house a single rod may suffice for protection, provided its point be sufficiently high above the roof; the rule being observed that the elevation of the point should at least be half of the distance to which its protection is intended to extend. Thus, the point of a rod on a house the ridge of the roof of which is fifty feet in length, should have an elevation of twelve and a half feet, which is half the radius of the circle of protection. This rule is derived from experiment; but it is safer, where several points are erected on the same house, that they should be nearer than this rule would indicate; and indeed there is no objection to an indefinite number of rods, provided they are placed in good metallic connection with each other on the sides of the building or at the surface of the earth. A building entirely enclosed, as it were, in a cage of rods intimately connected with the earth and each other would be safe from discharges of electricity, whatever might be its energy. (11) When the house is covered with a metallic roof, it should be connected with the lightning-rod, or the perpendicular pipes conveying the water down from the gutter at the eaves may be made to act the part of a rod. In this case the roof must be connected with the gutter by strips of copper or iron, and the lower end of the spout with the gas or water pipes, if in the city, by the same means; or in the country with the earth, after the manner we have mentioned. In addition to this, a pointed rod should be elevated above the roof, especially at the chimneys; but in arranging this care must be taken to join the rod in good metallic connection with the roof, the foot of the former being soldered to the surface of the latter.

The foregoing rules may serve as a general guide in erecting lightning-rods on ordinary buildings, but in large, complex structures a survey should be made, and the best form of protection in accordance with scientific principles adopted.

One effect of the lightning-rod deserves especial notice—namely, the effect it has upon the air in the vicinity of the point; during the passage of a thundercloud the point is frequently seen illuminated by a glow of light. During a violent thunderstorm at night, while flashes of lightning were passing from cloud to cloud near the zenith, the author of this article stood in the trapdoor on the top of the high tower of the Smithsonian Institution, within about ten feet of the top of the lightning-rod. At every flash of lightning a jet of light at least five or six feet in length issued from the point of the rod with a hissing noise. The top of this rod is about 155 feet above the earth. The electricity thus passing from the rod was of an opposite character from that of the cloud, and would tend to electrify a globe of air surrounding the point of which it was the centre. If the cloud was positive, this globe would be negative, and in case of a discharge from the cloud to the rod, the electricity of this globe would be neutralized; and in the act of this neutralization the intensity of the discharge would be considerably modified. This result was probably connected with the peculiarity of the sound of the discharge heard in several cases in which lightning was transmitted through a rod of the institution. The sound in these cases consisted in at first a hiss, followed in a moment after by a loud explosion. The Smithsonian building being situated on a plain in an isolated position, and furnished with a number of high towers and pinnacles, is evidently, from theoretical considerations, in a condition especially liable to be struck by lightning. And as an evidence of the truth of this inference, as well as of the utility of lightning-rods, we may mention that it is certain that within the last twenty-five years at least as many as four discharges have been harmlessly conveyed to the earth through the conductors with which the building is provided. In two of these cases the evidence of the occurrence of the discharge rests upon the melting of the platinum points, and the others on the nearness of the explosion and the peculiar sound previously mentioned. In one of the first cases the author himself was within six feet of the rod, with a wall of masonry of about two feet intervening. He felt no shock, but a person in the same room, either from fright or a nervous affection, fell upon his knees, devoutly making the sign of the cross on the instant.

The mode of protecting ships from lightning generally consists in suspending a light chain from the lower end of a pointed rod attached to the upper yard-arms, the lower extremity of the chain being immersed below the surface of the ocean. These chains are not unfrequently destroyed by heavy discharges, though in the act of being broken they serve, in most cases, to protect the vessel from injury. Sir Snow Harris of England has introduced another plan into the British navy, which consists in letting into a groove down the mast a ribbon of thick copper, so as not to interfere with the hoisting of the sails. The upper end of this rod terminates above the mast in a platinum point, and the lower part, continued down along the mast through the decks to the bottom of the vessel, terminates in the copper sheathing. We do not consider this plan as safe, especially in ships loaded with cotton, as that in which the copper ribbon is continued across the deck in a groove, and over the side of the vessel until it reaches the copper sheathing.

It has been shown by the author of this article, from conclusive experiments, that in the transmission of a positive charge, for example, the different points of the rod are excited in succession along its length by two adjacent waves, as it were, of electricity—a positive one, preceded by a negative wave. To illustrate this point, the following experiment may be mentioned. Sparks from the prime conductor of an ordinary electrical machine were thrown on the upper part of a lightning-rod as it projected above a tower, and although the lower end of the rod was intimately connected with the earth by the most approved method, yet at each discharge of the prime conductor a spark could be drawn from every point of the rod throughout its whole length, down to within a foot of the ground. With these sparks a gas-pistol was exploded and the fibres of combustible substances ignited. These sparks, though in some cases half an inch long and apparently very intense, failed to affect in the slightest degree a delicate gold-leaf electrometer—an evidence that they consisted of two sparks in momentary succession, the one plus and the other minus.

In regard to the safest position during a thunderstorm, especially in a house not well protected by a lightning-rod, we would advise a position in the middle of the room, and a horizontal one rather than a vertical. Windows, either open or shut, and chimneys should be avoided, but in a house not protected by rods no place can be considered as entirely safe. When in the open air trees should be avoided, since the trunk being a bad conductor of electricity, the discharge will leave it and pass through the body of a man or animal which may be near it, this being the path of least resistance previously marked out by the inductive action of the descending bolt.

We have thought it necessary to dwell upon this subject of lightning-rods because innumerable patents have been granted in this country for improved rods, most of which are completely valueless because they have been devised by persons ignorant of the principles of electricity.

Joseph Henry.

Ligne (Charles Joseph), Prince of, b. May 12, 1735, at Brussels, descended from one of the wealthiest and most powerful Belgian families; entered the Austrian army in 1752, distinguished himself in the Seven Years' war, and commanded the vanguard in the Bavarian war of succession. Under the reign of Joseph II. he held the highest military and diplomatic positions, and the elegance of his manners and the brilliancy of his conversation made him a favorite with all European courts. But under Leopold he fell into disgrace, partly on account of his son's participation in the Belgian insurrection (1790), and he was never again employed in active service. He lived in retirement at Vienna, engaged in literary pursuits, and d. there Dec. 13, 1814. Of his *Mélanges militaires, littéraires et sentimentaires* (34 vols., 1795–1811), Malte-Brun has given a selection, *Œuvres choisies*, in 2 vols. His letters and memoirs have considerable historical interest.

Lig'nine [Lat. *lignum*, "wood"], a synonym of Cellulose. (See article under this head, by Prof. C. F. Chandler, Ph. D., M. D., LL.D.)

Lig'nite [Lat. *lignum*, "wood"], the name originally given to bitumenized wood, but now applied to most coals which occur in the more recent geological formations; the term is therefore synonymous with brown coal. As stated in the article on Coal, lignite has no definite formula of composition, but different specimens vary much in physical and chemical character, shading into unchanged vegetable fibre above and true coal below. The chemical composition of wood-fibre, according to Bischoff, is carbon 49.1, hydrogen 6.3, oxygen 44.6. When this is buried in water or earth, it immediately commences to decompose by the combination of its constituents, and the absorption of external oxygen, forming carburetted hydrogen, carbonic acid, carbonic oxide, water, petroleum, etc., which escape, and leave a solid diminished in volume, increased in density, and darkened in color. Ultimately it becomes black, though having a brown streak, with a glistening, pitchy fracture. In this stage it is called *lignite*, and when chemically examined is found to have lost perhaps one-third of its carbon, one-half of its oxygen, and more or less of its hydrogen, the relative percentage of carbon being therefore greater in lignite than in wood. Lignites or brown coals are found chiefly in the Cretaceous and Tertiary formations. Here they occur in deposits which rival in area and thickness the coal-beds of the Carboniferous system. In general terms, it may be said that the lignites occupy an intermediate position, both in date and composition, between the peat which is now forming and true coals of Palæozoic age, and represent a stage in the progressive distillation vegetable tissue passes through when buried, and which results in the formation as residual products of —1st, peats; 2d, lignite; 3d, bituminous coal; 4th, anthracite; 5th, graphite. No sharp lines of demarcation separate these groups, however, as we find them shading into each other by all possible intermediate phases. Since they are successively derivatives one from the other, the series is necessarily continuous. It should also be said that the name *lignite* is applied to woody tissue in which the process of bitumenization has begun, however modern it may be; and among the forms of recent and superficial bitumenized vegetation that which has been derived from the decomposition of mosses, grasses, etc.—generally a porous, spongy substance—is called peat, while changed wood is called lignite.

The mode of formation of the great beds of so-called lignite of the Cretaceous and Tertiary systems seems to have been similar to that in which peat is now accumulating, and in which coal was formed in the marshes of the Carboniferous age. In some instances they are underlain by strata of fireclay, and are overlain by shales, sandstones, and limestones, precisely as the coal-strata are; and it is evident that they have a common origin and history, except that in the lignites that history has not reached as far as in the coals. It not unfrequently happens, however, that beds of lignite have by local causes been changed to the condition corresponding to bituminous coal, or even anthracite. Such instances are furnished by some of the best lignites of Colorado, Utah, and Alaska, which have reached the condition of bituminous coal, and by the anthracites of Crested Buttes, Colorado, and that of Queen Charlotte's Island. In the last two cases beds of Cretaceous lignite have been, by local volcanic action, converted into anthracite as bright, hard, and useful as that of Pennsylvania. As the deposits of carbonized vegetation formed in the Tertiary and Cretaceous systems are classed as lignites, all the so-called coals of the great areas underlain by these formations come into this category, and it will probably be found that these modern coals exceed in the extent of their development, and rival in their value to man, the true coal-strata which are recognized as constituting the basis of all the great industries of civilization and the richest source of the wealth of nations.

It happens that the most important deposits of mineral fuel in Europe and Eastern America are found in the Carboniferous systems, but it is not known that any important deposits of true coal exist in other parts of the world. So far as we know, all the great coal-fields of China, India, Borneo, and Western America are of Mesozoic or Tertiary age. Deposits of lignite are also known to exist in Greenland, Arctic America, and in Central and South America. The economic value of lignites is, as a general rule, considerably less than that of true coals. This is due both to their chemical composition and physical characters. They usually contain from 12 to 20 per cent. of oxygen and 10 to 16 per cent. of water. Their heating power is therefore usually from one-half to two-thirds that of bituminous coal. The different ingredients mentioned sometimes constitute as much as one-third of the mass—a third which probably contributes nothing to the heating power, the water even absorbing some portion of the energy of the combustible material in its vaporization. The calorific power of pure carbon being estimated at 8000 units, and that of our best coals, in which the hydrogen is mainly neutralized by the oxygen, at from 7000 to 7500, the calorific power of lignite may be said to vary from 4000 to 5000. It should be said, however, that this is only a general rule. The calorific power of some of our Carboniferous coals hardly exceeds 6000 units, and some of the best lignites reach and even pass this point. The physical character of lignites also frequently impairs their economic value. They are usually somewhat tender, and the waste in mining and transporting them is greater than in the bituminous coals. They are apt, also, to crack badly, and frequently on exposure fall into a multitude of angular fragments. It rarely happens that they are capable of producing good coke. They are usually open-burning—*i. e.* do not adhere in the fire—and the proportion of volatile matter to fixed carbon is large. When this is driven off the residual coke is spongy and pulverulent. To this rule there are, however, exceptions which will be mentioned farther on.

In Europe the lignites or brown coals have been mined and used for many years, and the practical tests to which they have been subjected have accurately determined their value. The Bovey Tracey brown coal of England and most of the modern coals of France, Switzerland, Spain, Germany, Greece, India, etc. exhibit the characters here recorded. In some localities, however, especially in Austria and Italy, lignites are not only employed for household fuels and the generation of steam, but for locomotives and in furnaces. The following table shows the composition of a series of foreign lignites:

	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Waste.	Ashes.
Tasmania........	59.90	4.66	15.99	1.08	13.43	4.64
France...........	70.49	5.59	18.00	.93	......	4.99
"	63.88	4.58	17.10	1.00	......	13.43
Switzerland....	70.02	5.20	20.50	1.27	......	3.01
Greece...........	61.20	5.00	23.50	1.28	......	9.02
Bohemia.........	73.79	7.46	12.79	1.00	......	4.96
Germany........	70.12	3.19	7.59	1.00	3.63	15.47
"	60.83	4.36	23.50	1.14	9.07	2.43
Persia............	63.55	6.68	26.00	1.93	......	3.05
Siberia...........	47.46	4.50	32.00	1.03	......	14.95

All the coals found in the western half of the U. S. are of modern age, and are classed as lignites. These occur in both the Cretaceous and Tertiary formations, but chiefly in the former; and although their extent and value have been but imperfectly determined, it is known that very extensive deposits of this kind occur in New Mexico, Colorado, Wyoming, Utah, Nevada, California, Oregon, and Alaska. The lignites of New Mexico all belong to the Cretaceous formation, and are chiefly found in the lower portion of this series. They underlie a large area, including the northern portion of this Territory and Arizona, and on the San Juan River form strata altogether similar in appearance to our coal-beds, showing many miles of outcrop, and sometimes attaining a thickness of over thirty feet. These great beds, however, are not homogeneous, but consist of layers of a better quality interstratified with those that are shaly and impure. The lignite beds of Colorado and Wyoming occupy a broad belt along the flanks of the Rocky Mountains, extending N. across the Missouri and reaching far into Canadian territory. It is not known how large an area in this belt is underlain by workable beds of lignite, but it would probably not be extravagant to estimate that at least 50,000 square miles will prove to be productive coal area. The strata here vary in thickness from a few inches to twenty and even thirty feet. In Colorado and along the line of the Union Pacific R. R. these beds have been opened in many places, and are now extensively mined. The most important mines now worked are located at Trinidad, Cañon City, Golden, Carbon Station, Evanston, etc., and the coal is not only generally used by the resident population, but is largely consumed for locomotives on the railroad, and is exported in considerable quantities to San Francisco. The lignites of Colorado have much the character of the best-known varieties used in the Old World, and hold about the same rank in comparison with the Carboniferous coals. Here, however, as in other countries, some localities furnish fuels of superior character; for example, the coal of Trinidad and Crested Buttes, Col., can be coked, and is capable of being successfully used in forging and smelting. The same may be said of the San Pete coal, which is found in Utah, S. from Salt Lake City. The geological age of the lignites of Colorado has been much discussed, but there is little doubt that they are for the most part Cretaceous. There are, however, Tertiary lignites in this region, and a part of those so extensively exposed along the Missouri River are of Tertiary age. Nevada and California are not so well supplied with mineral fuel as Colorado, Wyoming, and Utah, but beds of lignite have been found in both. In California they have been quite largely mined on the flanks of Mount Diablo, and the market of San Francisco is partially supplied from this source. The coal of this locality is Cretaceous. On the coast of Oregon the Coose Bay coal has been mined for many years. This is of Tertiary age, and may be taken as a typical example of Tertiary lignite. Its composition will be seen from the table given below. In physical character it is, when first mined, hard, bright, and pitchy, but on desiccation is prone to break up into small fragments. Vancouver's Island is well supplied with coal, and has been a source from which a large part of the coal used on the Pacific coast has been derived. This is of Cretaceous age; it has precisely the appearance of some varieties of bituminous coal, and has a higher heating power and bears exposure and transportation better than most of the western coals. From Alaska two varieties of lignite have been brought, both of which are reported to exist in large quantities. Of these, one (No. 7 of table) resembles closely the Coose Bay coal, and may be suspected, both from its composition and associated fossils, to be of Tertiary age. The other has been subjected to local metamorphism, and is much harder and more valuable.

The localities which have been mentioned are by no means all in which lignite is known to exist in the far West, and there is every reason to believe, so far as quantity is concerned, that the deposits in this region are capable of fully supplying all the wants of its future population. In quality, however, these coals are not fully equal to the Carboniferous coals of the Eastern States. For the most part, they have decidedly less calorific power, are unfit for the manufacture of gas, and are not adapted for smelting purposes by any system of treatment yet adopted. There is little doubt, however, that they are capable of much more extensive and successful application than has yet been reached in their use. As their heating power is considerably greater than that of wood, they constitute a store of fuel of greater intrinsic value, and far exceeding in amount that which would be supplied by the densest forest-growth covering the entire area where they are found. They can-

ANALYSES OF AMERICAN LIGNITES, BY H. S. MUNROE, N. Y. School of Mines.

	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Water.	Ash.
1. Mount Diablo, California..............Cret...	59.724	5.078	15.697	1.008	3.916	8.940	5.637
2. Weber River, Utah...................... " ...	64.842	4.336	15.518	1.288	1.602	9.415	2.999
3. Echo Cañon, " .... " ...	69.840	3.897	10.990	1.932	.768	9.170	3.403
4. Carbon Station, Wyoming............ ? ...	64.992	3.762	15.199	1.736	1.066	11.565	1.680
5. " " " .... ? ...	69.144	4.362	9.539	1.246	1.025	8.065	6.619
6. Coose Bay, Oregon.......................Tert...	56.244	3.379	21.815	.420	.810	3.285	4.047
7. Alaska.. " ...	55.789	3.264	19.004	.608	.632	16.520	4.183
8. " .... ? ...	67.674	4.658	12.804	1.582	.920	3.075	9.287
Lignitic Anthracites.							
9. Santa Fé, New Mexico.................Cret...	74.372	2.583	8.712	1.764	.727	3.190	6.052
10. Los Bronces, Sonora.....................Trias.	84.103	.852	2.137	.280	.229	5.191	7.204

not fail, therefore, to play an important part in the future history of the West. Whether they can ever be made fully to take the place of our Carboniferous coal is doubtful, but the results attained in Austria and in the Val d'Arno, Italy, in the use of similar fuels afford good ground for the hope that they will be made to accomplish much more than has been done with them. By the introduction of the stair grate, and especially through the use of the Siemens regenerator, they may be made to produce a degree of heat sufficient for all metallurgic processes; and it may be confidently expected that by coking those which are capable of being coked, and by some method of combustion similar to those now suggested, they may be made to accomplish all the purposes served by other varieties of mineral fuel.

The foregoing table of analyses will show the composition of typical examples of the lignites of Western America.

The material called *jet*, so largely used for ornaments, is a variety of lignite which is chiefly obtained from the Lias at Whitby, England. Lignite of similar character occurs in Texas, Utah, and Colorado, and some of it is quite equal in quality to the English jet.

J. S. NEWBERRY.

Lig'num Rho'dium [Lat., "rosewood"], a commercial name for Canary Island rosewood (see ROSEWOOD), which yields the so-called oil of rhodium; also for the wood of *Amyris balsamifera*, a tree of the West Indies, which yields an oil used as a substitute for that just mentioned. The name is also given to other fragrant woods.

Lignum Vitæ. See GUAIACUM.

Ligonier', Noble co., Ind. (see map of Indiana, ref. 2–F, for location of county), on the Elkhart River and the Air-line division of the Lake Shore and Michigan Southern R. R., midway between Toledo and Chicago, has wagon and carriage factories, foundry, flour-mill, planing- and saw-mills, furniture-factory, a steam-elevator, and is situated in a fine grain-raising section. Principal occupation, farming. Pop. in 1870, 1514; in 1880, 2010.

Lign'y, a v. of Belgium, in the province of Namur, noted for the great battle of June 16, 1815, two days before that of Waterloo, in which Napoleon attacked and defeated the Prussians under Blücher.

Liguo'ri, de' (ALFONSO MARIA), SAINT, a doctor of the Church of Rome, b. at Naples, Italy, Sept. 27, 1696, of a noble family; became a lawyer when sixteen years old; entered a monastery in 1722, and was ordained priest in 1726; devoted himself to the religious instruction of the poor; founded in 1732, at Villa Scala, the order of REDEMPTORISTS (which see), which received papal approbation in 1749, when Liguori was confirmed as its superior-general; declined the archbishopric of Palermo; was bishop of Sant' Agatha 1762–75, when he resigned and devoted himself to theological studies and writing, giving up even his generalship of the Redemptorists. D. at Nocera dei Pagani Aug. 1, 1787; was declared venerable 1796; beatified in 1816; canonized in 1839, and declared a doctor of the Church in 1871. Among his many works are *Theologia Moralis* (1755), *Homo Apostolicus* (1782), *Institutio Catechetica* (1768), highly esteemed by Roman Catholics, though not accepted altogether unchallenged. As a moral philosopher he is equiprobabilist, teaching that in a balance of opinions that which is the less safe may be followed provided it be as probable, or nearly as probable, as its opposite. Always leaning toward the laxer side of the question, his doctrine has been attacked by the rigorists and designated *Liguorianism*.

Liguorians. See REDEMPTORISTS.

Ligu'ria, in ancient geography, a district of Northern Italy, the land of the Ligures, the boundaries of which were not accurately defined until the time of Augustus. According to his division of Italy, it comprised the territory from the Ligurian Sea across the Maritime Alps to the Padus (Po) in the N. and from the Varus in the W. to the Macra in the E. When first mentioned in history, the Ligures (or, as the Greeks called them, Ligyes or Ligystini) occupied a much larger territory, extending far into Gaul, on the western side of the Rhone. They were a warlike, quick-witted, and enterprising people, whose true descent was and is entirely unknown; they were neither Celts nor Siculians, but may have been related to the Iberians. In the period between the first and second Punic wars the first encounter took place between them and the Romans, and about 125 B. C. they were wholly subjugated. Large numbers of them were brought to Samnium and settled there, while Roman colonists took their place. Liguria formed the first nucleus of the Roman province of Gaul. The name was renewed by Napoleon, June 6, 1797, when the republic of Genoa was transformed into the Ligurian republic. (See GENOA.)

Li'lac [Turk. *leilāk*], the popular name of shrubs of the genus *Syringa*, order Oleaceæ. The best known is the common lilac, *S. vulgaris*, a native of Central Asia, half naturalized in Europe and America. Its early-blooming flowers are commonly of the tint called *lilac*, but often are white or dark purple. *S. Persica*, *S. Chinensis*, with other species and their hybrids, are common in cultivation. Their bark has decided febrifugal powers. The "wild lilacs" of the Pacific coast are beautiful shrubs of the genus *Ceanothus* (order Rhamnaceæ).

Lil'burne (JOHN), b. at Thickney Puncharden, Durham, in 1618; imbibed in youth opinions extremely hostile to the Church of England, and having circulated pamphlets against the bishops, was condemned in 1637 to pay £500, to receive 500 lashes, to stand in the pillory, and be remanded to prison. In 1641 he received a handsome compensation (£3000) for his sufferings from the Long Parliament. He fought in the Parliamentary army at Edgehill, Brentford, and Marston Moor, and was thrown into Newgate for libelling the Presbyterians. He afterwards aided in organizing the "Levellers;" accused Cromwell and Ireton of designs upon the sovereignty; was in 1649 tried for sedition and acquitted; took refuge in Holland; returned in 1653; joined the Quakers, and d. in 1657.

Lilia'ceæ [Lat. *lilium*, "lily"], a large order of petaloideous endogenous plants, characterized by a regular complete perianth, free from the three-celled ovary, and six stamens. They are mainly herbaceous, and with the six divisions of the perianth colored alike and the leaves parallel-veined; but to all these characters there are exceptions. Many have bulbs, others tubers or root-stocks. A few are arborescent, such as the larger yuccas, and especially dragon trees (*Dracæna*). The famous dragon tree of Orotava, Teneriffe, described and figured by Humboldt, and which succumbed only a few years ago, was regarded as one of the oldest trees in existence. As now received, the order comprises not only the Asphodeleæ and the Asparagineæ, but also the Melanthaceæ, which were generally regarded as distinct orders. To the lily family proper belong the tulips, lilies, crown-imperial, calochortus, and most of the well-known and highly-prized ornamental plants of the order, as also the hyacinth and the onion tribe. To the Asparagineæ, represented in cultivation by asparagus and by a popular conservatory climber, *Myrsiphyllum* (falsely called *Smilax*), are also referred *Convallaria* (the lily-of-the-valley), *Polygonatum* (Solomon's seal), and its allies, and even the dragon trees. To the colchicum family belongs not only the medicinal and ornamental *Colchicum* (meadow saffron, so-called from a resemblance to *Crocus*), but also *Veratrum*, the white hellebore and its allies, which furnish *veratrine*, all having very active acrid-poisonous roots or corms. Such properties are not wholly absent from the proper lily family, as, for instance, in the bulbs of *Gloriosa* and of crown-imperial. Those of squills are likewise very active, while those of garlics and leeks are well-known condiments, and those of onions and the young shoots of asparagus are staples of food. The bitter juice of one or two species of *Aloë* furnishes aloes, a common purgative. One of the strongest of fibres is New Zealand flax, from the leaves of *Phormium tenax*. The order is widely distributed over the world, but is most abundant in warm-temperate climates.

ASA GRAY.

Lille, or **Lisle** [Flem. *Ryssel*], town of France, the capital of the department of Le Nord, is situated in a fertile and well-cultivated plain on the Deule, and communicates by canals and railways with the sea and all the large commercial places of Northern France and Belgium. It is the head-quarters of the third military division, and is one of the strongest fortresses of Europe. Its fortifications were erected in the eleventh century; by Vauban they were thoroughly reconstructed, and they have received great improvements again in this century. The city is well built, with broad and regular streets and numerous squares, but of its public buildings none are very remarkable. It has a lyceum, an academy of design with a celebrated collection of drawings—among which are 86 by Raphael and about 200 by Michael Angelo—a botanical garden, several literary societies, and many scientific and educational institutions. Its principal importance, however, it derives from its manufactures. Much flax is grown in the vicinity, and the linen manufactures of Lille, especially those of table-cloths, are very extensive; the whole neighborhood is covered with bleaching-grounds. No less important is its cotton-spinning industry; about 36 large establishments are in operation. The tobacco manufactory of the government produces annually about 11,000,000 pounds. Beetroot sugar, rapeseed oil, gloves, and gunpowder are also manufactured in large quantities, and a very extensive trade is carried on. Lille was founded in the ninth century, belonged alternately to France or to the counts of Flanders, came into the possession of the house of Burgundy at the end of the fourteenth century, passed from Burgundy to Austria and Spain, but was conquered in 1667 by Louis XIV., since which time it has been a French city. In 1792 the Austrians bombarded the city for nine days and nights, but had finally to raise the siege. Pop. in 1881, 178,144.

Lil'lo (George), b. at London, England, in 1693; was a jeweller who produced several dramas, two of which were successful and celebrated—*George Barnwell* (1731) and *Fatal Curiosity* (1737). D. in London in 1739. His *Dramatic Works* were published in 1755, with a memoir.

Lillebonne' [Lat. *Juliobona*], town of France, in the department of Seine-Inférieure, noted for the vast quantities of Roman remains recently found, including marble and bronze statuary and a magnificent theatre in good preservation. In its vicinity stands the palace of Harcourt, built by William the Conqueror, one of the most remarkable edifices of Normandy. Pop. 6108.

Lillers', town of France, in the Pas-de-Calais, on the Nave, noted as the place where the first artesian well was dug in the twelfth century. It has some manufactures. Pop. 7353.

Lilly (John). See Lyly.

Lil'ly (William), b. at Diseworth, Leicestershire, England, May 1, 1602; commenced the study of astrology in 1632, and in 1644 began the publication of an annual almanac, *Merlinus Anglicus Junior,* which contained some wonderful predictions, and was eagerly read by all parties. He instructed many pupils in his art, and practised medicine in combination therewith. In his *Monarchy or No Monarchy* (1651) appeared two hieroglyphical figures which were subsequently claimed to refer to the plague and the great fire in London in 1666. He wrote an *Introduction to Astrology,* a *Grammar of Astrology,* and *Tables of Nativities,* and d. at Walton-upon-Thames June 9, 1681, leaving an *Autobiography,* which was first published in 1715.

Lil'y [Lat. *lilium*], the popular name of the leading genus of the order Liliaceæ (which see), comprising some of the commonest and most valued of hardy ornamental bulbiferous plants, natives of the northern temperate zone. Several are indigenous to the U. S., the more showy and common ones being *Lilium Philadelphicum,* with an upright flower, and *L. Canadense* and *L. superbum,* with nodding ones; these orange and orange-red. Related species of California are now coming into cultivation, as well as one or two with white or rose-colored blossoms. *L. candidum,* the common white lily of the gardens, came from the Levant and Caucasus. The large and choice Japanese lilies, white or partly so, came from *L. longiflorum,* with long and narrow flowers, and *L. Japonicum, L. speciosum,* and *L. auratum,* with very broad and open ones. In the scarlet-flowered *L. Chalcedonicum,* abounding in Palestine, we "behold the lilies of the field" of Scripture. The Martagon lily, *L. Martagon* of the Old World, answers nearest to our *L. superbum.* The tiger and bulblet-bearing lilies of cultivation, all natives of the Old World, and producing bulblets in the axils of the leaves, belong to *L. tigrinum, L. croceum,* and *L. bulbiferum,* the last two known by their erect flowers. Finally, the name of lily is extended in popular use to various other lily-like flowers of this and related orders, and even to some of the exogenous class, as, for example, the water-lily, *Nymphæa.* Asa Gray.

Lilybæ'um, the modern *Marsala,* was built by the Carthaginians in 397 B. C. on the westernmost promontory of Sicily, and was their last possession on the island. After a siege of ten years it was abandoned to the Romans in 241 B. C., after which it became the basis for their attacks on Africa. At the fall of the Roman empire it was still a flourishing place, and the Saracens valued its port so highly that they called it *Marsa Allah,* "the port of God," whence its present name.

Lilye, or **Lilly** (William), b. at Odiham, Hampshire, England, about 1466; was educated at Oxford; visited Jerusalem: studied Greek five years at Rhodes and in Italy, and in 1509 opened a classical school in London, in which Greek was first taught by an Englishman in his own country. The following year he was appointed master of St. Paul's School, just founded by Colet, and in 1513 he brought out his celebrated *Latin Grammar,* which was the standard textbook in England for two centuries, and of which the last edition was published in 1817. Colet, Erasmus, and Wolseley bore a part in this production, which bears the title *Brevissima Institutio, seu Ratio Grammatices Cognoscendæ.* D. of the plague in London Feb., 1523.

Lily-of-the-Valley, the *Convallaria majalis,* a plant of Europe and Asia, also sparingly indigenous in the Alleghany Mountains, prized in garden and green-house cultivation for its beauty and fragrance. It is used by perfumers as the basis of *eau d'or.*

Lima. See Limidæ.

Li'ma, the capital of the republic of Peru, is situated at the foot of the Cordillera, in a fertile plain on the Rimac, 6 miles from Callao, its port on the Pacific. It is regularly built, the streets crossing each other at right angles, and has many churches with double towers. The streets are long and narrow, and the houses mostly of one story and built of sun-dried brick, which material suffices, as heavy showers never occur; the rains which fall frequently between May and November, called *garuas,* are little more than heavy dews. Among the thirty-three public squares, the Plaza Mayor or Principal is the most important, embracing nine acres in the centre of the city, and being surrounded on three sides by a covered colonnade. On the fourth side stands the cathedral, one of the most beautiful churches in South America, founded by Pizarro, the conqueror of Peru, destroyed in 1746 by an earthquake, but rebuilt by the viceroy, Count Superunda. It has two towers, a large, beautiful portal, reminding of the Moorish style, and in the interior rich altars, good pictures, and a splendid organ. In the centre of the richly ornamented plaza is a circular garden, surrounded by an iron fence and provided with a fountain and statues. Facing the entrance from the principal square to the Callejon de Petateros ("Mat-maker's Alley") is the front gate of Pizarro's palace, now used for government offices, and containing official apartments for the president. In the centre of the Plaza de la Independencia stands an equestrian statue of Bolivar, modelled by Tadolini and cast in bronze at Munich. Here also is the royal and pontifical university of San Marcos, founded by royal decree in 1551, the walls of which constitute a mass of the most elaborately carved woodwork. The place contains furthermore the senate-house, formerly the palace of the inquisition, from which the square was called Plaza de la Inquisicion. One of the finest buildings of the city is the exhibition palace, commenced Jan. 1, 1870, opened July 1, 1872—founded by Don Manuel Fuentes, built by the Italian Leonardo, and situated on the south-western side of the city, on a square 225 mètres long and 172½ mètres broad. In the vicinity of this building most of the old, now useless, city walls were pulled down in 1873, and an elegant boulevard laid out, called, after its designer, Meiggs's boulevard. The marble statue of Columbus, which formerly stood on the Alameda, on the other side of the Rimac, has been transferred to the open space between the boulevard and the exhibition palace. Among the sixty or seventy churches only that of San Pedro is noteworthy, as containing the national library of Peru. Remarkable among the other public buildings are the penitentiary, very commodious and safe in its construction, eight national colleges, an ecclesiastical seminary, a college for the study of medicine and the accessory sciences, another for secondary instruction, a normal school, a naval and military institute, an industrial municipal school, two theatres, and a circus for bull-fights, the largest in the world. The population of Lima numbers, according to a recent estimate, about 200,000: it is very varied—whites, blacks, Indians, and Chinese of all shades. In consideration, however, of recent events—the war with Chili, the riots, etc.—the estimate is probably too high. The sanitary state of the city is not good, on account of the poor drinking-water and the bad system of sewage; the *gallinazas* (carrion-vultures), which here swarm by the hundred, are of great benefit as scavengers. The city is connected by railways with Callao and the bathing-place Chorillos, and carries on a considerable foreign commerce, exporting guano, cinchona, Indian wool, raw cotton, hides, sugar, saltpetre, gold, silver, and other minerals. Its imports and exports together average more than $25,000,000 a year. Lima, generally styled *Ciudad de los Reyes* ("the City of the Kings"), was founded by Pizarro in 1535. Most extravagant records exist of its former wealth; thus, in 1683 the merchants are said to have paved the streets with silver bars on occasion of the arrival of a new viceroy. The greatest danger to Lima is that from earthquakes. The severest occurred in 1630, 1687, 1746, 1806, and 1828, of which that of Oct. 28, 1746, was the most destructive. August Niemann.

Lima, Livingston co., N. Y. (see map of New York, ref. 5–D, for location of county), 4 miles S. from Honeoye Falls, on the N. Y. Central R. R., is the seat of Genesee Wesleyan Seminary, the oldest institution of the kind in this part of the State. Pop. in 1870, 1257; in 1880, 1878.

Lima, city and R. R. centre, cap. of Allen co., O. (see map of Ohio, ref. 3–D, for location of county). Pop. in 1870, 4500; in 1880, 7567.

Limac'idæ [from *Limax,* the typical genus], a family of the class Gasteropoda and order Pulmonata, distinguished by the elongated semi-cylindrical body, which is not distinguishable from the foot, the absence of any visceral sac, and the consequently rudimentary or shield-like character of the shell, which is concealed by the mantle; the mantle is anterior, moderate, and oval; the respiratory orifice near the right posterior margin of the mantle; the anus close in front of the respiratory orifice; the head has oculigerous as well as inferior tentacles; the jaws are ribless; the teeth of the radula in numerous rows, the central and inner "lateral" tricuspid, the "uncini" or outer lateral aculeate. The family thus defined embraces the well-known slugs of the gardens, and includes a number of species which have been differentiated by some authors into about half a dozen genera; the best known, however, is *Limax*, and the most conspicuous species, in at least the sea-coast towns of the U. S., are two species introduced from Europe—viz. *Limax agrestis* and *L. flavus.* These are found in moist places under boards, stones, etc. They are herbivorous, and are frequently quite injurious to succulent young plants. They emit, when handled, a milky secretion, and are even capable of secreting a mucus which, like a thread, suspends them from the point to which it has been attached. Besides the introduced species, there is an indigenous form which is quite widely distributed in the U. S.—*Limax campestris*, Binney. Theodore Gill.

Limatula. See Limidæ.

Lima-wood. See Brazil-wood.

Limb. In angular instruments, the plate that bears the principal graduated arc is called the *limb* of the instrument; the secondary arc concentric with the first, and used for subdividing the divisions on the limb, is called the *vernier.* In the theodolite there are two limbs—one for measuring horizontal angles, called the *horizontal limb*, and one for measuring vertical angles, called the *vertical limb.* The term limb is often applied to a straight rod which is graduated; thus, in the levelling-rod the staff on which the principal graduation is placed is called the limb, the graduated line on the vane being called the vernier. W. G. Peck.

Limbo, or **Limbus** [Lat. *limbus*, "margin" or "border"—*i. e.* of hell]. The former word, now a nominative, as in the Italian, was originally the ablative of *limbus*, which latter word was first used in its present theological sense by Thomas Aquinas (d. 1274). The doctrine pertaining to it was first authoritatively formulated at the Second Council of Lyons (fourteenth œcumenical) in 1274. The teaching of the Roman Catholic Church is that hell is at the centre of the earth; next to hell is purgatory; next to purgatory is the *limbus infantum*, for unbaptized children, idiots, and the like; and next to that the *limbus patrum*, where were the Old Testament saints whom Christ delivered and took with him to heaven, so that the *limbus patrum* is now empty. R. D. Hitchcock.

Limborch, van (Philippus), b. June 19, 1633, at Amsterdam; studied theology under his uncle, Episcopius, and was appointed in 1657 minister of the Remonstrant congregation at Gonda, and in 1667 professor of theology at the Remonstrant college of Amsterdam, where he d. Apr. 30, 1712. His *Theologia Christiana* (1686) gives a comprehensive and systematic exposition of the doctrines of Arminius. It was translated into English by Jones (London, 1702). His *Historia Inquisitionis* was translated by Chandler (London, 1731).

Limbs, Artificial, formerly of crude structure, chiefly the "peg-leg," merely enabled the patient to walk and to work. By successive steps of improvement they have come to simulate the natural limb so fully that the form and gait may baffle detection or observation. Lightness is secured without loss of strength by use of wooden cylinders properly shaped, artificial joints correspond to the natural ones, and the functions of many muscles are imitated by tendinous cords and springs. It is a fallacy to suppose that artificial limbs are made of cork.

Lim′burg, or **Limbourg,** a territory extending along both sides of the river Meuse, which alternately belonged to the Netherlands, Belgium, France, and Austria, until it was finally divided between Belgium and the Netherlands in 1839. Along the Meuse the region is very fertile, affording excellent pasturage for large herds of cattle, but the rest of the country is sterile, the soil being either marshy or sandy. Brewing and distilling are the principal branches of industry pursued here. *Dutch Limburg* comprises an area of 851 square miles, with 235,135 inhabitants, of whom nine-tenths are Roman Catholics; the principal towns are Maestricht and Roermond. *Belgium Limburg*, which contains some iron and coal mines, comprises an area of 932 square miles, with 211,694 inhabitants. Principal towns, Hasselt, St. Trond, and Tongres.

Lime [Fr.; from Ind. *leemoo*], the fruit of *Citrus acida* and *C. Limetta* (the last called sweet lime), both probably mere varieties of *Citrus medica*, the citron tree. The lime grows upon a dwarfish tree or shrub, and is a native of Asia, but cultivated in nearly all warm regions. Limes are in no wise inferior to lemons, for which they are used as a substitute. Pickled limes are prized as a condiment. Lime-juice is extensively employed in ships' stores as an antiscorbutic. Citric acid is largely manufactured from it. Lime is the usual English name of *Tilia*, the linden tree.

Lime, one of the alkaline earths, chemically the protoxide of calcium, symbol CaO. It forms the base of limestones, marbles, corals, and the shells of mollusks, where it is in combination with carbonic acid, forming the carbonate of lime. By the application of heat the carbonic acid is driven off, and the lime is left in the condition of "caustic" or "quick" lime. Lime is usually white, light-gray, or cream-colored, porous and soft. It rapidly absorbs water, uniting with it chemically, with the evolution of much heat. This process is called slaking or slacking. Pure or "fat" limes when slaked swell very much, and ultimately fall into a snow-white powder. If more water is added, what is called the "milk of lime" is formed. The lime is now in the condition of a hydrate, and if exposed to the action of the air it absorbs carbonic acid, and is again converted into the carbonate of lime. In the preparation of mortar, sand is added according to the richness or "fatness" of the lime—that is, according to the fineness and uniformity of the powder into which it falls when slaked. Where the powder is very fine, it makes with water a fluid paste which will penetrate the interstices between the grains of sand, however closely they may be crowded. The thinner the film of paste between the grains of sand the stronger their adhesion will be. Hence, the value of a lime is roughly measured by the quantity of sand it will serve to unite. Lime is largely used in agriculture as a dressing on soils which require calcareous matter, in the manufacture of bleaching-powder (chloride of lime), in tanning, as a flux in smelting iron, etc. etc. Lime is extremely infusible, and cylinders of this substance are commonly used in the oxyhydrogen or calcium light, a jet of the ignited gases being thrown upon a piece of lime, which when intensely heated emits a light so bright as to be almost unbearable to the eye.

The great consumption of lime, however, is in the production of mortar, and for this purpose it has been used in construction by all modern and most ancient civilized nations. In the earliest masonry of which any remains have been found, as the Etruscan, that of the island of Cyprus, and ancient Troy, walls were laid up with large stones without mortar ("Cyclopean" masonry), or with smaller ones packed in clay, but by the Egyptians, Hebrews, Greeks, and Romans the use of lime for mortar was universal. In the manufacture of mortar from lime, as has been stated, the hydrate of lime is formed by the addition of water to quicklime. This is, in part, chemically combined with the lime, and produces the first "setting" of mortar. Subsequently, by the absorption of carbonic acid, it is converted into the hydrated carbonate. In process of time a combination is also formed between the lime and some of the silica of the sand with which it is associated, and silicate of lime is produced. By this the strength of the mortar is still further increased. This progressive change has been ascertained by careful analysis of many samples of older and newer mortars. These have shown that in the older mortars—which in some instances are as hard as the stones they join—the percentage of silicate of lime is much greater than in those more recently made.

The notion is commonly entertained by architects and masons that the best lime is produced from the purest carbonate of lime, and statements to that effect will be found in many books which treat of this subject. This theory, however, has been abundantly proved to be a fallacy, for it has been shown that nearly all the most extensively used and highly esteemed limes contain a large percentage of magnesia. Magnesian limes are preferred by masons, because, as they say, they are "cooler" and set more slowly. The pure lime is, in their language, too "hot" and "quick." This is illustrated by the high reputation in New York of the lime from Smithfield, R. I., and that made from the white marble along the Hudson River, both of which are highly magnesian. The following analyses show the composition of the Westchester marble, so much used for lime:

	1.	2.
Carbonate of lime	55.40	54.20
" " magnesia	43.28	44.80
Silica	0.20	0.10
Alumina and iron	0.60	0.80

It will be seen from these analyses that this rock is a typical dolomite, and yet the lime made from it is as highly esteemed and takes as much sand as any other used in the Atlantic States. In Ohio, where this subject has attracted special attention in connection with the geological survey, it has been found that all the most esteemed limes are highly magnesian. At Cincinnati, which is surrounded by hills composed of limestones which are nearly pure carbonate of lime, all the quicklime used is brought from distant localities, where it is manufactured from the Niagara limestone, there a dolomite, containing nearly as much magnesia as lime. The cities of Northern Ohio and Michigan are supplied with lime from the Niagara and Water-lime groups, both of which are dolomites, and from the Corniferous limestone, which contains from 15 to 21 per cent. of magnesia. A considerable portion of magnesia in quicklime causes it to slake and set more slowly, but the mortar is quite as white as that made from pure lime, and becomes much harder by age.

A similar fallacy prevails in regard to the use of magnesian limestones for fluxes in metallurgy. It is generally believed that pure limestones make much the best fluxes, but this is a mistake, as abundant experience has shown that magnesian limestones are quite as well adapted to this use as those which contain the carbonate of lime only.

Lime is manufactured from limestone, marbles, or shells by calcination, which expels the carbonic acid. This is effected in kilns of various kinds. Formerly, lime-burning was done in kilns having the form of an inverted beehive, with a single opening at the bottom. In these the fuel and stone were mixed, the fire being lighted below. At the end of three or four days, the fuel having been consumed and the limestone calcined, the charge was allowed to cool partially, and was then drawn out at the bottom. Now, lime-burning is nearly all done in what are called *perpetual* kilns. These are square or round towers 25 to 30 feet in height, having a cylindrical cavity within, 5 or 6 feet in diameter. These kilns have usually two furnaces, one on either side, situated at about one-third of the height from the bottom. In these the fires are kept perpetually burning, and are fed with wood or soft coal, the flame and heat from which, passing up through the limestone, calcine it so that when it has descended to the level of the furnaces it is deprived of all its carbonic acid. From time to time the limestone is charged at the top and the calcined lime drawn out below. As limestones vary much in the facility with which they are burned, the time required for calcination and the amount of fuel consumed will depend much on the kind of stone used. Something will also depend upon the excellence of the fuel and the pattern of kiln employed. The best results attained are the production of 300 bushels of lime every twenty-four hours with the consumption of four cords of wood. Where coal is used, as is the case in most foreign localities and many in the U. S., a considerable economy of fuel is obtained; but in some places where our bituminous coals have been tried the quality of the lime is said to have been impaired. This, if true, was possibly the effect of an unusual amount of sulphur in the coal, or it may have been the result of a want of adaptation of the furnaces to mineral fuel. The experience of the lime-burners abroad and in certain localities on the Atlantic coast of our own country has conclusively proved that lime can be burned more rapidly and cheaply with a fair quality of coal than with wood, and this without any impairment of quality.

When mortar freshly made from quicklime is placed in water, it softens and loses its form; but the lime made from certain limestones which contain a large percentage of silica and alumina, on the contrary, hardens under water and forms what is known as hydraulic cement. When calcined, these hydraulic limestones yield a yellow or brown lime which does not slake or heat much on the application of water. From its hardness it must be ground in a mill before it can be used for mortar. (Further particulars in regard to this class of lime will be found in the articles CEMENT, HYDRAULIC LIMES, etc. See also Vicat *On Mortars* and Vicat's *Treatise on Mortars and Cements;* Pasley's *Limes, Mortars, and Cements;* Burnell's *Mortars, Limes, Cements, and Concretes;* and Gillmore's *Limes, Mortars, and Cements*, 2d ed.) J. S. NEWBERRY.

Lime, Medicinal Uses of. *Quicklime* is a powerful caustic, but is little used for this purpose except in the form of the officinal *potassa cum calce* or "Vienna caustic," which consists of equal parts of the two alkalies, mixed to form a powder. For application this powder is made into a paste with a little alcohol. *Chlorinated lime* is a valuable desiccant and disinfectant. *Lime-water* (a saturated solution of lime in water) and *calcium carbonate* (in the form of prepared chalk and prepared oyster-shell) are used in medicine for a variety of purposes. They are valuable antidotes in sulphuric and oxalic acid poisoning, as they form insoluble precipitates with those acids, and have no poisonous properties of their own. They are among the best of alkalies for neutralizing the undue acidity generated in the alimentary canal in certain forms of dyspepsia, especially when, as is often the case, there is also diarrhœa; for, being somewhat astringent, they tend to check the discharge. Being of low diffusion power, they are but little absorbed, and hence cannot be used for alkalizing the blood like the alkaline compounds of sodium and potassium. Lime-water is also used as an alkaline wash in many skin diseases, and mixed with equal parts of linseed oil forms the so-called "Carron oil," a favorite application to burns. Lime-water rapidly dissolves the false membranes of croup and diphtheria, and is accordingly sometimes applied locally to the throat in those diseases by means of the spray-apparatus. But in this dilute form it is doubtful if it exercises much useful solvent power. Mixed with ice-cold milk, in the proportion of 1 to 1 or 2, lime-water has a remarkable effect in allaying nausea and vomiting; and the same mixture thus furnishes an invaluable means of conveying nourishment in cases of obstinate vomiting when all the usual forms of food are rejected. EDWARD CURTIS.

Lime, Chloride of, or **Bleaching-Salt.** See HYPOCHLOROUS ANHYDRIDE and HYPOCHLORITES, by PROF. HENRY WURTZ.

Lim'erick, county of Ireland, in the province of Munster, is bounded on the N. by the estuary of the Shannon and the counties of Clare and Tipperary, on the E. by Tipperary, on the S. by Cork, and on the W. by Kerry. Area, 1036 square miles. The surface is mostly an undulating plain on a subsoil of limestone, trap, and sandstone, comprising the larger portion of the so-called Golden Vale, and watered by the Shannon, which is navigable up to Limerick, the Maig, which rises in the Galtees, flows into the Shannon, and is navigable up to the town of Adare, the Deel, and the Mulcair. Toward the S., however, the ground rises into the picturesque Galtee Mountains, which extend into the county of Tipperary and have in Galtymore an elevation of 3015 feet. In the mountainous districts the soil is poor and incapable of improvement, but the Golden Vale comprises the most fertile districts in Ireland. In 1880 there were 176,774 acres under tillage—namely, 7257 wheat, 21,440 oats, 3003 other cereals, 23,035 potatoes, 5520 turnips, 3994 other green crops, and 112,578 meadows and clover—415,107 in pasture, 8407 plantations, and 62,465 waste. The total number of holdings was 16,286, but all the land, exclusive of the city of Limerick, was divided between 1676 proprietors, of whom nearly forty per cent. had less than one acre. The county possessed in that year 201,456 cattle, 15,389 horses, 50,599 sheep, 48,801 pigs, 10,012 goats, and 428,398 poultry. Besides agriculture, some manufactures of coarse woollens and paper are carried on, and there is a considerable number of flour-mills; but the old flax-spinning and weaving industry has become almost wholly extinct. The population, which in 1841 amounted to 331,003, had in 1881 decreased to 177,203. During the period between 1851 and 1881 there emigrated 130,333 persons. The county belonged originally to the kingdom of Thomond, and was inhabited by the Coriandi; afterward it became an independent state, under the name of *Aine-Cliach*, and from the eighth to the eleventh century it was partially occupied by the Danes. The county is, however, not particularly rich in interesting antiquities.

Limerick, city of Ireland, capital of the county of Limerick, province of Munster, on both sides of the Shannon, which is crossed by five bridges and lined with docks. On the western bank of the river stands Irish Town, on the eastern Newtown Pery, and on an island in the river English Town; but the first and the last parts of the city are occupied by the poorer classes, and consist mostly of mean houses. All the principal buildings, streets, and squares are in Newtown Pery. The city has distilleries, tanneries, flour-mills, flax-spinning and weaving factories, and lace manufactures, and its port is the fourth in importance in Ireland. It admits vessels of 1000 tons, and in 1880 the value of imports amounted to £837,269. The exportation is of much less magnitude. It was taken in 1651 by Gen. Ireton, and was the last place in Ireland which surrendered to William III., on which occasion a treaty was signed (1691) granting certain rights to Roman Catholics. Its prosperity dates mainly from the founding of Newtown Pery, in 1769, by Sexton Pery. Pop. in 1881, 48,246.

Lime'stone, a sedimentary rock composed chiefly of the carbonate of lime, the calcareous deposit of the sea wherever the mechanical sediments—sand and clay, the wash of the land—do not reach. The lime of limestones is for the most part derived from the hard parts of marine organisms, the shells of Foraminifera and mollusks, the skeletons of polyps (corals), etc. By the formation of limestone carbonic acid is drawn from the atmosphere, and fixed beyond the reach of all natural agents except heat sufficient to calcine the limestone. As the causes which produce the ordinary metamorphism of rocks, converting limestones into marbles, though rendering them more crystalline and often discharging all organic colors and leaving them pure white, does not drive off the carbonic acid, it may be supposed that the carbonic acid which is absorbed in the formation of limestone is, for the most part, permanently withdrawn from the atmosphere. As Prof. Henry Wurtz has suggested, this process has probably caused a great diminution of the carbonic acid contained in the primeval atmosphere, and should it continue with no other compensating action than such as we now know, it must result in the extinction of all life on the globe. J. S. Newberry.

Lime Tree. See Linden.

Lim'idæ [from *Lima*, the principal genus], a family of monomyarian conchiferous mollusks, resembling, in some, the scallops (Pectinidæ), but with the mouth bordered by tentacular filaments; the mantle destitute of ocelli; an oval tube developed and cylindrical in form; and the foot compressed. The family has numerous recent as well as fossil (Secondary and Tertiary) species, which have been grouped by Adams into two genera—viz. *Lima* (with the sub-genera *Radula* restricted, *Ctenoides*, *Mantellum*, *Acesta*, and *Limatula*) and *Limæa*. Of the latter, only one species was known from Norway and the Mediterranean. Theodore Gill.

Lim'it [Lat. *limes*]. The *limit* of a varying quantity is that value *towards* which the first may be made under the law by which it varies to approach, *from* which it may be made to differ by less than any assignable quantity of the same kind, and *with* which it may be made to coincide by a particular supposition. Thus, the quantity $2ax + h^2$ varies with h; if we suppose h to diminish numerically, the value of the expression will approach towards that of $2ax$; by making h sufficiently small the value of the expression is made to differ from $2ax$ by less than any assignable quantity; and finally, by supposing h equal to 0, the value of the expression becomes $2ax$; hence, $2ax$ is the limit of $2ax + h^2$ with respect to h.

The method of limits has been made the basis of a system of differential calculus. To explain this system let us assume the general equation—

$$y = f(x) \quad \ldots\ldots \quad (1)$$

if we increase x by a positive but variable increment, h, and denote the corresponding value of y by y', it may be shown (Courtenay's *Calculus*, art. 4) that the new state of the function can always be expressed by the formula,

$$y' = f(x+h) = f(x) + Ah + Bh^2 + Ch^3 + \text{etc.}; \quad \ldots\ldots \quad (2)$$

in which A, B, C, etc. depend on x, but are independent of h. Subtracting (1) from (2), and dividing through by h, we have

$$\frac{y'-y}{h} = A + Bh + (\text{etc.})h^2 \quad \ldots\ldots \quad (3)$$

The first member of (3) is a symbol to express the ratio of the increment of the variable to the corresponding increment of the function, and the second member is the value of that ratio. If, now, we suppose h to approach 0, the value of the ratio will approach A, and when h becomes equal to 0 the value of the ratio becomes equal to A; hence, A is the limit of the ratio in question. This limiting value is called the differential coefficient of the function, and is denoted by the symbol $\frac{dy}{dx}$; if this result is multiplied by the differential of the variable, dx, the product, denoted by the symbol dy, is called the differential of the function, and we have

$$dy = Adx.$$

If we suppose h to be a constant infinitesimal, denoted by dx, the difference between y' and y will be the difference between two consecutive values of the function; this difference is the differential of the function, and it may be denoted by the symbol dy. Subtracting (1) from (2), and in the result making $y' - y$ equal to dy, and h equal to dx, we have

$$dy = Adx + Bdx^2 + Cdx^3 + \text{etc.};$$

rejecting from the second member all terms involving dx to a higher power than the first, as infinitesimal in comparison with the first, we have, as before,

$$dy = Adx.$$

This result shows that the expression for the differential of the function is always the same, whether it is found by the *method of limits* or by the *method of infinitesimals*, inasmuch as the function that we have used is perfectly general. The latter method is far simpler than the former, and is therefore better adapted to *practical* investigations.

The method of limits is immediately applicable to the theory of tangents. We may define a tangent to a plane curve at a given point to be the limit of the secant through that point. If a secant is drawn through the given point and any other point of the curve, we may conceive the second point to approach the first, and finally to coincide with it; at this instant the secant becomes a tangent. If, now, we suppose the second point to pass the first, continuing to move in the same direction, we shall have a secant cutting the curve on the other side. There is but one position in which a secant becomes a tangent, and that is its limiting position. At this point the slope of the tangent is equal to the limit of the ratio of the *increment of the abscissa* to the corresponding *increment of the ordinate*; that is, to the differential coefficient of the ordinate taken at the point of contact. A tangent plane to a surface at any point is the limit of all the secant planes that can be passed through the point.

The method of limits is used in deducing properties of geometrical magnitudes of one and two dimensions. Let a regular polygon be inscribed in a circle, and suppose the number of sides to be indefinite. As the number of sides increases, the area of the polygon approaches that of the circle, and finally, when the number of sides becomes infinite, the two areas coincide; hence, we say that the circle is the limit of a regular inscribed polygon. It is also the limit of a regular circumscribed polygon. The circumference of a circle is, in like manner, the limit of the perimeters of the inscribed and circumscribed polygons. The surface and volume of the cone and the cylinder are limits of the surface and volume of regular inscribed pyramids and prisms. In all such cases it is assumed that whatever is true for all states of a varying magnitude is true for its limit.

A limit of the roots of a numerical equation is a number greater or less than any of the real roots of the equation. In this sense there must be an infinite number of limits, but it is understood that the superior limit is the smallest and that the inferior limit is the largest whole number that will satisfy the conditions of a limit. W. G. Peck.

Limita'tion, Statutes of, are statutes limiting or prescribing particular periods of time within which civil actions or suits or criminal prosecutions must be instituted or certain legal rights enforced. Various statutes of this kind have been enacted in England at different periods of English history, but those which were first adopted were narrow in scope, applying only to actions relating to real property. The first statute to be enacted of a comprehensive character, applying to civil actions in contract and in tort, as well as to actions concerning real estate, was passed in the reign of James I. (21 James I. ch. 16). This has been superseded, so far as it relates to real property, by the statute 3 and 4 Will. IV. ch. 27, but its remaining provisions are still substantially in force, though they have been to some extent modified by subsequent enactments. Upon this statute, so far as it relates to actions upon contract, the various statutes of limitation enacted by the different States of this country have been chiefly based, its principal provisions having been frequently adopted with but slight if any modification; and a consideration of its terms, of the interpretation which it has received, and of its effect upon legal procedure will exhibit the principles of law upon this subject as established in England and generally in the U. S. The rules relating to actions of tort and to actions concerning real property, as well as the statutes of limitation which have been enacted with reference to suits in courts of equity and to criminal prosecutions, may with most convenience and advantage be considered separately.

I. *Actions upon Contract.*—It is provided by the statute of James that "all actions of account and upon the case, other than such accounts as concern the trade of merchandise between merchant and merchant, their factors, or servants, all actions of debt grounded upon any lending or contract without specialty, all actions of debt for arrearages of rent, shall be brought within six years next after the cause of such actions, and not after." Before the enactment of this statute there was no limit to the period within which an action upon contract might be instituted. It was a maxim of the common law that a "right never dies," and it could therefore not be barred or extinguished by any lapse of time, unless it were a right of action in tort, in which case the action was then required (though there are now important exceptions to this rule) to be brought within the lifetime of the parties. The object sought to be attained by the enactment of these provisions limiting the right of action to a specific and comparatively brief period was to relieve debtors from the undue embarrassment and hardship naturally attendant upon harassing litigation at remote periods of time, when vouchers and other instruments of evidence are likely to be lost or destroyed, or it has become unreasonably difficult or impossible to procure the necessary testimony. The statute is in furtherance of the principle that "the law favors those who are vigilant, not those who sleep upon their rights," and aims to promote the diligence of creditors in enforcing their claims while an adequate defence, if any can be made, is reasonably practicable. The limit of time assigned is necessarily arbitrary, though it was undoubtedly fixed upon with reference to two important considerations: first, that the creditor should not be forced to undue haste in bringing action before time was given to collect all necessary testimony, to employ other means of effecting a settlement, or to wait until an impoverished debtor might become capable of satisfying the claim; and, secondly, that the debtor should not be unwarrantably prejudiced in his interests by the creditor's excessive delay. For these reasons the statute is commonly termed in law a statute of repose, because its purpose and effect are to quiet old and stale claims, to extinguish causes of litigation, and to relieve debtors from oppressive suits. There has been, however, no little conflicting adjudication in the courts as to whether it should be deemed a statute of repose or one of presumption. The decisions sustaining the latter doctrine proceed upon the ground that a creditor's claim is not to be enforced at the expiration of the prescribed period, because it is then presumed in law that it has been satisfied. This contrariety of opinion led to important consequences in regard to the necessity of a new promise by the debtor to revive a liability affected by the statute, which will be again referred to. It is now to be considered as the generally established rule that the statute is one of repose, founded upon principles of expediency and public policy, and not of legal presumption. The phraseology of the statute has reference to the technical forms of action upon contract employed in common-law procedure, instead of to various kinds of contracts. The nature and objects of these various actions are explained under the topics ACCOUNT, CASE, and DEBT (which see). The "action upon the case," as the phrase is used in this connection, includes the action of assumpsit. (See ASSUMPSIT.) It may be briefly stated as the substance of the statute that it requires actions upon simple contracts (*i. e.* contracts not under seal) to be brought within six years after the cause of action accrues, with the single exception of merchants' accounts, which concern the trade of merchandise. The time when the cause of action accrues, and from which the six years are to be reckoned, is the time when the creditor could have commenced his action. Thus, if credit be given, the statute begins to run when the term of credit expires. If a bill of exchange be payable at sight, the six years are computed from the date of presentment. But a note payable on demand is due at any time, and the statute runs from the making of the note. If, however, the note be drawn payable a certain time after demand, a demand must be made to fix the commencement of the period of limitation. If a bill or note have days of grace, the statute runs from the time of their expiration. If a debt be payable by instalments, the statute begins as to each instalment from the time when it becomes due; there may, however, be an agreement that upon default in paying any instalment the whole debt shall become payable, and in that case the six years are reckoned as to the entire debt from the time of default. The statute begins to run when the plaintiff could bring his action, and not when he knew he could, if these two periods of time do not coincide. If the claim be for breach of contract, the statute runs from the time of breach, and not from the time when loss or injury was sustained by the plaintiff in consequence. If money be payable upon the happening of a contingent event, the period of limitation will be reckoned from the time of its occurrence. The statute provides that the suit "shall *be brought* within six years." It therefore becomes important to determine what steps will be sufficient to constitute the bringing or commencing of an action, for if suit be brought even upon the last day of the six years the terms of the statute will be satisfied, even though the action may be prolonged beyond that limit. It was the rule at common law that the suit was commenced by the first act performed in the institution of legal proceedings, such as filling out and completing the original writ or the summons, which were the initiatory steps requisite. At the present day the same general rule remains true, though different forms of process have been established in England and the States of this country as the prescribed mode of beginning legal proceedings. It is provided in some States that the action shall be deemed begun as to any defendant when the first process, as a summons, is served on him or on a co-defendant, but that an attempt to commence it by delivering the summons to the sheriff to be served shall be equivalent to an actual service. This is the case in New York and in other States which have adopted its code of civil procedure.

It is a general principle applicable to statutes of limitation that they do not apply to actions brought by the Crown or State, unless there be an express provision in the statute to that effect. It was a maxim of common law that "time does not run against the king." Special provisions are generally adopted at the present day barring the right of the State to recover real property after a certain specified interval; but the rule as applicable to actions upon contract is not so frequently changed. The statute also provides that actions upon contracts under seal or specialties shall not be included within the prescribed period of limitation. But in analogy with the provisions of the statute an artificial presumption was established at an early period that payment of a debt upon specialty had been made when it had been unclaimed and without recognition for the period of twenty years. This, however, did not operate as an absolute bar, but was merely a disputable presumption, which might be rebutted by any evidence sufficient to satisfy the jury that the debt still remained due. The same presumption was also made in reference to claims upon simple contract when the statute was not pleaded by the defendant, since it was a rule that a defendant could not take advantage of the statute of limitations, though he might be able to do so, unless he made it the basis of a special plea. But it is now provided in England, by statute 3 and 4 Will. IV. ch. 42, that actions upon specialties shall be commenced within twenty years after the accruing of the cause of action. Similar statutes have been enacted in a number of the U. S.

No special provision is made in the statute of James with reference to mutual, open, and current accounts between the parties to an action; but the rule was established at an early date in England by the adjudications of the courts, and has been generally sustained in the American States, that such accounts, if they contain items on both sides within the period of limitation, are not barred by the statute. The last item is said to draw to itself the other items, and its date is deemed the date of the entire account. These accounts are to be distinguished from "merchants' accounts," which are provided for by the statute. These may exist between parties who are not merchants. The reason generally given for this rule is that the items within six years are clearly an admission of an unsettled account, and equivalent to evidence of a new promise which operates to remove the bar of the statute. It is indispensable that the accounts be mutual in order that the rule may apply. If the items be entirely upon one side, only those which are within six years will be valid claims. It has been held in some States that an item upon either side will be sufficient to take the whole account out of the statute. Mere statements of successive credits on one side of an account and of debits on the other do not make an account mutual. There must be reciprocal demands, mutual rights of action. The account must also be "open and current" in order to be referred to the time of each successive item. If a balance be struck, and acquiesced in by the debtor, thus making the account what is technically termed an "account stated," the balance constitutes a definite and specific debt, against which the statute begins to run from the time it is ascertained and settled. A balance thus found may, however, be embodied in a new account current as its first item, and thus be drawn out of the operation of the statute. But the rule in regard to mutual accounts has been changed in England by statute 9 Geo. IV. ch. 14, commonly termed Lord Tenterden's act. This provides that the existence of items within six years shall not operate to prevent the previous items of the account from being barred. This provision has been declared anew by statute 19 and 20 Vict. ch. 97. In this country, however, the previously existing common-law rule has been established by statute in a number of the States. The exception as to "merchants' accounts" in the statute applies only to such "accounts as concern the trade of merchandise;" *i. e.* to those which arise from the buying and selling of goods. The existence of mutual debits and credits merely is not sufficient. A "merchant," within the meaning of this provision, is one who is engaged in traffic in merchandise as a regular business. It was finally decided in England before this exception was there abolished that it applied only to actions of account, technically so called, and perhaps to actions on the case for not accounting. (See ACCOUNT.) In those States of this country, however, where this provision of the statute has been adopted, other forms of action based upon matter of account have been held to be included within its terms. In some of the States the phraseology was changed, so as to read, "other than such *actions* as concern the trade of merchandise," etc. The adjudications of the courts as to the meaning and effect of this exception have been conflicting. On the one hand, it has been maintained that such accounts cannot be barred by the statute, although all the items which they contain are beyond the limit of six years; while, on the other hand, it has been contended that they will be barred unless they contain items within six years, which may serve to draw after them the antecedent items in the same way as in "mutual accounts." The former doctrine became settled in England, and is sustained by the weight of authority in the U. S. But, though such accounts are held not to be within the statutory bar, the presumption of payment after twenty years would apply to them in the same way as to specialties. In a number of the U. S. this exception as to "merchants' accounts" has not been retained, and the statutes as to "mutual accounts" which have been adopted are applicable to these accounts also. In England the exception has been done away with by the act 19 and 20 Vict. ch. 97, and such claims are to be sued within six years.

The bar of the statute may be removed in any case by a new promise to pay the debt or by a part payment of its amount made within six years before action is brought for its recovery. The statute begins to run anew from the time of the promise or payment. This is true whether the six years have wholly or partially expired. The new promise may be either express or implied. It will generally be implied from an unconditional and unqualified acknowledgment of the existence of the debt, if unaccompanied by any refusal to pay or by any declarations showing an intention to rely upon the statute as a defence. In former times, when the statute was generally held to be a statute of presumption, very slight and trivial admissions of the debtor from which the existence of a debt could be inferred were fastened upon by the courts as sufficient evidence of a new promise, because they served to repel the presumption of payment. It was even generally held that the debtor would be liable though his admission were accompanied by a refusal to pay. But when the statute came to be regarded as a statute of repose the natural deduction was that the debtor might take advantage of the statute, unless he voluntarily waived it by an express promise or by an acknowledgment so full and unequivocal as to be equivalent to a new promise; and this is now the established rule. If, notwithstanding the admission, an intention be expressed to take advantage of the statute, no inference of a new promise will be made. The acknowledgment must in every case refer definitely to the debt which is the cause of action, though it need not state the amount payable thereon. This may be proved by extrinsic evidence. But an acknowledgment of a more general indebtedness will not be sufficient. If the admission be accompanied by terms or conditions of any kind, a recovery cannot be had unless they are fulfilled. The promise or acknowledgment must be voluntary, and not extorted by duress. Part payment is held to take a debt out of the statute, on the ground that it amounts to an acknowledgment of a present subsisting debt which the debtor is liable and willing to pay. But this may also be accompanied by a refusal to pay the residue, and the statutory bar will not then be removed. A payment of interest upon any debt is sufficient to render payable the principal and the residue of the interest. If a debtor owes several debts to the same creditor, some of which are barred and some are not, and makes a general payment without appropriating it to any specific claim, it has been held that the creditor may appropriate it to any claim that is barred, but cannot thereby take the residue of such claim out of the statute. It is not yet definitively settled whether the same rule prevails if all the debts are barred, though the tendency of judicial opinion is in this direction. (See APPROPRIATION OF PAYMENTS.) It is now provided in England by Lord Tenterden's act that no promise or acknowledgment shall be sufficient to take a debt out of the operation of the statute unless it be contained in some writing to be signed by the party chargeable thereby. This act, however, it is declared, shall not alter the effect of any payment of principal or interest. Similar statutes have been adopted in a number of the U. S. It was the rule in England until the passage of Lord Tenterden's act that a new promise or part payment by one of several joint debtors would revive the obligation as to all, and take the debt out of the statute. But this act provides in substance that the promise or admission of a single co-debtor shall be binding upon himself only. In some of the U. S. the course of adjudication at common law has established the former doctrine, while in others, as in New York, it has established the same rule as is declared by this statute. Some of the States have also enacted statutes similar to the English act. A new promise or acknowledgment, it is generally held, must be made to the creditor or his authorized agent, and not to some third person.

The statute of James provides that if the plaintiff be under certain disabilities at the time when the cause of action accrues, he may bring his action within six years after the disability ceases or is removed. The disabilities enumerated are minority, coverture or marriage, imprisonment, unsoundness of mind, or absence beyond the seas. It has been held under this provision that if any of these causes of disability does not exist when the statute begins to run, but arises subsequently, the operation of the statute will not be arrested. If the disability exists when the cause of action accrues, but is afterwards removed, though only temporarily, the statute will begin to run from the time of removal, and will not be discontinued because the disability returns. If several disabilities coexist when the right of action accrues, they must all be removed before the statute will commence to run. The expression "beyond seas" means beyond the four seas surrounding Great Britain, and therefore is equivalent to "out of the realm or country." The same phrase, as contained in statutes of limitation in this country, has been usually interpreted to mean "out of the State," though in some States it has been held to mean "out of the U. S." In some of the State statutes this phraseology has been changed, and the words "out of the State" substituted. This disability applies not only to citizens who are temporarily absent from a State or country, but also to foreigners who do not reside within its limits; and they have six years within which to commence action after coming into the State. It was also provided by the statute 4 Anne, ch. 16, that if the *defendant* in any action shall at the time when the cause of action accrues be "beyond seas," the action may be brought against him within six years after his return. It has been generally held under this statute that the return must not be clandestine, and with an intent to set the statute in motion, and then depart without giving the creditor an opportunity to enforce his claim. It must be so public and made under such circumstances of notoriety as to render it presumable that the creditor might by ordinary diligence have acquired information of the return and placed the debtor under arrest. This exception is also usually held to apply to foreigners as well as non-resident citizens, and they may be sued within six years after coming within a State, even though the debt may be barred by the statute of their own State. For it is a general principle in reference to statutes of limitation that they are controlled in their operation and effect by the *lex fori*, or the law of the place where a suit is brought to enforce a legal demand. (See LEX FORI; INTERNATIONAL LAW (PRIVATE).) Similar exceptions and disabilities are usually included in the statutes of limitation in force in the U. S. There is very great weight of authority in this country that when fraud has been committed by the defendant under such circumstances as to conceal from the plaintiff all knowledge of the fraud, and prevent him from asserting his right, the bar of the statute may be avoided in courts of law, and the six years computed from the discovery of the fraud. It is undoubtedly the rule that a court of equity would interfere in such a case and prevent the statute from operating to the plaintiff's detriment. It is provided by statute in some States that the cause of action shall not be deemed to accrue in such a case until the discovery of the facts constituting the fraud. The statutes of some of the States—*e. g.* New York—confine this rule to actions *solely* cognizable in courts of equity.

The statute of limitations is held to affect the plaintiff's remedy, but not his right. Hence, though the remedy be lost by the expiration of the prescribed time, any lien which the creditor may have will not be extinguished. So a promissory note may be barred, while a mortgage given as security for its payment may be enforced by foreclosure after the six years have terminated. Moreover, it is held that the enactment by a State of a statute of limitations barring a right of action after the lapse of a certain interval, and operating prospectively, is not in violation of that clause of the U. S. Constitution which provides that "no State shall pass any law impairing the obligation of contracts," since the "obligation" of the contract still subsists, though the creditor is deprived of the regular legal means of enforcing it. But a reasonable time must be given after the enactment of the law for the enforcement of claims included within its terms, for it is equally well settled that the act by a State of depriving a creditor substantially of his remedy amounts practically to an impairment of the "obligation of the contract."

II. *Actions of Tort.*—The periods of limitation prescribed by the statute of James with reference to actions of tort are as follows: in actions of trespass for injuries to real or personal property, in actions of trover, of detinue, of replevin, and of case (except for slander), six years after the cause of action accrues; in actions of trespass for assault, battery, or false imprisonment, four years; and in actions for slander, two years. (See TRESPASS, TROVER, CONVERSION, DETINUE, REPLEVIN, CASE.) These are the periods still established in England. In the States of this country similar statutes generally exist, applying to the same forms of action or the same classes of tortious injuries, though there is no such general agreement among the various States in regard to the periods of limitation prescribed in these actions as in relation to actions upon contract. In determining the time from which the statute begins to run, it is important to distinguish between tortious acts which are wrongful in themselves, and for which an action may be maintained without proof that actual damage has been sustained, and those cases where the injury is consequential, and the right of action is founded on the special damages suffered by the plaintiff. In the former class of cases the period of limitation runs from the time when the act was committed, without regard to any loss or damage resulting from it; while in the latter it is reckoned from the time when the special damage was sustained. Thus, in an action for slander on account of defamatory statements charging the commission of a felonious offence, the statute runs from the time when the words were spoken; but when slander is actionable only by reason of the pecuniary damage resulting, as in slander of title, it runs from the time the damage occurs. The reason of the rule in the last two cases is, that there is *no cause of action at all* until the special damage has accrued. (See SLANDER.) In trover the period is reckoned from the time of conversion of the goods. In actions for official or professional negligence the cause of action is deemed to be founded upon the breach of duty, and not upon the resulting damage, and the former determines the period from which the statutory period is computed. Thus, if an attorney were sued for neglect of professional duty, the time when the neglect occurred would mark the commencement of the period of limitation.

III. *Actions relating to Real Property.*—By the statute of James it was further provided that no person should make entry into lands, tenements, or hereditaments but within twenty years after his right should first accrue. This provision controlled the right to bring an action of ejectment, since this is founded upon a right of entry, and operated to make an uninterrupted adverse possession for twenty years a complete bar to such an action. (See EJECTMENT.) And now, under 3 and 4 Will. IV. ch. 27, it is declared that no person shall make an entry or distress, or bring an action to recover any land or rent, but within twenty years next after the time at which the right to make such entry or distress or to bring such action shall have first accrued to some person through whom he claims or to himself. Persons under the disabilities of infancy, lunacy, coverture, or beyond seas, and their representatives, are to be allowed ten years from the termination of the disability or death to enforce their rights, but no action can be brought by such parties after forty years. Statutes of a similar character exist in the various States of this country, and though they differ much in details and comprehensiveness of scope, the period of twenty years is almost invariably fixed upon as the time of limitation. A person, therefore, who is deprived of the possession of his land by an adverse occupant for the space of twenty years is prevented from recovering it, and is in fact divested of his ownership. It is important in this connection to distinguish between prescription and limitation as relating to interests in real property. Prescription applies properly only to incorporeal hereditaments, such as a way or watercourse, a right of common, etc., and does not relate to land or corporeal property. (See INCORPOREAL HEREDITAMENTS.) It depends upon a legal presumption that a grant of the property has been made after an enjoyment continued for a sufficient period of time, and was not a doctrine originally established by statute. But the theory of limitation was wholly created by positive statute, and applies only to corporeal property, such as land, houses, etc. The subject of prescription is now, however, in England, governed by statute (3 and 4 Will. IV. ch. 71). The adverse possession of land which under the statute of limitations is sufficient to constitute a bar to the assertion of a legal title by the owner of it, or by one against whom the adverse occupant brings an action of ejectment, must be an actual, continued, visible, notorious, distinct, exclusive, and hostile possession. It must be with an intention to claim title to the land occupied in opposition to any other claimant. In order that the possession may be *actual*, the adverse occupant must make an entry upon the land, so that an ouster may be effected. By this means the owner is disseized if possession be taken under claim of right. (See DISSEIZIN.) Taking a deed is not sufficient to constitute adverse possession. The possession must be *continued* during the entire period of limitation, either by actual residence or cultivation, or by such use and occupation of the premises as they are capable of, with claim of ownership. But successive periods of adverse possession by different occupants cannot be united so as to make up the full statutory period, unless there is a privity of estate between the successive occupants by purchase or descent. Such a privity exists between ancestor and heir, grantor and grantee, devisor and devisee, etc. But in some States the right to unite successive possessions is denied. The possession must, moreover, be *visible, notorious*, and *distinct*. It must be continued under such circumstances of notoriety that the owner may be presumed to have notice of it and of its extent. There are two modes of possession which the law deems sufficiently notorious and distinct to constitute adverse possession under the statute. The first mode is where one enters, not asserting a right of ownership derived from a deed or written instrument of title, but merely taking possession with claim of right. In this case the disseizin extends only to the premises actually enclosed, cultivated, improved, or otherwise occupied. The other mode of possession is where one enters under color of title derived from a deed or other instrument, and occupies, cultivates, or improves the land, either in whole or in part. In this case his legal possession will be deemed generally to extend to the boundaries or limits of the property prescribed in the instrument of title, even though this be of no legal validity in conveying a title. These principles may be considered as generally established by the adjudications of the different States, though with various degrees of modification and a somewhat different extent of application. In some of the States rules embodying this distinction are declared by statute; this is the case in New York. The possession must also be *exclusive* during the entire period, and *hostile* or *adverse*. If the occupancy be begun and continued under the owner's permission, it is not hostile, but in recognition of his title. So when the parties were in privity with each other, and the possession was originally taken in recognition of and acquiescence in the right of the real owner, a positive disclaimer of holding in subserviency to such title must be made before the possession can become adverse. The question whether the possession is adverse or in recognition of the owner's title is to be determined by the jury, but what is sufficient to constitute adverse possession is a question of law for the court. One tenant in common may occupy the common premises in adverse possession against his cotenant if there be sufficient evidence of an exclusive claim. This would be the case if he should exclude the other from occupying the premises, and should appropriate the profits to himself under a claim of exclusive right. But mere occupancy of the premises by one tenant alone would not be sufficient. The statute of limitations as applying to land does not run against the State unless there be an express provision to that effect. The same general principles prevail in regard to the disabilities enumerated in the statute as have been already stated in reference to actions upon contract.

IV. *Suits in Courts of Equity.*—The statutes of limitations which have been thus far considered were not enacted with reference to proceedings in equity, but only applied to actions in courts of law. In equitable procedure there was therefore no binding obligation to enforce their provisions. It became, however, the practice in equity to act in obedience to these statutes in all causes of action which came specifically within their provisions, and also to extend their application to other analogous cases. This was done in furtherance of the equitable principle that laches and remissness are to be discountenanced and disfavored. But courts of equity refuse to apply the statute of limitations when this would enable fraud to be committed or would result in manifest injustice. Other rules and principles in relation to the subject of the limitation of suits in equity are stated in the article upon LACHES (which see). In a number of the U. S. positive statutes have been enacted prescribing a fixed period of limitation for equitable suits.

V. *Criminal Prosecutions.*—There have been several statutes of limitation enacted in England at different periods applying to prosecutions for certain crimes. Thus, by statute 7 Will. III. ch. 3, it was provided that no prosecution shall be had in cases of high treason whereby corruption of blood may ensue, except for an attempt to assassinate the king, unless the bill of indictment be found within three years after the offence was committed. So by the statute 31 Eliz. ch. 5, prosecution by information upon a penal statute was limited to a prescribed period. In New York it is provided that indictments for murder may be found at any time after the death of the person killed; in all other cases indictments are to be found within five years after the commission of the offence, but the time during which the defendant shall not have been an inhabitant of the State, or usually resident therein, shall not constitute any part of this period. Statutes of an analogous character exist in other States.

VI. Statutes of limitations have also been enacted in many of the States applying to parties occupying particular official positions, as sheriffs or other officers, or to actions of a peculiar character, as for the recovery of penalties or forfeitures under a statute, etc. These need only be referred to for the sake of completeness. The statutes of the various States must be specially consulted. It will have been seen from this discussion that the legislation upon the subject of limitations depends largely upon a principle of public policy. Its aim is to quicken the diligence of creditors and prevent delay in the enforcement of even righteous claims. It seeks to shield one charged with crime from the consequences of a long postponement of a prosecution, as he may then lose the means of making a just defence. The justice and expediency of these rules is well illustrated by a practice now becoming common with persons liable to encounter much litigation, at the time they enter into a contract to stipulate that an action for its breach must be brought within a brief period, say sixty or ninety days, or perhaps a year. Although this agreement is not a limitation in the sense of being imposed by law, yet it is valid, and if reasonable becomes a part of the contract, and will be enforced by the courts. Such stipulations are almost regularly found in insurance policies and in the receipts of express and telegraph companies. (Consult on this general subject the works of Parsons and Chitty *On Contracts;* Angell *On Limitations;* Wilkinson *On Limitations;* Washburn *On Real Property;* Cruise's *Digest;* Greenleaf *On Evidence,* vol. ii.; Smith's *Leading Cases,* index.)

George Chase. Revised by T. W. Dwight.

Limoges′ [anc. *Lemovices*], city of France, capital of the department of Haute-Vienne, on the Vienne River, 250 miles S. of Paris. It is one of the seven places in which Christianity was planted about the middle of the third century, and it became an important ecclesiastical centre. It was here, in 994, that the first attempt was made to establish the Truce of God. Limoges has a famous breed of horses and is noted for its porcelain, a very fine white porcelain earth having been discovered in the neighborhood in 1768. It has also some cotton- and woollen-mills. Pop. in 1881, 63,765. R. D. Hitchcock.

Lim′onite [Gr. λειμών, "meadow"], the hydrated sesquioxide of iron, often called brown hæmatite, one of the commonest and most important ores of iron. The deposits of limonite are peculiarly local and irregular in character. They are never found forming continuous strata, but are (1) either the superficial deposits of chalybeate waters, filling fissures or cavities or encrusting slopes or accumulating in concretionary or botryoidal masses in sand, clay, or gravel; or (2) they are produced by the oxidation, at and near the surface, of beds of the carbonate of iron or iron pyrites. From their mode of formation the deposits of limonite are less extensive and reliable than those of other ores of iron, and their irregularities have often been a cause of disappointment and loss; but some of them are of great extent, and they are so numerous in many countries that they have always constituted one of the great sources from which the supply of iron has been derived. In the U. S. valuable deposits of limonite are found in a great number of localities. They occur perhaps in the greatest abundance in a belt which extends along the eastern flank of the Alleghanies from New England to Georgia. Here they rest on rocks of various kinds, such as gneiss, serpentine, crystalline limestone, slate, etc. From Pennsylvania southward their association with the lower Silurian limestones and slates is such that they have by some writers been represented as holding a definite geological position in that series of rocks. It is quite certain, however, that they are altogether superficial in position, and form no part of the stratification of this or any other formation. It is probable, as suggested by Prof. Frederick Prime, that some of the brown hæmatites of Pennsylvania are formed from the decomposition of pyrites along the outcrops of pyritous slates; but some of the most important deposits of this belt are so far removed from the metamorphosed Palæozoic rocks of the Alleghanies that they can have had no connection with them—such as the limonites of Roxbury, Amenia, and Staten Island. In the latter locality the iron ore occurs at the N. end of the island in superficial cavities in serpentine; at the southern end, in concretionary masses scattered through Cretaceous clays, with which they are evidently contemporaneous. The truth seems to be that these deposits of limonite have been forming from the drainage of all the ferruginous rocks of the E. flank of the Alleghanies since the beginning of the Cretaceous age. In Alabama and Tennessee deposits of limonite of great extent and purity are found along the outcrops of the Lower Carboniferous limestone. In Missouri a belt of superficial limonite encircles the district which contains the great deposits of specular iron in the central part of the State, and may be supposed to have been formed from the ferruginous drainage of this district. The limonites which are formed by the oxidation of the stratified carbonates are best seen in Southern Ohio and Eastern Kentucky, where some of the calcareous ore-beds of the coal-measures are oxidized along their outcrops, and are more or less deeply converted into the hydrated sesquioxide. A similar change is observable in some of the limonite beds of Eastern New York and Connecticut, which pass into siderite in depth.

Bog-iron ore is a spongy and usually impure limonite which accumulates in marshes from the leaching of surrounding beds of sand, gravel, etc. containing iron. *Lake ore* is the name given to limonite which gathers at the bottom of lakes and ponds that receive the drainage of ferruginous strata or soils. In some of the Swedish lakes this ore is dredged up periodically, the deposit being reproduced at intervals of one year or of several years.

The *modus operandi* of the deposition of limonite is as follows: The sesquioxide of iron is insoluble, but the protoxide is soluble. When organic matter is buried with peroxide of iron, the carbon of the decomposing organic matter takes from the iron ore one equivalent of oxygen. It is now dissolved by atmospheric water, which contains carbonic, and often crenic and apocrenic, acids, and is carried into any reservoir that receives the drainage. Here the iron is oxidized by contact with the air, and falls to the bottom as the hydrated sesquioxide. If it there finds decomposing organic matter, it imparts to it a portion of its oxygen to form carbonic acid, and floats off to gather more oxygen. As long as any organic matter remains the iron oscillates between the surface and bottom of the water; when it has all been oxidized, it accumulates as bog or lake ore. Thus, iron becomes a carrier of oxygen in the aqueous circulation of the globe, as it does in the hæmal circulation of animals. The iridescent film so frequently seen on pools of water is limonite formed in the manner described above.

Chalybeate springs throw down a yellow or brownish precipitate in the channels or reservoirs through which their waters flow when they come in contact with the air, and the iron they contain is oxidized. This precipitate is limonite. If it remains as a powder, it is called yellow ochre; if it is brown it contains manganese, and is known as "umber" or "Spanish brown." It may, however, form concretionary masses with a radiated structure or successive layer of solid limonite many feet in thickness. It is supposed that most of the great limonite beds found along the flanks of the Alleghanies and elsewhere have accumulated in this way.

Pure limonite contains 60 per cent. of metallic iron, but it often contains 10 to 20 per cent. of foreign matter, so that its average yield of iron does not reach 50 per cent. The quality of the iron made from it is sometimes excellent, as is attested by the good repute of the Roxbury and other limonite irons. It generally contains too much phosphorus, however, to be successfully used for the manufacture of steel. From their fusibility the brown hæmatites are very useful adjuncts in the smelting of the more refractory magnetites and specular ores, and their employment in this connection has caused them to be largely mined and highly valued. J. S. Newberry.

Limousin′, a former province of Central France, comprised the present departments of Corrèze, Creuse, Dordogne, and Vienne. Its capital was Limoges. It gave name to a mediæval dialect which prevailed through much of Southern France, and had a considerable poetic and romantic literature.

Limoux′, town of France, in the department of Aude, stands on both sides of the Aude in a fertile valley which produces much grain and the famous wine of Blanquette de Limoux, and has extensive manufactures of woollen cloth, yarn, and articles of iron and brass. Pop. 6283.

Lim′pet [Gr. λεπάς], a name applied loosely to many gasteropod mollusks, but appropriately belonging to the Patellidæ, of which *Patella* is the typical genus. The species are very numerous, but are less frequent on our Atlantic coast than in most others. *Patella vulgaris,* the common European limpet, is extensively used for fish-bait and for human food. Many species are fossil. The living shells adhere to rocks by atmospheric pressure. They slowly bore into wood or chalk to which they are attached. The Calyptræidæ are called bonnet or cup limpets. The keyhole limpets are *Fissurellæ.* The *Parmophori* are called duck's-bill limpets. The genus *Ancylus* includes the river limpets. The limpets of tropical shores have in many species extremely beautiful shells. Many of them are edible.

Lin′acre, or **Lynacer** (Thomas), M. D., b. at Canterbury, England, about 1460; studied at Oxford and on the Continent; became fellow of All Souls', Oxford, in 1484, and afterwards professor of physic; was an associate of Colet, Erasmus, and Lily in introducing into England a knowledge of Greek, from which language he made elegant translations of Galen into Latin; studied theology, and in 1518 became a prebendary of York; founded the College of Physicians at London (1518), was its president for life, and was physician to Henry VIII. and his family. D. in London Oct. 20, 1524. His translation of Galen's *De Sanitate Tuenda* appeared in 1517, the *Methodus Medendi* in 1519, and the *De Temperamentis* in 1521. He published in 1524 a treatise on the rules of Latin prose composition, *De Emendata Structura Latini Sermonis, lib. vi.*

Lina′res, town of Spain, province of Jaen, is well built and flourishing. It owes its prosperity chiefly to the rich copper and lead mines in the vicinity. Pop. 36,630.

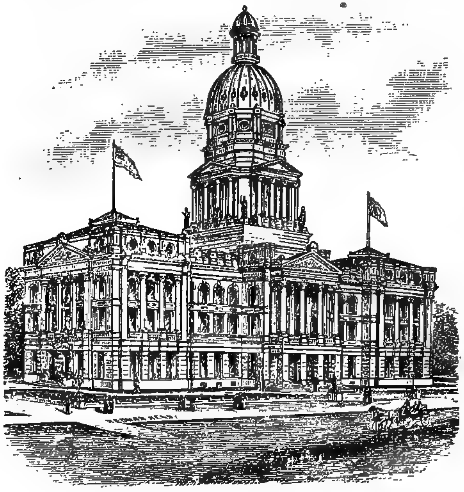
Lincoln, or **Lincolnshire,** county of England, extending along the North Sea from the Wash to the Humber. Area, 2762 square miles. Pop. 469,996. The ground is very low along the coast; in some places it must be protected by dikes against inundations of the sea. But from the coast it gradually rises until it swells into high chalk hills in the north-western part of the county, the so-called *Wolds*. The soil is generally very fertile and cultivated with great care. Large crops of wheat and oats are raised, and fine breeds of horses, short-horned cattle, and long-woolled sheep are reared. Immense flocks of geese are fed on the fens along the shore.

Lincoln, city of England, the capital of the county of Lincoln, on the Witham. It is an old city, with a fine cathedral, built in the thirteenth century, 524 feet long, 250 feet wide, and one of the finest church-buildings in England; large foundries and manufactures of hardware, and an extensive trade in corn and wool. Pop. 37,312.

Lincoln, city and R. R. centre, cap. of Logan co., Ill. (see map of Illinois, ref. 6–E, for location of county), 28 miles N. E. of Springfield, contains a college, a library, a coal-shaft, flouring-mills, a manufactory of smut-mills, a foundry, etc. Pop. in 1880, 5639.

Lincoln, cap. of Lincoln co., Kan. (see map of Kansas, ref. 5–F, for location of county), on Saline River. Pop. in 1880, 422.

Lincoln, city and R. R. centre, cap. of Nebraska and county-seat of Lancaster co. (see map of Nebraska, ref. 10–G, for location of county), has new and handsome statehouse, penitentiary, insane hospital, university, home for the friendless, 26 churches, a high-school building costing $65,000, 8 other school buildings, new opera-house costing $100,000, new stockyards, capital $1,000,000, Grand Union dépôt, 6 railroads, general railroad offices, street railroad, 4 national and several private banks, large government court-house and post-office, 3 daily and 6 weekly newspapers, several large flouring-mills and grain-elevators, packing-house, canning-factory, gas- and waterworks, electric light, largest tannery in the West, 4 foundries, 6 machine-shops, 21 lodges and societies, 35 hotels, a large number of manufactories, artesian salt-well, 3 parks, exposition grounds and buildings, telephone exchange, and all the accessories of cities of its size and character. It does an immense wholesale and distributing business in all lines of merchandise, lumber, coal, grain, and live-stock. Pop. in 1870, 2241; in 1880, 13,003; in 1885, 20,004.



State Capitol (Lincoln, Neb.).

J. D. Calhoun.
Managing Ed. "Daily State Journal."

Lincoln (Abraham), the sixteenth President of the U. S., b. Feb. 12, 1809, being a grand-nephew of Daniel Boone, in Larue (then Hardin) co., Ky., in a cabin on Nolin Creek, 3 miles W. of Hodgensville. His parents were Thomas and Nancy Hanks Lincoln. Of his ancestry and early years the little that is known may best be given in his own language: "My parents were both born in Virginia, of undistinguished families—second families, perhaps I should say. My mother, who died in my tenth year, was of a family of the name of Hanks, some of whom now remain in Adams, and others in Macon co., Ill. My paternal grandfather, Abraham Lincoln, emigrated from Rockbridge co., Va., to Kentucky about 1781 or 1782, where a year or two later he was killed by Indians—not in battle, but by stealth, when he was laboring to open a farm in the forest. His ancestors, who were Quakers, went to Virginia from Berks co., Pa. An effort to identify them with the New England family of the same name ended in nothing more definite than a similarity of Christian names in both families, such as Enoch, Levi, Mordecai, Solomon, Abraham, and the like. My father, at the death of his father, was but six years of age, and he grew up literally without education. He removed from Kentucky to what is now Spencer co., Ind., in my eighth year. We reached our new home about the time the State came into the Union. It was a wild region, with many bears and other wild animals still in the woods. There I grew up."

The early residence of Lincoln in Indiana was 16 miles N. of the Ohio River, on Little Pigeon Creek, 1½ miles E. of Gentryville, within the present township of Carter. Here his mother died Oct. 5, 1818, and next year his father married Mrs. Sally (Bush) Johnston of Elizabethtown, Ky. She was an affectionate foster-parent, to whom Abraham was indebted for his first encouragement to study. He became an eager reader, and the few books owned in the vicinity were many times perused. He worked frequently for the neighbors as a farm-laborer, was for some time clerk in a store at Gentryville, and became famous throughout that region for his athletic powers, his fondness for argument, his inexhaustible fund of humorous anecdote, as well as for mock oratory and the composition of rude satirical verses. In 1828 he made a trading voyage to New Orleans as "bow-hand" on a flatboat; removed to Illinois in 1830; helped his father build a log house and clear a farm on the N. fork of Sangamon River, 10 miles W. of Decatur, and was for some time employed in splitting rails for the fences—a fact which was prominently brought forward for a political purpose thirty years later. In the spring of 1831 he, with two of his relatives, was hired to build a flatboat on the Sangamon River and navigate it to New Orleans; the boat "stuck" on a mill-dam, and was got off with great labor through an ingenious mechanical device which led some years later to Lincoln's taking out a patent for "an improved method for lifting vessels over shoals." This voyage was memorable for another reason—the sight of slaves chained, maltreated, and flogged at New Orleans was the origin of his deep convictions upon the slavery question. Returning from this voyage, he became a resident for several years at New Salem, a recently settled village on the Sangamon, where he was successively a clerk, grocer, surveyor, and postmaster, and acted as pilot to the first steamboat that ascended the Sangamon. Here he studied law, interested himself in local politics after his return from the Black Hawk war, and became known as an effective "stump-speaker." The subject of his first political speech was the improvement of the channel of the Sangamon, and the chief ground on which he announced himself (1832) a candidate for the legislature was his advocacy of this popular measure, on which subject his practical experience made him the highest authority. Elected to the legislature in 1834 as a "Henry Clay Whig," he rapidly acquired that command of language and that homely but forcible rhetoric which, added to his intimate knowledge of the people from which he sprang, made him more than a match in debate for his few well-educated opponents. Admitted to the bar in 1837, he soon established himself at Springfield, where the State capital was located in 1839, largely through his influence; became a successful pleader in the State, circuit, and district courts; married (1842) a lady belonging to a prominent family in Lexington, Ky.; took an active part in the Presidential campaigns of 1840 and 1844 as candidate for elector on the Harrison and Clay tickets, and in 1846 was elected to the U. S. House of Representatives over the celebrated Peter Cartwright. During his single term in Congress Lincoln did not attain any prominence. He voted for the reception of anti-slavery petitions, for the abolition of the slave-trade in the District of Columbia, and for the Wilmot proviso, but was chiefly remembered for the stand he took against the Mexican war. For several years thereafter he took comparatively little interest in politics, but gained a leading position at the Springfield bar. Two or three non-political lectures and a eulogy upon Henry Clay (1852) added nothing to his reputation. In 1854 the repeal of the Missouri Compromise by the Kansas-Nebraska act aroused Lincoln from his indifference, "like a fire-bell in the night," and in attacking that measure he had the immense advantage of knowing perfectly well the motives and the record of its author, Stephen A. Douglas of Illinois, then popularly designated as the "Little Giant." The latter came to Springfield in Oct., 1854, on the occasion of the State Fair, to vindicate his policy in the Senate, and the "Anti-Nebraska" Whigs, remembering that Lincoln had often measured his strength with Douglas in the Illinois legislature and before the Springfield courts, engaged him to improvise a reply. This speech, in the opinion of those who heard it, was one of the great efforts of Lincoln's life, certainly the most effective in his whole career. It took the audience by storm, and from that moment it was felt that

Douglas had met his match. Lincoln was accordingly selected as the Anti-Nebraska candidate for the U. S. Senate in place of Gen. Shields, whose term expired Mar. 4, 1855, and led in several ballots, but Trumbull was ultimately chosen. The armed conflict on the soil of Kansas, which Lincoln had predicted, soon began; the result was the disruption of the Whigs and the formation of the Republican party. At the Bloomington State convention in 1856, where the new party first assumed form in Illinois, Lincoln made an impressive address, in which for the first time he took distinctive ground against slavery in itself. At the national Republican convention at Philadelphia (June 17), after the nomination of Fremont, Lincoln was put forward by the Illinois delegation for the Vice-Presidency, and received on the first ballot 110 votes against 259 for William L. Dayton. He took a prominent part in the canvass, being on the electoral ticket. In 1858, Lincoln was unanimously nominated by the Republican State convention as its candidate for the U. S. Senate in place of Douglas, and in his speech of acceptance used the celebrated illustration of a "house divided against itself" on the slavery question, which was perhaps the cause of his defeat. The great debate carried on at all the principal towns of Illinois between Lincoln and Douglas as rival Senatorial candidates resulted at the time in the election of the latter, but being widely circulated as a campaign document, it fixed the attention of the country upon the former as the clearest and most convincing exponent of Republican doctrine. Early in 1859 he began to be named in Illinois as a suitable Republican candidate for the Presidential campaign of the ensuing year; and a political address delivered at the Cooper Institute, N. Y., Feb. 27, 1860, followed by similar speeches at New Haven, Hartford, and elsewhere in New England, first made him known to the Eastern States in the light by which he had long been regarded at home. By the Republican State convention which met at Decatur, Ill., May 9 and 10, Lincoln was unanimously endorsed for the Presidency. It was on this occasion that two rails, said to have been split by his hands thirty years before, were brought into the convention, and the incident contributed much to his popularity. The National Republican convention at Chicago, after spirited efforts made in favor of Seward, Chase, and Bates, nominated Lincoln for the Presidency, with Hannibal Hamlin for Vice-President (May 18), at the same time adopting a vigorous anti-slavery platform. The Democratic party having been disorganized and presenting two candidates, Douglas and Breckenridge, and the remnant of the "American" party having put forward John Bell of Tennessee, the Republican victory was an easy one, Lincoln being elected Nov. 6 by a large plurality, comprehending nearly all the Northern States, but none of the Southern. The secession of South Carolina and the Gulf States was the immediate result, followed a few months later by that of the border slave States and the outbreak of the great civil war. The life of Abraham Lincoln became thenceforth merged in the history of his country. None of the details of the vast conflict which filled the remainder of Lincoln's life can here be given; they will be found under more appropriate headings. Narrowly escaping projected assassination by avoiding Baltimore on his journey to the capital, he reached Washington Feb. 23, and was inaugurated President of the U. S. Mar. 4, 1861. Lincoln called to his cabinet his principal rivals for the Presidential nomination, Seward, Chase, Cameron, and Bates; secured the co-operation of the Union Democrats, headed by Douglas; called out 75,000 militia from the several States upon the first tidings of the bombardment of Fort Sumter (Apr. 15); proclaimed a blockade of the Southern ports (Apr. 19); called an extra session of Congress for July 4, from which he asked and obtained 400,000 men and $400,000,000 for the war; placed McClellan at the head of the Federal army on Gen. Scott's resignation (Oct. 31); appointed Edwin M. Stanton secretary of war (Jan. 14, 1862), and on Sept. 22, 1862, issued a proclamation declaring the freedom of all slaves in the States and parts of States then in rebellion from and after Jan. 1, 1863. This was the crowning act of Lincoln's career—the act by which he will be chiefly known through all future time—and it decided the war. On Oct. 16, 1863, President Lincoln called for 300,000 volunteers to replace those whose term of enlistment had expired; made a celebrated and touching, though brief, address at the dedication of the Gettysburg military cemetery, Nov. 19, 1863; commissioned Ulysses S. Grant lieutenant-general and commander-in-chief of the armies of the U. S. Mar. 9, 1864; was re-elected President in November of the same year by a large majority over Gen. McClellan, with Andrew Johnson of Tennessee as Vice-President; delivered a very remarkable address at his second inauguration, Mar. 4, 1865; visited the army before Richmond the same month, entered the capital of the Confederacy the day after its fall, and upon the surrender of Gen. Robert E. Lee's army (Apr. 9) was actively engaged in devising generous plans for the reconstruction of the Union, when on the evening of Good Friday, Apr. 14, he was shot in his box at Ford's theatre, Washington, by John Wilkes Booth, a fanatical actor, and expired early on the following morning, Apr. 15, 1865. Almost simultaneously a murderous attack was made upon William H. Seward, the secretary of state. At noon on the 15th, Andrew Johnson assumed the Presidency, and active measures were taken which resulted in the death of Booth and the execution of his principal accomplices. The funeral of President Lincoln was conducted with unexampled solemnity and magnificence. He was buried at Oak Ridge Cemetery, near Springfield, Ill., on May 4, and his remains were placed in an appropriate tomb, surmounted by a statue, Oct. 15, 1874. The leaders and citizens of the expiring Confederacy expressed genuine indignation at the murder of a generous political adversary; foreign nations took part in mourning the death of a statesman who had approved himself a true representative of American nationality; the freedmen of the South almost worshipped the memory of their deliverer; and the general sentiment of the great nation he had saved awarded him a place in its affections second only to that held by Washington. The characteristics of Abraham Lincoln have become familiarly known throughout the civilized world. His tall, gaunt, ungainly figure, homely countenance, and his shrewd mother-wit, shown in his celebrated conversations overflowing in humorous and pointed anecdote, combined with an accurate intuitive appreciation of the questions of the time, are recognized as forming the best type of a period of American history now rapidly passing away. (See biographies by Dr. J. G. Holland (1865), I. N. Arnold (1868), and Ward H. Lamon (1872).) Porter C. Bliss.

Lincoln (Gen. Benjamin), b. at Hingham, Mass., Feb. 3, 1733; was a farmer in his native town at the outbreak of the Revolution; had been a local magistrate, a colonel of militia, and several times a representative in the colonial legislature and the provincial congress, and was secretary of the latter body and member of its committee of correspondence in 1774, when, having taken an active part in organizing and training the Continental soldiery, he was appointed major-general of the State troops. He obtained the favor of Washington during the siege of Boston; commanded an expedition which in June, 1776, cleared Boston harbor of British vessels; led a body of Massachusetts militia at the battle of White Plains and in the ensuing engagements (1776); brought a new levy of militia to the aid of Washington at Morristown, N. J., in Feb., 1777; was appointed by Congress, at Washington's request, a major-general in the Continental service Feb. 19; was surprised and nearly captured at Bound Brook Apr. 13: co-operated with Schuyler in the summer campaign against Burgoyne, for which he raised a fresh body of New England militia; joined Gates as second in command Sept. 29; was severely wounded at the battle of Bemus Heights, near Saratoga, Oct. 8, and disabled from active service until Aug., 1778, when he joined, and was in September appointed to the chief command of the Southern army. Arriving at Charleston Dec. 4, he was chiefly occupied for several months in warding off the several demonstrations made by the British general Prevost against that city after the fall of Savannah; lost one-fourth of his forces by the defeat of Gen. Ashe at Brier Creek Mar. 2, 1779; unsuccessfully attacked the enemy's works at Stone Ferry June 20; joined D'Estaing in September in his fruitless siege of Savannah, and after the bloody repulse of Oct. 9 returned to Charleston, which in the spring of 1780 was besieged by Sir Henry Clinton and Gen. Arbuthnot with greatly superior forces. The defence was skilfully and strenuously conducted, but Lincoln was obliged to capitulate May 12, and was allowed to go to his home at Hingham on parole. Exchanged in the spring of 1781, he joined Washington on the Hudson, took part in the siege of Yorktown, and was deputed to receive the sword of Cornwallis on his surrender. Elected by Congress secretary of war in Oct., 1781, he held that office three years, after which he retired to his farm at Hingham. In 1786–87 he commanded the Massachusetts militia in the suppression of Shays's rebellion; was elected lieutenant-governor of Massachusetts in 1787; was appointed collector of the port of Boston in 1789, and held that office for twenty years. He was one of the commissioners who in 1789 made a treaty with the Creek Indians, and in 1793 was employed in an unsuccessful negotiation with the Ohio Indians. In his habits he was a model of temperance and morality, was deeply religious, and for many years a deacon in the church of his native town. D. at Hingham May 9, 1810. (See his *Life*, by Francis Bowen, in Sparks's *American Biography*, 2d series, vol. xiii.)

Lincoln (Enoch), b. at Worcester, Mass., Dec. 28, 1788, a son of Levi Lincoln (1749–1820); studied at Harvard

College; became a lawyer in 1811; settled at Fryeburg, Me., the scenery of which beautiful forest-town he described in a poem entitled *The Village*, and in 1819 removed to Paris, Me.; was a member of Congress 1818–26, and governor of Maine 1827–29. He delivered a poem at the centennial celebration of the Lovewell's Pond fight, was a warm friend of the Indians, and left valuable historical manuscripts, some of which were published in the first volume of the *Maine Historical Collections*. D. at Augusta, Me., Oct. 8, 1829.

Lincoln (John Larkin), b. at Boston, Mass., Feb. 23, 1817; graduated at Brown University in 1836; studied theology at Newton Seminary; was tutor at Brown University 1838–40; and after passing some years in Europe was elected professor of Latin in the same institution 1844. He has edited *Selections from Livy* (1847), the *Works of Horace* (1851), and Cicero's *De Senectute* (1872).

Lincoln (Levi), b. at Hingham, Mass., May 15, 1749; graduated at Harvard in 1772; became a lawyer of Worcester, Mass., in 1775, a judge of probate in 1776; was in the constitutional convention of 1780; and after holding many important offices was a Jeffersonian member of Congress 1799–1801; attorney-general of the U. S. 1801–05; lieutenant-governor of Massachusetts 1807–08, acting governor 1809. D. at Worcester, Mass., Apr. 14, 1820.

Lincoln (Levi), LL.D., b. at Worcester, Mass., Oct. 25, 1782, son of Levi Lincoln (1749–1820); graduated at Harvard in 1802; became in 1805 a lawyer; member of the constitutional convention of 1820; was often in the State legislature, of which he was Speaker in 1822, and president of the senate 1845; lieutenant-governor of Massachusetts 1823, governor 1825–34; was in Congress 1835–41; a judge of the State supreme court 1824; collector of the port of Boston 1841–43; first mayor of Worcester in 1848. D. at Worcester, Mass., May 29, 1868.

Lincoln (Robert Todd), eldest son of Abraham Lincoln, b. at Springfield, Ill., 1844; graduated at Harvard, and became a lawyer of Chicago, Ill.; appointed Sec. of War Mar. 5, 1881, by Pres. Garfield.

Linc'olnton, cap. of Lincoln co., Ga. (see map of Georgia, ref. 3–J, for location of county), 20 miles N. E. of Washington. Pop. in 1870, 92; in 1880, 70.

Lincolnton, R. R. junction, cap. of Lincoln co. N. C. (see map of North Carolina, ref. 3–D, for location of county), on the Carolina Central R. R. and the South Fork and Catawba rivers, has paper-mills, cane-seat chair-factory, cotton and tobacco factory, steam saw-mill, tanneries, sash, door, and blind factory. Pop. in 1880, 708.

Lincoln University, Chester co., Pa., originated from the Ashman Institute, whose first president was Rev. J. P. Carter, and whose name was changed in 1866 to that of Lincoln University. It has preparatory, collegiate, theological, law, and medical departments, and seven professors. It owns real estate worth $125,000 and an endowment fund of $100,000, and has three large halls for dormitories, and a university hall, in which are recitation-rooms and chapel. I. N. Rendall.

Lind (Jenny), "The Swedish Nightingale," b. in Stockholm Oct. 6, 1821, of humble parentage; her father was a teacher, and poor. Her precocious talent attracted the notice of Mme. Lundberg, a retired actress, who introduced her to Crælius and Berg, famous teachers in music, and to Lindblad, the composer. The manager of the court theatre procured for her admission to the musical academy, where her progress was rapid. She acted and sang in children's parts till she was twelve years of age, when her voice failed her. Four years later it returned on occasion of a public concert, and she sang the part of Alice in Meyerbeer's *Robert le Diable* with a brilliancy that ensured her success. She soon became the operatic star of Stockholm, and sang with applause in the chief cities of Sweden and Norway. In 1841, ambitious of perfecting herself in her art, she went to Paris and took lessons of Garcia. There she was introduced to Meyerbeer, who took a deep interest in her, and obtained from M. Pillet an opportunity to sing in opera. But she caused no enthusiasm, and in her chagrin turned her back on Paris. Her next opportunity, also due to Meyerbeer, was in Berlin in 1845. There her success was distinguished. Previous to this she had tasted once more the friendliness of Stockholm, and had sung in Dresden. At Vienna she repeated her triumphs in *Norma*, the *Camp of Silesia*, and the *Daughter of the Regiment*. Her first appearance in London was in May, 1847. In *Robert le Diable*, *Puritani*, *Sonnambula*, she more than justified her claims as an artist, and covered herself with honors. In 1848 she sang for the first time in oratorio, *Elijah*, at Exeter Hall, to found musical scholarships in memory of Mendelssohn. Henceforth this was to be her chosen field. In 1850 she came to the U. S., under contract with Mr. P. T. Barnum to give 150 concerts. The enthusiasm was unbounded, the profits were enormous, but the toil and irksomeness were excessive, and in June, 1851, after singing 95 times, the contract was terminated by Jenny Lind. In 1852 she married Otto Goldschmidt, soon after returned to Europe, and passed several years in Dresden, appearing only occasionally in public, and then for charitable purposes only. In 1858 she took up her residence in England, where she still lives. Jenny Lind's voice was a light soprano of remarkable sweetness, flexibility, and charm of expression, and she threw into it the feeling of a passionate soul. She sang out of a heart full of goodness. In the U. S. she was as well known for her charities as for her genius: they amounted to many tens of thousands of dollars; in England, Sweden, and Germany they have been equally munificent. Her private life and character are blameless. She is no less honored and beloved as a woman than admired as an artist. O. B. Frothingham.

Lin'dau, town of Bavaria, situated on an island in the Lake of Constance, manufactures musical and chirurgical instruments, and trades in wine, corn, cheese, and fish. It was a free city till 1803. Pop. 5337.

Lindau (Paul), b. at Magdeburg June 3, 1839, studied philosophy and literature at Halle, Leipsic, Berlin, and Paris; visited Italy, the Netherlands, etc.: founded *Die Gegenwart*, a weekly journal of politics and literature, in 1872, and contributed a great number of articles to various papers, besides publishing several critical essays—*Molière* (1872), *Beaumarchais* (1875), *Alfred de Musset* (1877), *Dramaturgische Blätter* (1875, 2 vols.), *Nüchterne Briefe aus Baireuth* (1876), *Ueberflüssege Briefe an eine Freundin* (1877), etc.; several dramas—*Marie and Magdalene*, *Marion*, *Diana*, etc.; and travelling sketches of Venice, Paris, etc.

Lin'den [Ang.-Sax. *lind*], the lime tree, *Tilia Europæa* (order Tiliaceæ), a large European forest tree, closely related to the Basswood (which see) of the U. S. Its wood is soft, but valued by carvers and turners and used in making charcoal. Its bark makes the bass matting so extensively exported from Russia. Its flowers afford valuable bee-pasture. It has many varieties, some of which are well known in cultivation in the U. S.

Linden, cap. of Marengo co., Ala. (see map of Alabama, ref. 5–B, for location of county), 95 miles W. of Montgomery. Pop. of v. in 1870, 300; of tp., 1927; in 1880, 1975.

Linden, cap. of Perry co., Tenn. (see map of Tennessee, ref. 7–D, for location of county), 12 miles N. E. of Decaturville. Pop. in 1870, 149; in 1880, 189.

Linden, cap. of Cass co., Tex. (see map of Texas, ref. 2–K, for location of county), 35 miles N. of Marshall. Pop. not in census.

Lin'derman (Henry), M. D., b. in Pike co., Pa., Dec. 26, 1825; studied medicine under his father, and graduated at the New York College of Physicians and Surgeons; practised his profession in Pike co., Nesquehoning, and Mauch Chunk, Pa.; took an active interest in politics as a Democrat; chief clerk of U. S. Mint at Philadelphia 1855–64; in 1864 he resigned and went into business in a firm of stockbrokers in Philadelphia; director of U. S. Mint at Philadelphia 1866–69; member of the Presidential convention which nominated Seymour and Blair; sent to investigate the San Francisco mint; in 1871 he was sent to London, Paris, and Berlin to collect information concerning their mints; in 1872 made an elaborate report on the condition of the market for silver; projected the trade dollar to make a market for the great amount of silver produced in the U. S.; author of the coinage act of 1873; Dec. 7, 1873, appointed director of all the U. S. mints for five years, having entire charge of them; published *Money and Legal Tender in the U. S.* in 1877. His annual report for 1877 was an exhaustive review of the metallic standard and of the capacity of the mines of the U. S. to supply the world with the precious metals. D. at Washington, D. C., Jan. 27, 1879.

Lindley (John), Ph. D., M. D., F. R. S., F. L. S., b. at Catton, Norfolk, Feb. 5, 1799, was the son of a nurseryman; began early to write upon botany, assisting in preparing Loudon's *Encyclopædia*; became in 1829 professor of botany in University College, London; was appointed in 1860 examiner in botany in the London University; edited the *Gardener's Chronicle* 1841–65. D. near London Nov. 1, 1865. His botanical writings are of the first importance. Among them are *Introduction to the Natural System* (1830), *Structure and Physiology of Plants* (1832), *Vegetable Kingdom* (1846), *Flora Medica* (1838), *Fossil Flora* (with Hutton, 1831–37), *Pomologia Britannica* (1841), *Orchidaceous Plants* (1837–38), *Folia Orchidacea* (1852), *Theory of Horticulture* (1840), etc.

Lind'say, capital of Victoria co., Ont., Canada, is on the Canada Midland Railway and on the navigable Scugog River. It has an extensive trade in lumber, grain, and flour. It has manufactures of castings, lumber, beer, sash, blinds, hemlock extract, etc. The town contains the county buildings, several churches and schools, and other fine edifices. It is mostly built of brick. It has 2 weekly newspapers. Pop. of sub-district, in 1881, 5080.

Lindsay, Barons and Earls, a distinguished family in the Scottish peerage, descended from Sir Walter de Lindsay, an Englishman of Norman descent, who in the reign of David I. acquired Ercildoun and Luffness in East Lothian. In the twelfth century the lands of Crawford in Clydesdale came into possession of the family by an intermarriage with the royal line of Scotland. Sir James Lindsay of Crawford was distinguished at the battle of Otterburn. His nephew and heir, Sir David, married a sister of King Robert III., and was made by that monarch earl of Crawford, while Sir William, younger brother of the earl, became ancestor of the Lords Lindsay of the Byres, Haddington, and, through a natural son, was also ancestor of the celebrated poet, Sir David Lindsay of the Mount. In the fifteenth century the earls of Crawford were among the wealthiest, proudest, and most influential of the Scottish nobility, and took a large part in the civil warfare of that agitated period. David, the fifth earl, a trusted minister of James III. was made duke of Montrose in 1488—a title never before bestowed in Scotland except upon princes. In 1644 the tenth Lord Lindsay of the Byres was created earl of Lindsay, and soon afterward obtained also, by a new creation, the earldom of Crawford, extinct in the elder line. John, fourth earl of Lindsay and Crawford, b. in Oct., 1702, was a distinguished general in the Russian service, in the German campaign 1743–45, and the suppression of the movement of the Pretender in Scotland in 1746. D. in London Dec. 25, 1759. A. W. Crawford Lindsay, earl of Crawford and Lindsay, wrote *The Lives of the Lindsays*. D. Dec. 13, 1880.

Lindsay (Sir David), of the Mount, b. about 1490, either at Garmylton, East Lothian, or at the Mount, Fifeshire, Scotland, on the estate from which his title was derived; is believed to have studied at the University of St. Andrew's (1505–09), and to have travelled in Italy in 1510. In the following year he is mentioned as an amateur actor in a play performed at the court of James IV. of Scotland, and in 1512 was appointed "keeper" or tutor to the infant prince, who succeeded to the throne as James V. a few months later (Sept., 1513). His important duties were discharged with an affectionate care, which the young king rewarded in 1528 with an appointment as king's herald, and in 1530 with knighthood and the office of "Lord Lyon king-at-arms," in which capacity he accompanied embassies to the courts of England, France, Spain, and Denmark, and is introduced into Scott's poem of *Marmion*. He represented Cupar in Parliament (1542–43), contributed to the success of the Reformation, and d. at an unknown place and date before May, 1555. As a poet Lindsay takes high rank, and his satires against the clergy are credited with having been the most efficient preparation for the labors of John Knox. His principal works were *The Dreme* (1528); *Satyre of the Thrie Estaitis*, played at court in 1539; *Historie of Squyer Meldrum* (1548); and *The Monarchie* (1553). The first collective edition of his works was printed at Copenhagen in 1553, and nearly twenty have since appeared in Scotland. The best edition is that of the Early English Text Society (1865–71), in 5 parts.

Lindsay (John Wesley), D. D., b. Aug. 20, 1820, at Barre, Vt.; graduated at Wesleyan University 1840; studied theology in Union Seminary, New York City; entered the Methodist ministry; was tutor 1847, and professor of Latin and Hebrew in his *alma mater* 1848–60; president of Genesee College 1864–68; became in 1868 professor of exegetical theology in what is now Boston University.

Lindsay (William Schaw), b. in Ayrshire, Scotland, in 1816; went to sea at the age of fifteen years as cabin-boy in a West India ship; became second mate 1834, chief mate 1835, took command of a merchantman 1836, became agent for the Castle-Eden Coal Company 1841; was influential in opening the port of Hartlepool and providing it with docks and wharfs; went to London 1845: became in a few years one of the "merchant princes" of that city; was twice defeated in his candidacy for Parliament 1852; elected for Tynemouth and North Shields Mar., 1854, and again without opposition Mar., 1857; elected for Sunderland Apr., 1859; distinguished himself in Parliament by zealous attention to commercial, and especially shipping, interests; took an active part in the formation of the Administrative Reform Association. He published many pamphlets on mercantile and political topics, a volume entitled *Our Navigation, Mercantile and Marine Laws considered* (1853), *Our Merchant Shipping* (1860), and in 1874, 2 vols. of an elaborate work, *The History of Merchant Shipping*. D. Aug. 28, 1877.

Lindsborg, Kan. See Appendix.

Lindsey (Charles), b. in 1820 in Lincolnshire, England; came in 1842 to Canada West and became an editor; was 1846–52 connected with the Toronto *Examiner*, and in 1852 became editor of the Toronto *Leader;* has since been city registrar; has published *Clergy Reserves, The Maine Law*, and *Prairies of the Western States*.

Lindsey (Theophilus), b. at Middlewick, Cheshire, England, June 20, 1723, studied at Cambridge, travelled on the Continent 1754–56 as tutor to the duke of Northumberland, held various positions in the Church of England, but gradually adopted Unitarian views, resigned his position in 1772 and began in 1774 to conduct Unitarian service in Essex street, London, and published *Unitarian Doctrine and Worship from the Reformation to our own Times* (1783). D. in London Nov. 3, 1808.

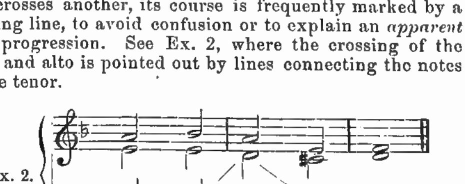
Lind'sley (John Berrien), M. D., D. D., b. at Princeton, N. J., Oct. 24, 1822; educated in Nashville, Louisville, Philadelphia, and Paris; was elected in 1856 professor of chemistry and dean of faculty of the medical department of the University of Nashville; in 1855 was made chancellor of that university, which for several years before the war had classes of 600 students. After the death of his preceptor, the celebrated Dr. Troost, from whom he imbibed the love of the sciences, he became the curator of his splendid cabinet, which in 1874 was purchased by the Kentucky Library Association and thrown open to the public; has contributed papers on education to the press, also to the *Theological Medium*, the quarterly of the Cumberland Presbyterian Church, and wrote the medical annals of Tennessee. Paul F. Eve.

Lindsley (Nathan Lawrence), LL.D., son of Philip, b. at Princeton, N. J., about 1816; received a careful education at Nashville University, of which his father was president; was distinguished as a philologist and as an educator. He rendered valuable assistance to Dr. J. E. Worcester in the preparation of his *Dictionary*, and had himself projected a great work to be entitled *An Encyclo-Lexicon of the English Language*. D. Oct. 9, 1868.

Lindsley (Philip), D. D., b. at Morristown, N. J., Dec. 21, 1786; graduated at Princeton in 1804; tutor there 1807–09 and 1812; professor of languages 1813; vice-president 1817, at which time he was ordained in the Presbyterian Church; between 1820 and 1839 was offered the presidency of ten different colleges; in 1824 accepted that of the University of Nashville, which he resigned in 1850, after a most successful career as an instructor. He was afterwards professor of archæology and church polity in the Presbyterian Theological Seminary at New Albany, Ind. D. at Nashville, Tenn., May 25, 1855. His complete works, consisting of sermons, educational, miscellaneous, and religious discourses and essays, were published in 3 vols., with a memoir by Leroy J. Halsey (Philadelphia, 1865).

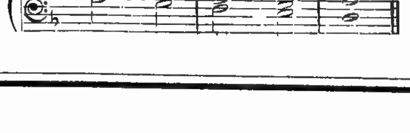
Line [Lat. *linea*]. In music, lines are used not only in the formation of the stave and its extension by ledger-lines, but also for several other purposes. In a figured bass a long unbroken line after a figure signifies the continuation or holding of the note indicated by the figure, while broken or short lines imply repeated strokes of a note, or sometimes the repetition of the same figure over the several notes of a moving bass. See Ex. 1:

Ex. 1.



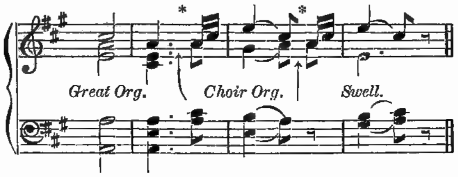
A line drawn across a figure thus, 4̸ or 4, 5̸ or 5̶, 6̸ or 6̶, etc., is equivalent to a ♯, and such figures stand for a sharp fourth, a sharp fifth, etc. When, in a condensed score, one part crosses another, its course is frequently marked by a slanting line, to avoid confusion or to explain an *apparent* false progression. See Ex. 2, where the crossing of the tenor and alto is pointed out by lines connecting the notes of the tenor.

Ex. 2.



In modern music for the organ, curved or straight perpendicular lines, with arrow-heads, are often used to mark the exact place where a change is to be made from loud to soft, or the reverse, or from one stop or set of keys to another. Instances of this are given in Ex. 3:

Ex. 3.



Two diverging or converging lines placed over a series of notes imply an increase or decrease of loudness, as otherwise expressed by the words *crescendo* or *diminuendo*, or their abbreviations, *cres.* and *dim.* WILLIAM STAUNTON.

Line [Lat. *linea*], a geometrical magnitude which has length, but neither breadth nor thickness. We may regard a line as the path of a moving point, in which case the nature of the line will depend upon the law of motion of the point. Two positions of the generating point are said to be *consecutive* when the distance between them is infinitesimal, and the corresponding portion of the line is called an *element*. We may suppose the point to move so that the elements shall be equal, or so that the projections of these elements on a given straight line shall be equal: the former is the method of plane geometry, and the latter is the method of analytical geometry and of the calculus. Lines may be either straight or curved. A *straight* line is a line whose elements all lie in the same direction; that is, it is a line whose direction is the same at every point; a *curved* line is one in which no two consecutive elements lie in the same direction. A *plane curve* is a curve all of whose elements lie in the same plane; a *curve of double curvature* is a curve in which no three consecutive elements lie in the same plane. In all cases the prolongation of any element in the direction of the motion of the generating point is a tangent to the curve; hence, we say that a tangent to a curve is a straight line drawn through two consecutive points of the curve. Of these points the first in order of generation is the *point of contact* or the *point of tangency*.

In analysis, lines are classed as algebraic and transcendental. An *algebraic line* is one whose rectilineal equation may be expressed by the ordinary operations of algebra; that is, by addition, subtraction, multiplication, division, formation of powers denoted by constant exponents, and extraction of roots indicated by constant indices; a *transcendental line* is one whose equation cannot be expressed by the ordinary operations of algebra. Algebraic lines are divided into *orders* according to the degrees of their equations. Lines of the first order are those whose equations are of the first degree, lines of the second order are those whose equations are those of the second degree, and so on. Algebraic lines of the first order are straight lines, and those of the second order are conic sections. Transcendental lines are sometimes classed, according to the relation between their co-ordinates, as, *logarithmic curves, curve of sines*, etc., but as yet no systematic classification of this class of lines has been made. W. G. PECK.

Line [Lat. *linea*], the twelfth part of an inch in English measurement.

Lin′en [Ang.-Sax. *lîn*, "flax"] is one of the earliest of textile manufactures. Its origin is lost in the cloudland of history. Pieces are still in existence which were woven 4000 years ago. In the days of Herodotus it was an article of Egyptian export. The mummies are wrapped in cerecloths of this material. Sir Gardner Wilkinson has fully described the linen manufacture of Egypt. The term *linen* is a generic name for cloths woven from the fibres of the flax-plant and hemp. The raw material of linen proper is the flax-plant (*Linum usitatissimum*), which thrives in latitudes ranging from Egypt to Russia. From the seed is expressed the linseed oil so much used in commerce. Cloth made from the hemp-plant was worn by the Thracians. This plant is extensively grown in various parts of Europe, and has been cultivated in Bengal from remote ages. It is esteemed there both for its fibre and for the narcotic *bhang* secreted by its leaves. The use of hemp in the linen manufacture is smaller now than formerly. JUTE (which see) may also be commercially considered as a sort of linen, as it affords a cheap substitute for flax, the cultivation of which has not kept pace with the requirements of the makers. Of other substitutes which have been employed with varying degrees of success, we may name the nettle, china-grass, rheea, New Zealand flax, and Manila hemp (*Musa textilis*). The garments of the Hebrew priests were chiefly of linen, and in the Bible we have many allusions which show the esteem in which this fabric was held. In Proverbs there is an oft-quoted passage which vividly portrays ancient methods of manufacture. "She seeketh wool and flax," says the wise king in his description of the virtuous woman, "and worketh willingly with her hands. She layeth her hands to the spindle, and her hands hold the distaff. All her household are clothed with scarlet. She maketh herself coverings of tapestry, her clothing is silk and purple. *She maketh fine linen and selleth it*, and delivereth girdles unto the merchants." In Homer we read of ladies working in this manner. The mother of Nausicaa in the early dawn spun by the hearth soft fleeces dyed with red purple. In many parts of the ancient world the manufacture of linen—chiefly, it may be presumed, carried on by the women as a household occupation—was common. Some parts of Spain and Italy were celebrated for the culture of flax and its subsequent conversion into textile fabrics. Linen has been made in England from an early date. The garments of the Anglo-Saxons were linen and woollen. The daughters of Edward the Elder were famous for their skill in spinning, weaving, and embroidering. The Bayeux tapestry is a linen cloth, with designs worked in wool. Although the flax-plant had been cultivated by the Saxons, it is not found in a list of tithable produce drawn up in 1070. Fine linen is said to have been first made in Wilts and Sussex in 1253. In 1272, Irish linen was used at Winchester. Flemish weavers were introduced into England in 1331, and in 1386 a guild of linen-weavers was established in London, but does not seem to have been very prosperous. Indeed, the manufacture was still in its infancy in the reign of Charles II. Yarranton, writing in 1677, proposed the establishment of spinning-schools, such as were then common in Germany. In these places perhaps 200 girls from six years old upwards were assembled under the supervision of a woman who sat in a pulpit, and with a long white wand "tapped" any of the little workers who flagged in their attention. If this were not sufficient, she rang a bell and the offender was taken away and chastised. This was done in silence, and Yarranton thought it would be good discipline for the maids of England, who were much given to chatting. From the introduction of the cotton manufacture until about 1773, whilst the weft was of cotton the warp was of linen yarn. Arkwright's invention changed this. In Ireland its history is mixed up with that of sectarian feeling, for the woollen manufacture of the popish S. and W. was ruined by heavy export duties, whilst the Protestant interest of Ulster was protected in 1699 by the act for the encouragement of the linen trade. A board was constituted which held sovereign sway over the trade until 1828, when its obsolete regulations and procedure led to its extinction. As early as the eleventh century linen was woven in Ireland, but it was Louis Crommelin, a refugee driven from France by the Revocation of the Edict of Nantes, who set it on a firm footing. The duke of Ormonde in 1711 ordered linen hatbands and scarfs to be used for funeral purposes; fourteen years later machinery began to be used. Improvements in bleaching were introduced by Dr. Ferguson in the middle of the century. It was not until 1828 that flax-spinning machinery was started at Belfast. The pioneers were Messrs. Mulholland. For eighteen years there was a society for the promotion of the growth of flax in Ireland, but it came to an end in 1859. Linen was made in Scotland, but on a very small scale and in a rude style, in the reign of Charles I. In 1688, Morer styles it the most noted and beneficial manufacture of the kingdom. As showing the unfriendly feeling between North and South, it may be mentioned that the Scotch packmen who travelled into England to sell linen were, about 1684, sometimes whipped as malefactors and obliged to give bonds that they would discontinue their traffic.

On the Continent traces of the use and manufacture of linen are found at early dates. Charlemagne, who dressed after the manner of the Franks, had linen under-clothes. In mediæval Italy it was an important article of commerce. In Spain the Moors paid great attention to textile manufactures, and linen was exported to India and Constantinople. In the fifteenth century Seville had 16,000 looms; a century later they had diminished to 300. Flanders, Brabant, and some of the German towns were notable for their linen manufactures in the eleventh century. Louvain had 150,000 linen and woollen weavers in the fourteenth century. In Flanders by the middle of the thirteenth century the manufacture was very flourishing, and its products were largely exported to England and other countries. Ypres, which dates from 960, has left its impress in the word *diaper* (*i. e.* d'Ypres, cloth of Ypres), still used for table-linen. The soil of France is suitable for flax-growing, and since the time of the Roman rule linen has been made in that country. In 1394 it is said the king sent fine linen of Rheims to the sultan in ransom of some noble prisoners who had fallen into the hands of the paynims. The Revocation of the Edict of Nantes was disastrous in its effects on French industry, and the linen trade suffered in common with all others from the loss of the Huguenots, driven by religious persecution to take their peaceful arts to countries where they might worship God without fear of "conversion" by dragonnades. Russia has long been the greatest flax and hemp growing country of the world.

There are more linens used in the U. S. in proportion to the population than in almost any other country.

We turn now to the history of the processes of the linen manufacture. The flax-fibre is made up of a number of smaller filaments bound together. The primary operation in their separation was termed heckling. The heckle is a many-toothed steel comb which removes the coarser fibres of the tow and partially divides the filaments of the flax. The fineness of the flax depends upon the number of hecklings it receives by instruments of increasing delicacy. Machine heckling is now most commonly used, and there are various patented inventions for this purpose. The fibres require to be united into a continuous thread before they are capable of being woven. The earliest method of doing this was by the spindle. One was found at Thebes by Sir Gardner Wilkinson which had still some linen thread upon it. They were about fifteen inches in length, usually of wood, with a circular head of gypsum or composition. They were bulbous near one end, tapering to a point, whilst the other end lengthened into a handle. The thread was attached to the handle; and the spindle resting upon the right thigh, the right hand was drawn quickly over it, causing it to revolve or spin like a top. To this was afterwards added the distaff, a piece of wood round which the flax to be spun was wrapped. The spinning-wheel was the next step forward. One was invented at Brunswick in 1553. That called Saxon had on the spindle a bobbin round which the thread was wound, a flier going round faster than it, giving the requisite twist to the thread. The flax was loosely wrapped round a distaff or rock above the spindle. A treadle moved by the foot gave a rotatory motion to the wheel. It was only by slow degrees that this supplanted the older instrument, and a two-spindled wheel had not been very long in use when Arkwright's cotton-spinning machinery must have turned attention to the possibility of a similar revolution in other branches of human labor. In 1787, John Kendrew and Thomas Porthouse, both of Darlington (Durham), took out a patent for this purpose. Various mills in Scotland were worked under licenses from the patentees. It was long before the hand-made yarn was superseded by the machine-made article. In 1788, Alexander Robb invented a loom to be driven by water, and in 1810, Joseph Crompton of Dundee one to go by water or steam, but it is doubtful if they were brought into use. The first manufactory for weaving flax by power was set up in London about 1812 by Charles Turner & Co.

According to the modern method of treatment, the fibres are first *scutched* or combed; *broken* into three pieces, the inner section being the best; *heckled*, now usually done by a rotatory machine, the flax placed on the periphery being drawn through or against a series of teeth; the short fibres *drawn* into one continuous thread; after having been *roved* it is *spun*. The flax, however, has to be kept wet during this process, for which purpose warm water is now used. The spun yarn is used either for thread or for weaving. The quantity of *leas* (300 yards) contained in a pound is the method of indicating the quality of the yarns. (For information as to the processes of SPINNING, WEAVING, and BLEACHING linen, those articles should be consulted.)

The principal varieties of linen are: *Lawn* (Fr. *linon*), very fine qualities of which are now made in Ireland, although it was once an exclusively French manufacture. Common sheetings and towellings are made in Scotland, and also ducks, huckabacks, osnaburgs, crash, and tick. Some sorts of velvet and velveteen are made from flax at Manchester. Diapers (the origin of the name has been incidentally mentioned) are fabrics with patterns of geometrical regularity, such as are produced by the kaleidoscope. Dowlas is a strong but coarse linen, formerly much used by workpeople for shirts. A good deal is now exported from Britain to Spain and Spanish America. Damasks are fabrics with figures of fruit and flowers, and free-hand ornament as opposed to the geometrical severity of diaper. The name is supposed to be taken from Damascus, an ancient seat of the art, which until the introduction of the Jacquard machine (see LOOM) was a mystery confined to a few localities. Damasking has been applied to silks, etc., but table-linens are fabrics in which it is chiefly used. The town of Dunfermline produces as much of this article as all Europe besides. It is used on the Continent for upholstery purposes. It is said that America uses as much British damask as all other parts of the world together. Courtrai and Liege in Belgium are famed for this kind of work. Cambric, which takes its name from Cambrai, once famous for its production, is the finest and thinnest of linen fabrics. The handkerchiefs vary in price from 4*s.* to 70*s.* per dozen. The so-called Scotch cambric is a cotton fabric with the fibre twisted very hard. Linen is used for shoe-lining, and coarse linens have been brought largely into consumption as hessians (bale-cloth) and beetlers; the last being converted into tarpauling and used for packing and other purposes. "French canvas" is a coarse variety much used by tailors for stiffening, etc. The evil of over-bleaching has lessened the durability of linen, but the price is 50 per cent. less also. For a time the rapid increase of the cotton manufacture endangered the prosperity of the linen-trade, and to some extent they are antagonistic. Although it has not had the same rapid increase as its cheaper rival, it has exceeded its former proportions as one of the great staple industries of the world.

The exports from Great Britain in 1881 were 18,285,500 pounds of linen yarn, 173,853,300 yards of linen manufacture, and £680,260 worth of thread for sewing. The home consumption would represent a similar quantity. The value of linen yarn was £1,057,172, and of manufactured linen was £5,163,669, in each case a decrease on the preceding year. The fullest history of the trade is Warden's *Linen Trade, Ancient and Modern* (1864). W. E. A. AXON.

Ling. See HEATH.

Ling [Ang.-Sax. *lang*, "long"], the *Lota Molva*, a sea-fish of the cod family extensively caught in Europe. It is eaten fresh or salted and dried. The estimation in which this fish is held depends to a great extent upon the perfect manner in which it takes salt and the length of time during which it can be preserved in an eatable state. Split and salted on the spot, it is packed in flats at once and consumed in immense quantities during Lent. Its flesh is also preserved in air-tight cans; its sounds are used for isinglass and for food; its roe is a good fish-bait; its liver yields a valuable oil. The ordinary ling of the American coast is *Lota lacustris*, a smaller fish. Thousands of barrels are taken annually in the Gulf of St. Lawrence. There are several other fishes called ling, both in the U. S. and in Great Britain.

Ling (PETER HENRIK), b. Nov. 15, 1776, at Ljunga, in the province of Småland, Sweden; led as a young man a rather adventurous life, travelling through Germany and France; became in 1805 fencing-master at the University of Lund, in 1813 teacher in fencing at the military school of Carlsberg, and in 1816 director of the gymnastic institute of Stockholm, where he d. May 3, 1839. Ling represents the same movement in Sweden as Turnvater Jahn in Germany. His poetical productions, *Gylfe* (1812) and *Asarne* (1816–26), were intended to awaken among the Swedes that heroism of feeling and thinking which characterized the ancient pagan Scandinavians; and his gymnastic exercises were at first simply a means of developing and strengthening the body. But by the thought and study which Ling bestowed on his profession he developed the simple gymnastic practices into a medical cure, the so-called movement cure, which has proved very effective in many chronic diseases, and has been introduced into many countries.

Lin'ga, the emblem of divine creative power amongst Hindus. It may be termed the phallic emblem of India. The *linga* holds a very high place amongst objects of adoration in India, and is especially an object of S'aiva worship. In Sanskrit *linga* means, primarily, a sign or emblem, but it is only used to signify the emblem of male creative power, the *yoni* being the representative of the female. The most common form in which the *linga* is worshipped is that of a round, perpendicular stone, rising out of an oval stone representation of the *yoni*. But pistils of flowers, etc. etc. are held to be likenesses of the mystic symbol. The S'aiva sect (see S'AIVA) is extremely numerous in India, and *lingas* are conspicuous in all their temples, from the Himalayas to Cape Comorin. Regarding the *linga*, Balfour says: "There is not apparent to any eye the faintest resemblance to the organs of which they are deemed the symbols or types." This view has also been held by a large number of scholars, but it is founded on very limited personal experience of Indian shrines. The writer has with his own eyes seen *lingas* in the great temples of Southern India, elaborately carved and painted, which are a public insult to common decency. It is true that thousands and thousands of *lingas* are to be met with which are simply upright pieces of stone, of great age, and often wind or wave worn, the peculiar emblematical significance of which, as objects of worship, is only known to the pundit or priest. But there are other lingas before which multitudes of men and women worship, at which the first glance of the eye is sufficient to show the worshipper exactly what it is he is worshipping. *Lingas* are frequently—perhaps most frequently—constructed of marble or granite. They are treated by their votaries just as idols are: offerings are placed before them, flowers are strewn, and they are anointed with oil and smeared with ashes. According to Balfour (who has an interesting article on the *linga* in the *Cyclopædia of India,* vol. iii.), "Sonnerat says the lingam may be looked upon as the phallus or the figure representing the virile member of Atys, the well-beloved of Cybele, and the Bacchus whom they worshipped at Hieropolis. The Egyptians, Greeks, and Romans had temples dedicated to Priapus, under the same form as that of the lingam. The Holy Scriptures inform us that Asa, son of Roboam, prevented his mother Maacha from sacrificing to Priapus, whose image he broke. The Jews caused themselves to be initiated in the mysteries of Belphegor, a divinity like the lingam, whom the Moabites and Midianites worshipped on Mount Phegor, and which worship, in all appearance, they received from the Egyptians. When 'Judah did evil in the sight of the Lord, and built them high places, and images, and groves, on every high hill and under every green tree,' the object was Baal, and the pillar, the lingam, was his symbol. According to Col. Tod, the lingam is identical with the Arabic idol Lat or Alhat. The worship reached France, doubtless with the Romans, and the figure of the lingam is still to be seen on the lintel which surrounds the circus at Nîmes, as well as on the front of some of their ancient churches, particularly on that of the cathedral of Toulouse and on some churches at Bordeaux. Plutarch says that the Egyptian god Osiris was found everywhere with the priapus exposed." With our latter-day notions of religion and morality, it comes to be a question whether the British government should allow the more indecent of these phallic emblems to stand in public places in India. Great Britain has resolved on being perfectly neutral in all matters of *religion* amongst Hindus, but still public breaches of *morality* are punishable in India by law, and are thus constantly punished. For instance, the sale of photographs of an indecent character has been rigorously put a stop to, but Sakti-worship is still allowed to be practised; temple-harlots exist, not as of personal choice on the part of the poor dancing-girls, but as a caste, of necessity; and these grossly indecent *lingas* are there allowed to stand "on every high hill and under every green tree." Of old, pious Hindus who spiritualized their religion, even the grossest forms of it, *linga*-worship included, were not lacking. For instance, the great Tamilian poet, Sivavâkkiar, writes as follows (see the *Indian Antiquary,* Bombay, Apr., 1872, first paper on "Tamil Popular Poetry," by the writer):

"My thoughts are flowers and ashes,
In my breast's fane enshrined;
My spirit, too, therein is
A *linga* unconfined."

Here the sage speaks of his body as a metaphorical temple (using language similar to that employed in the New Testament, "Ye are *temples* of the Holy Ghost"); then he likens his thoughts to flowers and ashes, which are used in the services of temples; lastly, he declares that his breath or spirit—which as a part of universal life has no bound or limit—is the true *linga,* creative, and a part of the creation, of his own being. But, even though many may think in the present day like Sivavâkkiar, yet the majority of Hindus have no such spiritual notions. Their religion is materialistic, and in parts of it is yearly becoming grosser. Linga-worship is, in the case of the majority of Hindus, merely sensual idolatry. R. C. CALDWELL.

Lingan (Gen. JAMES MACCUBIN), b. in Maryland about 1752; took part in the Revolutionary war, rising to the rank of brigadier-general; was one of the prisoners at Fort Washington; kept for a long time in the prison-ship; was after the war collector of the port of Georgetown, Md. (now D. C.); resided in Baltimore in 1812, and was killed by a mob while gallantly defending the printing-office of the *Federal Republican,* July 28, 1812.

Lin'gard (JOHN), D. D., LL.D., b. at Winchester, England, Feb. 5, 1771; studied at Douai, and was ordained a Roman Catholic priest in 1795; was afterwards connected with the seminary at Ushaw, near Durham; was (1811–51) parish priest of Hornby, Lancashire; declined a cardinal's hat soon after the publication of his great work, the *History of England* (1819–30, 8 vols.; 6th ed. 1854–56, 10 vols.). This work is one of great ability and excellence, though colored by the religious views of the writer, and recent Ultramontanists find it tainted with Gallicanism. It has been translated into German, French, and Italian, and should always be consulted for the Roman Catholic view of its period, though it cannot be implicitly relied upon, as the author sometimes withholds part of the truth when it goes too strongly against his argument. Author of a *History and Antiquities of the Anglo-Saxon Church* (1806) and an English verson of the New Testament (1836). D. at Hornby July 13, 1851.

Lingayen', town of Luzon, Philippines, situated on the northern coast of that island. Pop. 18,000.

Linguaglos'sa, town of Sicily, in the province of Catania, beautifully situated on a very fertile slope of Mount Etna, about 30 miles N. of the city of Catania, has good churches and conventual buildings, and better popular instruction than is usual in Sicily. Pop. in 1874, 8822.

Lingu'lidæ [from *lingula,* diminutive of *lingua,* "tongue"], a family of the class BRACHIOPODA and order LYOPOMATA (which see), distinguished by the more or less linguiform shape of the shells, the slightly unequal valves, the want of articulating apophyses, and the development of a long vermiform peduncle which passes between the apices of the valves; the shell is composed for the most part of phosphate of lime and horny laminæ, and has rather the appearance of horn than of true shelly matter; there are perforations; the brachia or "arms" are subspiral and destitute of any calcareous apophyses. By Dall the family is divided into two sub-families: (1) Lingulinæ, in which the posterior adductor scar is median and single, and the shell more or less elongate; and (2) Obolinæ, in which there are two posterior adductor scars, more or less separated from the median line, and the shell is inclined to an orbicular form. The family is very interesting, being one of the very few which have survived in comparatively unaltered forms from the Lower Silurian epoch, some of the types of the earliest period being scarcely generically distinct from the living Lingulæ, although the apparent slight differences may be the result of the simplicity of the shell. The living species have been differentiated by Dall into two genera: (1) *Lingula,* containing ten nominal species, the type of which is *L. aratina,* the species confined to the Moluccan, Australian, and Polynesian seas; and (2) *Glottidia,* with five doubtful species, the chief of which are *G. pyramidata* of the southern coast of the U. S. and *G. albida* of California, all of whose representatives are American. In *Lingula* the neural valve is smooth within; in *Glottidia* the neural valve has two internal ridges or lamellæ diverging forward from the beak, and apparently serving as fulcra for the post-parietal muscles. The embryology of *G. pyramidata* has recently been studied by Prof. E. S. Morse. THEODORE GILL.

Lin'iment [Lat. *linimentum*], in pharmacy, an oily preparation for external application, but thinner in consistence than the ointments. Some are stimulant oily compounds (ammonia-soaps), while others are medicated with powerful drugs, designed to act after absorption.

Link [Sw. *länk,* "ring"], a unit of measure used in land surveying. The length of a link is 7.92 inches; a square link is equal to .0001 of an acre.

Lin'köping, or **Linkjöping,** old but well-built town of Sweden, 100 miles S. W. of Stockholm, is the see of a bishop and has a beautiful cathedral from the twelfth century. Pop. 8752.

Linkville, on Klamath Lake, cap. of Klamath co., Or. (see map of Oregon, ref. 8–C, for location of county). Pop. of precinct in 1870, 737.

Linlith'gow, or **West Lothian,** county of Scotland, bordering N. on the Frith of Forth, E. and S. on the county of Edinburgh. Area, 127 sq. m. Pop. 43,198. In the southern part the soil is swampy; elsewhere it is generally fertile, producing wheat, barley, and oats. Very little of the arable land has remained unreclaimed. According to the agricultural returns of 1881, the corn crops occupied 17,347 acres, of which oats were the most important (10,348 acres), and barley came next (4874 acres); 7264 acres were under green crops; 12,980 were under clover and grass, and 21,289 were permanent pastures. Horses, cattle, sheep, and swine are reared. Great numbers of cattle are annually bought and fattened, and dairy-farming is briskly prosecuted, the fresh butter and buttermilk being sent partly to Edinburgh and partly to Newcastle. Very little cheese is made. Linlithgow, the principal town, has interesting monuments, among which is the castle in which Mary Queen of Scots was born. Though now in ruins, it is one of the most imposing memorials of its kind in Scotland. It forms a square, enclosing a court 91 by 88 feet, in which stood the fountain which was used as a model for that erected in front of Holyrood palace. It was built at various times; the W. side is probably the oldest portion of the structure, and is believed to date from the time of James III. In the history of Scotland the palace has been quite conspicuous. It was burned down in 1746 by Hawley's dragoons. Pop. of town, 3689.

Linn, cap. of Osage co., Mo. (see map of Missouri, ref. 4–H, for location of county). Pop. of tp. in 1870, 1757; in 1880, 1804.

Linn (JOHN BLAIR), D. D., son of William, b. at Shippensburg, Pa., Mar. 14, 1777; removed in childhood to

New York; entered Columbia College at the age of thirteen; graduated in 1795; entered the law-office of Alexander Hamilton, and published anonymously two small volumes of miscellanies in prose and verse. In Jan., 1797, he brought out at the John Street Theatre a "serious drama, interspersed with songs," entitled *Bourville Castle, or the Gallic Orphan*, which was represented three nights, but did not succeed in winning public favor. Shortly afterwards he abandoned the law, studied theology under Rev. Dr. Romeyn at Schenectady, was ordained in 1798, and in June, 1799, became assistant pastor of Rev. Dr. Ewing's Presbyterian church at Philadelphia. In 1800 he wrote an Ossianic poem on the *Death of Washington*, and in 1802 published his principal production, *The Powers of Genius*, a poem of some 600 lines, smoothly written and scholarly, but destitute of the "powers" it commemorated. It was, however, well received, soon reached a second edition, and was reprinted in England. In 1803 he engaged in a theological polemic with Dr. Priestley, occasioned by the latter's comparison of Socrates with Christ, publishing two able pamphlets which elicited replies from Priestley, and procured for the young divine the degree of D. D. from the University of Pennsylvania. D. of consumption at Philadelphia Aug. 13, 1804. In the following year his brother-in-law, the novelist, Charles Brockden Brown, gave to the world, with a brief memoir, *Valerian*, a narrative poem, incomplete, but extending to 1500 lines of blank verse, treating of the early struggles of Christianity against paganism.

Linn (Lewis Fields), M. D., b. near Louisville, Ky., Nov. 5, 1795; successfully engaged in medical practice at St. Geneviève, Mo., in 1815, and was a U. S. Senator 1833–43. He labored zealously for the interests of Oregon and the West generally. D. at St. Geneviève, Mo., Oct. 3, 1843. (See his *Life*, by E. A. Linn and N. Sargent, 1857.)

Linn (William), D. D., b. near Shippensburg, Pa., Feb. 27, 1752; graduated at Princeton 1772; studied divinity with Rev. Dr. Cooper of Middle Spring, Pa., and in 1775 was licensed to preach by the Donegal presbytery. He served as a chaplain in Gen. Thompson's regiment early in the war of the Revolution, taught in an academy in Somerset co., Md., became pastor of a church at Elizabethtown, N. J., 1786, and a few months later became one of the pastors of the Collegiate Dutch Reformed church in New York, where he remained until 1805, when he retired on account of his health, and d. at Albany Jan. 8, 1808. He published *Discourses on Scripture History* (1791), *The Signs of the Times* (1794), a series of essays in favor of the French Revolution, and (1800) a *Funeral Eulogy of Gen. Washington*, delivered before the Society of Cincinnati, besides many sermons separately printed. Dr. Linn was celebrated for his eloquence. He had a vivid imagination, a fine command of language, and a picturesque style—qualities which made him very successful as a revivalist, but sometimes betrayed him into exaggerations for which he was severely criticised.

Linnæ'a, a genus of plants containing but a single species, *L. borealis*, the twin-flower, of the honeysuckle family, found by Linnæus in Lapland in 1732, and named by Gronovius. It is a small trailing evergreen herb, with round leaves occurring in pairs, as do also the flowers, which are bell-shaped, of a pinkish color, and very fragrant. It abounds in the more northern regions of Europe, Asia, and North America, where it occurs as far S. as Maryland.

Linnæ'us, the Latinized name of Carl von Linné, the father of modern botany, b. May 12, 1707, at Råshult, in Småland, Sweden, the son of a Lutheran vicar, who, we are told, on account of poverty, apprenticed his son to a shoemaker, but at ten years old sent him to Wexiö to school, where his fondness for natural science made him so careless of his other studies that his teachers advised the father to put him to some trade; but Rothman, the good doctor of the place, took the boy into his house and gave him books upon botany and medical science to read; sent him in 1727 to Lund, where he read books of botany under Prof. Stobæus, and whence in 1728 he went to Upsala, attracted by the fame of Rudbeck, professor of botany. But the young Linné suffered much from hunger and cold, and being without money or friends began to despair, when Olaf Celsius, professor of divinity, met him by accident, gave him congenial employment upon his *Hierobotanicon*, took him into his own house, and introduced him to Rudbeck, whose assistant he became. In 1732 he explored Lapland under the patronage of the Academy of Sciences, and gathered material for his *Flora Lapponica* (1737). In 1735 he took the degree of M. D. at Harderwyk, in the Low Countries; resided at Hartecamp 1735–38, under the patronage of George Cliffort, a banker of Amsterdam; published his *Systema Naturæ* (1735), *Fundamenta Botanica* (1736), *Bibliotheca Botanica* (1736), *Critica Botanica* (1737), *Hortus Cliffortianus* (1737), *Genera Plantarum* (1737), *Classes Plantarum* (1738); returned in 1738 to Sweden; was appointed in 1739 physician to the king and professor of botany at Stockholm; became in 1740 professor of medicine at Upsala, and was professor of botany there 1741–78, giving the university a worldwide fame and attracting thither large numbers of students from foreign lands; was ennobled in 1757, and d. at Upsala Jan. 10, 1778, after some months in which his mental powers were lost or in abeyance, the result of apoplectic strokes. Besides the works above mentioned, his principal writings are *Philosophia Botanica* (1751), *Fauna Suecica* (1746), and *Flora Suecica* (1746); works on materia medica (1747–50); and above all the *Species Plantarum*. It would be hard to over-estimate the importance of the work of Linnæus in the establishment of natural science upon its modern basis. Not only in botany, his specialty, but in all departments of zoology, he was the foremost man of his time. He introduced the binomial nomenclature of species, an apparently obvious, but a most important step. His artificial system of plant-classification, though now discarded, was simple and easily followed, and greatly promoted the study of botany in its day. It is too often forgotten that Linnæus only designed this arrangement as a key to the diagnosis of species, and that he at the same time foresaw the importance and final prevalence of the natural system, and labored on the foundations of it. His library and collections were bought, after the death of his son, in 1783, by J. E. Smith, the first president of the Linnæan Society in London, who also translated his *Lachesis Lapponica* into English (1811).

Linn Creek, cap. of Camden co., Mo. (see map of Missouri, ref. 5–G, for location of county). Pop. in 1870, 132; in 1880, not in census.

Lin'net [Fr. *linot*, from Lat. *linum*, "flax," its general food], a name given to various birds of the family Fringillidæ (finches), but proper to those of the genus *Linota*, of which *L. cannabina*, the common European linnet, is the typical species. These birds are remarkable for the changes which take place in their plumage during the breeding season. North America has several birds generally referred to this genus, though some class them in other genera.

Linneus, on R. R., cap. of Linn co., Mo. (see map of Missouri, ref. 2–F, for location of county), has flouring and planing mill. Principal occupation, farming. Pop. in 1880, 860.

Lino'leum [Lat. *linum*, "cloth," and *oleum*, "oil"] is simply a manufacturer's name for oil-cloth, applied to heavy floor-cloths, made of canvas and painted with linseed oil. (See Floor-cloth.)

Lin'seed Oil [Ang.-Sax. *lînsæd*], the oil of flaxseed, is extensively used for all kinds of painting, for making oil-cloths, oil-silks, printer's ink, etc., its manufacture being among our most important industries, and the parent of many others. The oil-mills not only consume the greater part of the seed raised in this country, but large quantities are imported, especially from the East Indies. The seed is crushed and submitted to very great pressure in hydraulic presses, by which means the oil is for the most part removed. When the seed is not heated the oil is light colored, and is called *cold-pressed* oil. When, however, the seed-paste is heated after grinding, and pressed while still hot, the oil is of a little darker color, but it is much more rapidly and thoroughly removed. The paste in this operation is heated by steam, and brought to a temperature not much higher than that of boiling water. It is placed in strong cloths or bags of equal size and holding equal quantities, which are placed in iron cases and laid up under the presses, where they are subjected to a gradually increasing pressure, equivalent at length to a weight of 300 to 800 tons. The cakes from cold-pressed oil are reground and heated with the rest. (See Oil-cake and Oil of Linseed.)

Lins'ley (James Harvey), b. at Northford, Conn., May 5, 1787; graduated at Yale College 1817, and became a Baptist clergyman, but on account of ill-health left the pulpit and devoted his leisure to the study of natural history. In vols. xliii. and xlv. of Silliman's *American Journal of Science* may be found catalogues of Mammalia and birds from his pen. D. at Stratford, Conn., Dec. 26, 1843. (See *Memoir*, by his daughter, Hartford, 1845.)

Linsley (Joel Harvey), D. D., b. at Cornwall, Vt., July 15, 1790; graduated at Middlebury College 1811; was tutor there three years; studied law, and practised at Middlebury until 1822, when he was licensed as a Congregational preacher; went to South Carolina as a missionary; was pastor of the South Congregational church at Hartford, Conn., 1824–32, and of Park street church, Boston, 1832–35, when he was elected president of Marietta College, O., which post he held ten years, raising a considerable fund for that institution; became pastor of the Second Congregational church at Greenwich, Conn., 1847, and remained there until his death, Mar. 22, 1868. Dr. Linsley was a man of genial disposition and of great mental activity and industry, of which his few published sermons and addresses afford a very inadequate specimen.

Linton (Eliza Lynn), wife of W. J. Linton, b. at Keswick, Cumberland, England, in 1822; published a novel, *Azeth, the Egyptian* (1846), *Amymone, a Romance of the Days of Pericles* (1848), and *Realities*, a romance of modern life (1851). She has since been connected with the press, especially the *Saturday Review*, in which her papers on *The Girl of the Period* attracted great attention. Among her later novels are *Lizzie Lorton of Greyrigg* (1866), *Sowing the Wind* (1866), *The True History of Joshua Davidson, Christian and Communist* (1872), and *Patricia Kemball* (1874). The two latter works have been the most popular of her writings.

Linton (William James), b. in London, England, in 1812; was apprenticed to G. W. Bonner, and in 1842 became partner with Orrin Smith: was first engaged on the *Illustrated London News*, and did the work of illustrating Jackson's *History of Wood Engraving*, published by the proprietors of that journal. His hand is seen in *The Lake Country* and in the book of *Deceased British Artists*, issued in 1860 by the London Art Union. Mr. Linton, though eminent as an engraver, is still better known as the author of a *Life of Paine, Claribel and Other Poems, The English Republic*, and papers in the *Westminster Review, Examiner, Spectator*, mainly on social topics. In youth a zealous Chartist, he was interested in the revolutionary plans of his time, was a friend of Mazzini, entered heartily into the cause of the English and European workingmen, and defended the French Commune against the accusations of its enemies. Since 1867, Mr. Linton has resided in the U. S. Author of *Wood Engraving; A Manual of Instruction* (1884). O. B. Frothingham.

Lintz, city of Austria, the capital of the province of Upper Austria, on the Danube. It is fortified by thirty-two bombproof towers, connected with each other by subterranean alleys, a method of fortification invented by Archduke Maximilian of Este, but superseded by recent improvements in artillery. It is the seat of the provincial government and of a bishop, has a theological seminary and two cathedrals, one dating from 1670, and one commenced in 1862 and dedicated to the Immaculate Conception, but not yet finished. It has some manufactures of cloth, carpets, silk, leather, gold-lace, paper, and tobacco (the factories employing, in 1881, 787 hands and producing 25,286,050 cigars and 1850 tons of smoking tobacco), and a considerable trade on the Danube. By the treaty concluded here Dec. 13, 1645, religious liberty was granted by the emperor Ferdinand to Hungary. Pop. 41,687.

Li′num [Lat., "flax"], a genus of plants of which the common Flax (which see) is the most important. It includes several flax-plants not cultivated for fibre, but sometimes grown in gardens for ornamental purposes. Among these are *L. perenne*, or perennial flax, found in the Western U. S. and growing 18 inches high, which forms tufts of slender stems with delicate blue flowers; *L. grandiflorum*, a beautiful annual found in Algiers, with abundant scarlet flowers; *L. flavum*, a greenhouse species, and *L. Berlandieri*, growing in Texas, both of which have yellow flowers.

Li′nus (2 Tim. iv. 21), tradition says, was the first bishop of Rome after St. Peter, but it is doubtful whether he succeeded the apostle, or whether St. Peter consecrated him bishop, perhaps long before his own martyrdom. The dates of his life are uncertain, some giving the year of his death as 80; others, as 78 or 67.

Linus, in Greek mythology, celebrated as a minstrel, a reputed son of Apollo and one of the Muses; said to have taught Orpheus and Hercules.

Li′odon [Gr. λεῖος, "smooth," and ὀδούς, a "tooth"], a genus of extinct marine reptiles from the Cretaceous formation. (See Mosasaurus, by Prof. O. C. Marsh.)

Li′on [Gr. λέων], (*Felis leo*), next to the tiger the largest and most powerful of the Felidæ or cat family. Two very marked varieties are known—one, tawny and full-maned, the Barbary lion, inhabiting the wilds of Africa; and a nearly maneless, yellow variety, found in Asia. Other varieties are seen in both countries, having less distinctive marks. The lioness is smaller than the male, and has no mane. She is said to go with young about five months, and to produce but one brood in the year. The young are from two to four in number. They are spotted at birth, and remain so until more than half grown. The mane and tuft of a lion are not fully developed till the animal is six or seven years old. The natural period of its life is considered to be a little over twenty years, though authors have recorded its age as in "some instances that of man." A lion of the largest size was found to measure eight feet from nose to tail, the tail being four feet more. The carnivorous propensities of this beast are well known, the general prey being the larger herbivorous quadrupeds. Some ancient authors, including Didymus of Alexandria, have laid great stress upon the uses of a certain "prickle" which is found at the end of the tail of the lion. For a time this was considered as unimportant, and its existence was even denied. Investigation has shown, however, that there is a corneous claw-like appendage about a third of an inch in length, sharp at the apex, and hollowed at the base. Its function has been thought to be connected with lashing the tail for the purpose of stimulating anger, but it is now more properly regarded as a means for dressing the hair or matted portions of the mane. Except when pressed for food, the lion is rather a lazy and indolent beast. He remains at rest during the day, and preys during the night. The testimony of the famous hunters who have written of the lion is that he is rather timid than courageous, and that he entertains great fear of man. Dr. Livingstone gives a singular account of the roar of the lion. He says, comparing it with the voice of the ostrich, "In general, the lion's voice seems to come deeper from the chest than that of the ostrich, but to this day I can distinguish between them with certainty only by knowing that the ostrich roars by day, and the lion by night." Gordon Cumming gives a graphic description of the imposing character of the nightly concerts which the lions perform when they meet one another, often in considerable numbers, at some spring where they all come in order to drink, and then stop and—so to speak—challenge one another with mighty roars of defiance.

J. B. Holder.

Lipan′ Indians, a warlike tribe of aborigines of Mexico, Texas, etc., and are quite uncivilized. Upon the reservation of the Mescalero Apaches in New Mexico 350 Lipans were reported in 1872.

Lip′ari [anciently *Meligunis*], one of the Æolian Islands, situated near the N. coast of Sicily. It was a volcano, as appears from Aristotle, but the period of its extinction is unknown. With the exception of certain very precipitous and rocky portions, this island is most fertile, and its fruits and wines are excellent.—II. A town on the above island, situated on a rocky eminence protected by a fort. It is an old town, and many interesting antiquities exist in the neighborhood. Not long since some ancient baths, mentioned by Polybius, and containing fine mosaics, were excavated, but they have been reburied by the present proprietor to escape the annoyance of visitors. The modern town, which has suffered severely from earthquakes, is not well built, but it has a handsome cathedral and some respectable public buildings. The inhabitants are skilful sailors, and carry on an active commerce with Sicily, etc. The port affords good anchorage, though a mole is required to make it secure. Pop. 12,020.

Lipetsk′, town of European Russia, in the government of Tambov, on the Voronezh. It was founded in 1700 by Peter the Great, but it derives its chief importance from the mineral springs in its vicinity, which were discovered in the present century, and now attract a large number of visitors during the summer. The bathing establishment, with its park and promenades, is very beautiful. The manufactures of woollens and cloths are not unimportant, and the trade in horses, cattle, tallow, skins, honey, and timber is very considerable. Pop. 14,213.

Lip′pa, town of Hungary, on the Maros. Pop. 6809.

Lip′pard (George), b. near Yellow Springs, Chester co., Pa., Apr. 10, 1822; author of several romances once quite popular. D. at Philadelphia in 1854.

Lip′pe, or **Lip′pe Det′mold,** a small principality of Germany, between Hanover, Brunswick, and Westphalia, and comprising an area of 438 square miles. It is hilly, but very fertile, well wooded, and watered by the river Werre, an affluent of the Weser. The southern part is covered by the Teutoburger Wald, famous as the place where Arminius destroyed the Roman legions under Varus. The inhabitants, numbering 111,135, belong to the Reformed Church, and enjoy a high reputation for their good education and intelligent industry. The principal town is Detmold.

Lip′pi (Fra Filippo), an Italian artist who flourished between 1412 and 1469. Of his personal history little is known. In 1452 he was chaplain to the nuns of S. Giovannino in Florence, and in 1457 rector of S. Quirico at Legnaja. The best of his pictures are in Florence, though all the large European galleries contain works from his hand. They are remarkable for richness of color, vitality of feeling, and excellence of drawing. D. at Spoleto, and was buried in the cathedral. O. B. Frothingham.

Lip′pincott (Sara Jane Clarke), b. at Pompey, N. Y., Sept. 28, 1823; educated at Rochester, N. Y., and removed in 1843 to New Brighton, Pa. She wrote verses at an early age, and in 1844 began to contribute to the New York *Mirror* under the *nom de plume* of "Grace Greenwood," by which she has been long favorably known to American readers. In 1853 she was married to Leander K. Lippincott of Philadelphia, and made an extended tour in England and on the Continent. Among her works are *Greenwood Leaves* (2d series, 1850), *History of my Pets* (1850), *Poems* (1851), *Haps and Mishaps of a Tour in England* (1854), *Merrie England* (1855), *Stories from Famous Ballads* (1860), *Records of Five Years* (1867), and *New Life in New Lands* (1873). She has taken a considerable part in the anti-slavery and other reform movements by means of lectures, and has been frequently engaged as correspondent of leading New York papers, in which capacity she has several times visited the Pacific States, and resided for a time in Colorado. In 1875 she undertook a second European tour as correspondent of the New York *Times*.

Lipp′stadt, town of Prussia, in the province of Westphalia, on the Lippe. Pop. 9349.

Lips′comb (Andrew A.), D. D., LL.D., b. in Georgetown, D. C., Sept. 6, 1816; his father's family went to Virginia, and in 1842 he moved to Montgomery, Ala., and attained great distinction as a minister of the Methodist Protestant Church; in 1860 was elected chancellor of the State University of Georgia, which position he held until 1874, when he resigned, to prepare for the press a more extended work, then in hand, than any of his previous publications. He has recently (Aug., 1875) accepted a professorship in the Vanderbilt University, Nashville, Tenn. A. H. Stephens.

Lip′sius (Richard Adelbert), b. at Gera (Reuss), Germany, Feb. 14, 1830; studied at Leipsic, where in 1859 he became professor of theology; in 1861 at Vienna, and in 1865 at Kiel. He has published *The Pauline Doctrine of Justification* (1853), *The First Epistle of Clement of Rome* (in Latin, 1855), *On Gnosticism* (1860), *On the Sources of the Writings of Epiphanius* (1865), *The Catalogue of Popes in Eusebius* (1868), *Chronology of the Bishops of Rome to the Middle of the Fourth Century* (1869), *Die Apokryphen Apostelgeschichten und Apostellegenden* (1883), and numerous minor articles.—His father, Karl Heinrich Adelbert (1805–61), was a professor at Leipsic, author of *Grammatical Studies on Biblical Greek*.—His brother, Justus Hermann, b. at Leipsic May 9, 1834, became in 1866 rector of a gymnasium in that city, and has published critical remarks on *Sophocles* (1860 and 1867) and *Lysias* (1864).

Liqueur′ [Fr., "liquor"], a name given to various highly-flavored alcoholic or strong vinous liquids. There are many kinds, most of which are drunk in small quantities after dinner. The best known kinds are *curaçoa*, strongly flavored with orange-peel and various spices; *absinthe*, from wormwood and anise; *anisette*, from aromatic seeds; *kirschwasser* and *maraschino*, from cherries; *cassis*, from black currants; *kümmel*, from caraway, etc.; *noyau*, etc., from bitter almonds.

Liq′uid [Lat. *liquere*, to "melt"], a consonant formed by a closure of the vocal organs greater than the closer vowels require, but less than that of the remaining (mute) consonants. The liquids are *w*, *l*, *r*, *y*. They are subject to whispered aspiration, as *w* in *when* or *wh-w-en*, *y* in *hew* or *yh-y-oo*, and *ll*, *rh* in Welsh. The consonants *m*, *n*, *ng* are not liquids, but nasal mutes. S. S. Haldeman.

Liquidamber. See Gum Tree.

Liq′uids, Chemical and Physical Nature and Properties of ["liquids," from Lat. *liquere*, to "melt"].

1. *Change from the Liquid to the Solid State, and the Converse.*—The *liquid* state is one of the three states in which it is generally believed that all matter is capable of existing, and is intermediate between the solid and the gaseous states. Considered as that state of matter which forms a large part of living animals, as well as the bulk of mobile and changing nature, the importance to man of its study needs no explanation. In solids the molecules are maintained in certain relative positions with reference to one another, and generally in reference to certain lines called axes, which stand, in the same substance, in certain fixed angular positions and bear certain fixed relations of length to one another. Hence *crystalline* constitution. Liquids are formed from these solids by exposure to a higher temperature, by melting or fusion by heat, also by *solution* in some existing liquid; sometimes, also, by contact with some other solid, with which a new liquid chemical compound ensues. In all cases of change from the solid to the liquid or from the liquid to the solid condition, change of temperature occurs, sometimes to lower and sometimes to higher temperatures; but so far no case is known with certainty in which simple heating has changed a liquid into a solid, or simple cooling a solid into a liquid. It is often, indeed, generally held that, as the general effect of heat on all bodies is *expansion*, so expansion should generally follow the effect of heat in converting a solid to a liquid, and, *vice versâ*, that *contraction* should accompany the solidification of a liquid by cold. This principle holds probably for *most*, though not for all, of the *metals* when undergoing fusion, but its adoption as a universal principle would unquestionably mislead, and the student desirous of acquiring insight into the real system of nature should carefully avoid adopting it as such. That substance which performs the most important functions in nature of all, certainly of all in animated nature, *water*, departs so widely from the principle of continuous expansion by heat that when solid water, or ice, melts into liquid, 1000 volumes or measures contract or condense into 918, or about 8 per cent. less in bulk. This is the more remarkable when we consider that in the melting an amount of heat-force becomes "latent," or inactive upon the thermometer, which would raise the temperature of the water, *after melting*, through 44° F., and would expand the 918 volumes to 945. This heat-force continues acting to keep up the liquidity of the water—to keep it condensed, in fact; and when we deprive the water of just this amount of heat again, it *expands* back again into ice, through the action, as we may admit, of the crystallizing forces, whatever these may be. Among other cases in which liquefaction takes place with contraction of volume are many cases of solutions of solid bodies. In liquids the forces still exist that produce crystallization in solids, but they are modified in their mode of action into *radial* forces, acting equally in all directions from the centre of the mass of the liquid; so that a small body or *drop* of a liquid assumes a spherical form when free to do so; as in a drop of rain, for example. When resting on a surface or contained in a vessel, the weight of the liquid presses it out of the spherical form, but a curvature of the surface always shows that they still act, their resultant being what is known as the "contractile force" of liquids. The perfect spherical form of a bubble is due to this radial or contractile force. (See further under head of Solution.)

2. *Change from the Liquid to the Gaseous State.*—Every liquid body is believed to be capable, at a sufficiently high temperature, of passing into the third state of matter, the gaseous or vaporous condition. The difference between substances, however, in this respect is so great that while we have bodies whose boiling-points are so low that no degree of cold ever produced could condense them into liquids, like the gases that chiefly make up the atmosphere, there are other bodies, like some of the metals, which, while convertible into liquids readily by heat, boil, or become vapors only with difficulty at the most violent heats that are producible in the laboratory. In all operations of ebullition or vaporization, as in those of fusion, certain amounts of heat-energy or motion, variable with the substance, become "latent," or are needed to keep the body in the vapor form, thus expending their force in this way, so that the change of state is itself the only, though sufficient, evidence of the existence of the force or motion thus engaged. This is called "latent" *heat of gasifaction* or *vaporization*, the word "latent" being an objectionable one, because such heat-energy is sufficiently manifested by the *work* it does in keeping the liquid in a gaseous form. *Heat of gasifaction* simply is a sufficiently comprehensive term. Thus, water, the typical liquid, kept at 180° F.—that is, so disposed as to prevent all loss through radiation, or enveloped in a medium also at 212° F.—is in a *condition of energy*, as compared with ice, represented by the sum of the 212° and the 144° of *heat of fusion* indicated above; that is, of 324°. If it be now exposed to a still higher temperature, gaseous water or steam will be evolved, and this steam will require, as *heat of gasification* (though its own temperature will be not one degree higher than 212°, that of the water from which it is formed), enough heat to raise its own weight of cooler water through 998° F. (or so nearly 1000 that it is usually so stated in round numbers). This same amount of heat-energy, thus required to do the work of making the steam and keeping it in the form of steam, would even heat this same steam, if already previously formed, through 2010.5°, by reason of the far lower *specific heat* of steam.

The heats of gasification of other liquids, so far as yet known, are never so high as in the case of water. The figures for a few of the commoner liquids, taken at random as examples, are here given, water being, as above, 966° F.:

Latent Heats of Vaporization of Liquids at their Boiling-Points: Fahr. Degrees.

Alcohol	376°	Tetrachloride of tin	5.5°
Ether	164°	Terchloride of phosphorus	92.5°
Oil of turpentine	124°	Wood spirit	475°
Acetic acid	184°	Fusel oil	218.5°
Bisulphide of carbon	156°	Acetic ether	190°
Bromine	182°	Butyric acid	206.5°

(See further on vaporization and ebullition under the head of Steam.)

3. *Change from the Gaseous to the Liquid State.*—This kind of change plays very important parts in the operations of both nature and art. In nature all the liquid circulation of the earth, without which no life could be maintained, is kept up by the continual condensation to the liquid form of gaseous water from the atmosphere that has been previously vaporized by the solar heat. (See articles CLIMATE and WINDS, by PROF. ARNOLD GUYOT.) In art the operations of distillation and condensation furnish important illustrations, among which the recent stupendous expansion of the refining of mineral oils constitutes the most remarkable example. (See PETROLEUM, by PROF. CHANDLER.) The distillation of *alcohol* and of *spirits* generally, of *quicksilver*, of *coal-tar* products, of *acetic* and *nitric acids, ether, chloroform, bisulphide of carbon,* and many other chemical arts, may be cited as further examples of recovery of liquids from vaporous forms. (See article DISTILLATION.) Of the greatest interest to science is the obtaining of liquids from gaseous substances which are not condensable by refrigeration alone, a result which is accomplished by the application of enormous pressures. Sometimes this pressure is applied to the gas directly by means of powerful pumps, but in more frequent cases in the laboratory such liquid-condensed gases are procured by causing them to be evolved from solid compounds in one part of a closed apparatus of great strength, in another part of which they are condensed by their own force of elastic compression into liquid forms. Among the gases which have been thus condensed are *chlorine, cyanogen, ammonia, carbonic* and *muriatic acids, laughing gas,* and *olefiant gas.* Some gases, such as *air, carbonic oxide, marsh-gas, nitric oxide,* and *hydrogen,* refuse to liquefy at any pressure yet obtained. Some of these may nevertheless exist in liquid form at the enormous pressures that must prevail naturally in the interior parts of some rocks—*marsh-gas*, for example—possibly between the laminæ of some coal-beds, which evolve enormous volumes of it in the form of the terrible "fire-damp."

Another important mode of producing liquids from gases is by causing water or other liquids to take them up into solution. Water dissolves nearly if not quite all gaseous bodies, even those not liquefiable by cold and pressure, though these latter in very small proportion at ordinary pressures. The oxygen of the atmosphere, for example, is taken up by water in what appears but a small quantity, according to Bunsen but 3 per cent. of its volume at the normal temperature of 60° F.; yet this small proportion is of immense importance in nature. It is through this oxygen that the respiratory organs of fishes are supported. Without this oxygen also from the atmosphere, all standing fresh waters, and even many moving rivers, would quickly putrefy and poison the earth and air. This 3 per cent. of oxygen is the universal scavenger, by virtue of which alone the otherwise death-diffusing process of putrefaction is converted into one of *eremacausis*, and water thus enabled to become a purifying and life-sustaining agent. *Icy* water absorbs 4 per cent. of oxygen from the air. The manufacture of artificial mineral and aërated waters, so extensively practised at this day, is an instance of a practical application of the conversion of gases into liquid forms by combined solution and pressure.

4. *Relations of Liquids to Gravitation.*—Under this head comes the consideration of *densities* of liquids. These vary greatly, the heaviest known liquid—at normal temperature—being *quicksilver*, 13.5 times as heavy as water; and probably the lightest, the *hydruret of butyl*, C_4H_{10}, of Pelouze and Cahours, obtained from petroleum, which is only just six-tenths as heavy as water at the freezing-point of the latter. All the figures ever determined for the densities or specific gravities of all chemical compounds will be found in the invaluable publication of the Smithsonian Institution, called the *Constants of Nature*, compiled by Prof. F. W. Clarke of Cincinnati, who in this work has rendered a supreme service to science. The densities of liquids, which are inversely as their volumes, vary of course with their temperatures, and the amount of this variation of volume for each thermometric degree is called the *coefficient of dilatation.* This varies usually somewhat with the temperature, and must therefore, when required accurately, be computed from an algebraic expression, or formula of interpolation, as it is called. These formulæ are all calculated for the centigrade scale. As an example may be given the formula for the calculation of the density of water between the freezing-point and 25° C. Calling the temperature t°, the volume is equal to

$$1 - .000061045t^\circ + .0000077183t^{\circ 2} - .00000003734t^{\circ 3}.$$

Between 4.08° C. and the freezing-point this formula will give, instead of a continuous contraction by cooling, as above 4.08°, a negative contraction, or *positive expansion,* a peculiarity of water among liquids. On reaching 0° this expansion by cold may undergo, if the water freezes, a sudden and immense increase, as has been already explained. It is through this property of water, of expanding just before freezing, and thus *floating to the top* as a surface layer, that only the surface of water solidifies, and not its whole mass. Were it not for this, but a narrow tropical zone of the earth would be habitable, and indeed it is probable that almost all the water of the globe would in that case have accumulated at the poles as two enormous ice-caps. The temperature 4.08° C. = 39.33° F., at which the coefficient of dilatation of water by heat changes its sign from negative to positive, and which is the temperature of shallow waters under ice in winter, is generally deemed the most important fixed or *standard* point of temperature in nature, from which everything should be calculated. *Densities* are therefore referred to the density of water at this *point of maximum density.* The writer believes this an error, and that conclusive reasons exist why zero Centigrade, or 32° F., the melting-point of ice, is the real standard and initial temperature of chemical action and change in nature.

5. *Relations to Heat.*—(For *specific heats* of liquids see article upon HEAT.) *Expansion of Liquids.*—In addition to what has already been said under densities bearing upon this, it should also be remarked that *thermometers* are based upon the expansion of liquids by heat. (See articles THERMOMETRY and PYROMETRY.)

6. *Diffusion and Transpiration of Liquids.*—(For diffusion, see articles DIALYSIS and ENDOSMOSE, by PROF. CHANDLER.) *Transpiration.*—This term refers to the rates at which liquids pass through minute orifices or capillary tubes under pressure. The following principles were arrived at by Poiseuille with the same liquid: 1. The flow is directly proportional to the pressure; 2. In equal times, with tubes of equal diameters, it is inversely as the length; 3. With equal lengths it is as the fourth powers of the diameters. Heat increases the flow greatly. At 113° F. the flow of water is 2.5 times as rapid as at 41°. Alkalies all retard the flow. Other chemical subtances dissolved have important influences. The application of these investigations in physiology and to the flow of the blood through the veins is very important. It is believed also to have an important bearing in the study of molecular structure.

HENRY WURTZ.

Liq'uorice, or **Licorice** [a corruption of the Gr. *γλυκύῤῥιζα*, "sweet root"], the dried extract of the roots of *Glycyrrhiza glabra* and *echinata*, leguminous herbs of Southern Europe, Africa, and Asia, largely cultivated in Central Europe. The extract is a hard, black mass, containing a large percentage of an uncrystallizable sugar called glycyrrhizine. It is prepared very extensively in Spain, Italy, and Russia, and to some extent in France, England, Germany, and the U. S. It is a valuable demulcent and expectorant medicine, and is extensively employed in flavoring chewing tobacco, as well as in pharmacy as an excipient in pill-masses. The hard, woody root is also used in medicine and in porter and stout breweries. *Glycyrrhiza lepidota* of the Western States has the flavor of true liquorice, as have *Galium circæzans, G. lanceolatum,* etc., rubiaceous herbs of the U. S., which are used in domestic medicine and called "wild liquorice."

Li'ria, town of Spain, in the province of Valencia, in a rich and beautiful plain, which produces large quantities of wine, fruit, grain, and vegetables. Pop. 9443.

Lisaine', a small river of France, rises at the southern termination of the Vosges, flows W. of the fortress of Belfort, and enters the Savoureuse, an affluent of the Doubs, at Montbéliard. It became famous by the battle which in 1871 raged here for three days, between the Germans and the French. The German general Von Werder retreated before the French army under Bourbaki (which pushed on towards Belfort), and occupied a position to the W. of this fortress, along the Lisaine, in order to prevent the French from attacking the German troops besieging Belfort or from making an invasion into Southern Germany. Von Werder had with him about 43,000 men, 48 battalions, 30 squadrons, and 126 pieces, besides 37 heavy guns which he had taken from the siege artillery before Belfort; and with this force he held a distance of about ten miles along the left bank of the Lisaine, which commands the right bank. The villages of Héricourt, Bussurel, Montbéliard, Frahier, and others were barricaded. On Jan. 15, 1871, Bourbaki attacked the German position with 120,000 men, endeavoring to break through its centre at Bussurel. He succeeded in taking this place, and penetrated to Montbéliard, but further the French did not come, and the German line remained unbroken. A furious artillery contest took place at Héricourt and Luze. On Jan. 16, Bourbaki tried to surround the right German wing, which was rather weak, and he actually threw it back, taking the villages of Frahier and Chenebier. But the Germans took positions farther back, and could not be surrounded. It grew dark, and Bourbaki had not reached his aim. He then attempted a night attack on the centre, but without success. On the morning of Jan. 17 the Germans attacked at Frahier and Chenebier, and the fight lasted the whole day without decision. On all the other points the French renewed the fight, but with no better result than on the previous days. Thus, Bourbaki began to retreat on the 18th, and Von Werder undertook to pursue him. The Germans had 81 officers and 1847 men wounded and dead; the French about 6000. AUGUST NIEMANN.

Lis'bon [Port. *Lisboa;* anc. *Olisipo*], capital of Portugal and residence of its king, one of the most important commercial centres and one of the most beautiful harbors on earth, with a population of 246,343 (according to the census of 1881, and including the suburbs of Belem and Olivaes), lies amphitheatrically on the northern shore of a bay, Rada de Lisboa, 4 miles broad, formed by the Tagus at its influx into the Atlantic Ocean. Built on the declivities of seven hills, with numerous white cupolas and magnificent monumental buildings towering above the mass of 43,000 houses, interspersed with lovely terraces, Lisbon offers, when approached from the sea, an aspect at once charming and imposing. The bay forms a harbor large enough to accommodate at the same time all the fleets of Europe, and so deep that the largest ships can anchor up immediately at its docks. The entrance to this harbor is defended by several forts, of which one, consisting of an interesting old Moorish tower called Torre de Belem, is situated on a sandbank in the bay. The city is 10 miles in circuit, and is divided into four quarters—Alhama, Rocio, Bairro Alto, and Alcantara—besides several extensive suburbs. The old city, especially the quarter of Alhama, has irregular, narrow, and dark streets. The newer parts, built since the great earthquake (Nov. 1, 1755), which did not reach Alhama, are more regular and beautiful, and contain many palace-like buildings. The finest part is the quarter of Rocio, extending along the river and containing many splendid buildings and open places. Among the squares, Praça do Commercio is the most remarkable, situated on the Tagus, containing in the centre the equestrian statue of Joseph I., and surrounded with magnificent buildings, the exchange, the royal library, the custom-house; also the market-place is noteworthy, and the immense place of Dom Pedro in the northern part of the quarter of Rocio, bordered on one side by the monastery of S. Domenico and the buildings formerly belonging to the Inquisition. Still farther to the N. stretches the public promenade. The most beautiful streets are Rua Augusta, which is the business-centre and contains many fine jewelry shops, Rua do Oura, and Rua da Prata. The city has 64 churches and about 200 chapels; the former monasteries, mostly magnificent buildings, situated at the most elevated points, are now used for public purposes. The monastery of Belem is perhaps the most remarkable building of the city. It was founded in 1499 by King Emanuel the Great, on the spot where Vasco da Gama had embarked two years before, and its style is a mixture of Moorish, Byzantine, Norman, and Gothic elements. The material is white limestone, which has now become yellowish like old ivory. Its decoration is exceedingly rich in sculpture; especially splendid are the carvings in Pallisander-wood, a kind of ornamentation which is of frequent occurrence in Portugal. The least beautiful part of the building is the church, whose nave is in the Italian style. The whole building is now used as a hospital for foundlings and orphans. The monastery of the Heart of Jesus is also an interesting structure, founded in 1770 and provided with a splendid cupola of white marble, an imitation of the church of St. Peter in Rome; furthermore, the church of the Patriarchs, with its gigantic cupola, situated to the N. E. of Monte do Castello; the marble church of S. Roque; the basilica of S. Maria; the church of Carmo, in Gothic style; and the church of S. Vincent de Flora, the largest of the city, and the burial-place of the dynasty of Braganza. The most remarkable palaces are the royal palace of Ajuda, the palace of Nossa Senhora das Necessidades, and the palace of Bemposta. Other noteworthy buildings are the theatre of S. Carlos; the national theatre, which was formerly the palace of the Inquisition; the arsenal, the custom-house, the corn-market, and the polytechnic school. The scientific institutions are very numerous; there are schools of every kind, an academy of science, a geographical academy, a museum of natural history, etc. The city receives its water through the Alcantara aqueduct, a truly magnificent work, constructed by Emanuel de Maya. The main stream comes from the village of Canassas, 2½ miles from Lisbon, and traverses the valley of Alcantara on thirty-five arches, of which the largest has a height of 230 feet and a diameter of 107 feet. The promenade on the top of the aqueduct offers a most beautiful view. The Gallegos (Spaniards from Galicia), who carry the water from the various fountains throughout the city, form a corporation of their own and number about 30,000. A great nuisance are the unowned dogs, which swarm through the streets to the number, it is said, of 20,000. The hilly surroundings and the mountain-region of Cintra are full of charming valleys, interesting peaks, and beautiful locations for churches, monasteries, and mansions. The industry of the city is not considerable. Gold and silver ware is manufactured; spinning and weaving establishments, iron-foundries, and manufactures of chemicals, paper, soap, and steel are in operation. But the commerce is very considerable. To all sides—E. through the Straits of Gibraltar into the Mediterranean; N. along the whole coast of Europe; S. along the western coast of Africa; and W. to the countries of America—the sea opens up to Lisbon its splendid roads of commerce. Lisbon is the largest port in the kingdom, and its custom-house is a substantial and very spacious building, in which merchants are allowed to deposit their goods free of duty for one year, or for two years in the case of Brazilian produce. The duties annually collected at the port exceed £1,150,000, tobacco alone yielding £400,000. About 1400 foreign and 1100 Portuguese vessels (including coasters) annually visit the port. The average value of the annual imports amounts to about £5,600,000, and that of the exports to £4,500,000. The most active commerce is carried on with Brazil and Great Britain, tropical products being imported from the former and manufactured goods from the latter, while wine and oil are exported to both. Lisbon had existed as a Roman *municipium* under the name of *Felicitas Julia;* later on it was taken by the Alanes and by the Moors. When Alfonso, at the head of the crusaders, conquered and Christianized the city, it was called Lisboa. In 1580 the duke of Alva occupied it for Philip II. of Spain, and the Invincible Armada sailed from its port in 1588, but in 1640 the Spaniards were expelled and the dynasty of Braganza ascended the throne of Portugal. Nov. 1, 1755, an earthquake destroyed the greater part of the city and killed 30,000 persons almost in an instant. To complete the misery, a fire broke out among the ruins, and gangs of robbers infested the place like so many swarms of vultures. But, while all Europe was stupefied with terror and lost itself in characteristic speculations of what such a calamity could mean, the government and the inhabitants soon recovered, and in an incredibly short time the place rose from its ashes. In 1807, during the wars of Napoleon, the French held the city for a short time, but since those days a long period of peace has greatly promoted its prosperity. AUGUST NIEMANN.

Lisbon, on R. R. and Sheyenne River, cap. of Ransom co., Dak. (see map of Dakota, ref. 4–F, for location of county). Pop. in 1885, 1231.

Lis'burn, town of Ireland, in the county of Antrim, on the Lagan, is celebrated for its manufactures of damasks and fine linen stuffs, which branch of industry was established by a settlement of French Huguenots after the Revocation of the Edict of Nantes. The parish church, which has a beautiful octagonal tower, was by Charles II. constituted the cathedral church of the united dioceses of Down, Conor, and Dromore, and contains a monument to Jeremy Taylor, who was bishop of the see. Pop. in 1881, 10,384.

Lisieux' [anc. *Noviomagus* or *Lexovium*], town of France, in the department of Calvados, on the Touques at the very point where it is joined by the Orbiquet, with large linen and woollen manufactures and a brisk trade in corn, hemp, and cider. Though its position at the junction of two rivers makes it subject to disastrous inundations, it is one of the most prosperous cities of Normandy, forming the centre of a very considerable industrial activity, the arrondissement having nearly 300 factories, employing about 10,000 hands in the manufacture of cloth and cretonnes, besides woollen-mills, spinning-mills, bleaching-fields, dye-works, etc. Pop. 16,039. The cathedral of Lisieux is one of the most interesting specimens of the transition from the Roman to the Ogival style. It was founded in 1045, finished in 1233, and recently restored. It is 360 feet long, 90 feet broad, 65 feet high, and its southern tower rises 230 feet. It is dedicated to St. Peter. The church of St. Jacques, dating from the fifteenth century, is also an interesting building.

Lisle, on R. R., Broome co., N. Y. (see map of New York, ref. 6–G, for location of county), 23 miles N. of Binghampton, has a foundry and a gun-factory. Pop. in 1880, 429.

L'Islet, post-v. of L'Islet co., Quebec, Canada, on the S. shore of the St. Lawrence, and on the Grand Trunk Railway, 62 miles below Quebec, has an academy, a large lumber trade, and an extensive shipyard. Pop. in 1881, 2974.

Lis pen′dens. By this expression is meant in general a rule prevailing in courts of equity that all persons are supposed to be acquainted with the fact that an action is pending, and to hold any rights acquired during its pendency in the subject which the action affects in subordination to its results. The legal maxim in its Latin form is thus more fully stated: *Pendente lite, nihil innovetur* ("While an action is pending there must be no change in the existing state of things"). By a legal fiction every one who acquires the property affected by the suit while it is pending is supposed to have a "constructive" or theoretical notice of the litigation, which he cannot gainsay or deny.

The true scope of this rule has been frequently misunderstood. It has been supposed by some that it was based mainly on the idea just referred to, that every one must be understood to have knowledge of all that is transpiring in a court of justice, and accordingly to be affected by the refined ideas prevailing in courts of equity concerning constructive notice. (See NOTICE.) This, however, is not the real ground of the rule. The true view of it is not merely that it is notice, but that it is necessary to the correct administration of justice that a decision of the cause should be binding not only on the litigating parties, but also on those who derive title from them during the course of the action, whether with notice of the suit or not. The object of such a rule is to bring litigation to an end, to prevent new suits, and to lead the existing controversy to a close. It will be thus seen that a principle of public policy enters largely into the case. The theory of the rule is well expounded in the case of *Bellamy* v. *Sabine*, 1 De Gex and Jones's Reports (English), 566.

As would be expected from the form of the maxim, it only has application while the action is pending. After the decree has been obtained, the ends of public policy have been subserved. As long ago as the time of Lord Chancellor Hardwicke it was said, "There is no such rule in this court [equity] that a [final] decree made here shall be an implied notice to a purchaser after a cause is ended; but it is the pendency of the suit that creates the notice, for as it is a transaction in a sovereign court of justice, it is supposed all people are attentive to what passes there, and it is to prevent a greater mischief that would arise by people's purchasing a right under litigation and then in contest."

This doctrine is peculiarly applicable to litigations concerning real estate. It does not appear to have been resorted to in England to affect the title to personal property. There are some cases in the courts of this country which have extended it to that class of interests; if it is to be applied to these, it would seem clear that commercial paper and corporate stocks should be exempted from its operation. Such appears to have been the view of Chancellor Kent, for while in his judicial character he applied the rules of *lis pendens* to a contested title to a mortgage, which is not the subject of ordinary commerce, he remarked that he was not prepared to extend it to commercial paper not due. It is plain that there could be no safety in commercial dealings if it were necessary, in the rapidity with which such transactions are ordinarily and almost necessarily conducted, to inquire whether an action concerning title to the property dealt in were pending in some court of equity. The rule is a hard and harsh one in some of its aspects. It is undoubtedly beneficial in its relation to real estate, but no element of public policy can be found as a reason for extending it to commercial transactions. On these general grounds it has, in reference to stocks and notes, been rejected in the appellate courts of New York and of some other States. It should be added that a purchaser is not bound by the rule to take notice of an equitable action or suit pending in the courts of another State or country.

To alleviate the harshness of the "constructive notice" fastened upon a purchaser by force of this rule, it is common to regulate it by statute as far as real estate is concerned. The substance of the legislation is, that written notice of the pendency of the action is to be filed in a designated office, giving sufficient information of the names of the litigants, the property affected, and the object of the litigation. Constructive notice is given from the time of the filing. (Consult for further information the statutes of the respective States, and the treatises of Story, Adams, and Willard on *Equity Jurisprudence.*)

T. W. DWIGHT.

Lis′sa, an island in the Adriatic, in lat. 43° 10′ 11″ N., lon. 33° 51′ E., between Italy and Dalmatia, and belonging to the latter. The fortifications of its two harbors—especially of that upon the E. side, near the small town of Lissa—are so strong that they almost rival those of Malta. This island was an important naval station under the Romans, a stronghold of corsairs during the Middle Ages, an emporium of contraband English merchandise during the wars of Napoleon, and has recently attracted attention from the defeat sustained here by the Italian squadron in the war of 1866. Pop. about 4000.

Lissa, town of Prussia, in the province of Posen, has large liqueur, wax, and tobacco factories, a celebrated bell-foundry, and extensive manufactures of woollen and linen stuffs. In the sixteenth century it was the chief seat of the Bohemian Brethren. Pop. 11,758.

List (FRIEDRICH), b. Aug. 6, 1789, at Reutlingen, in Würtemberg; was appointed professor in political economy at the University of Tübingen in 1817, but gave up this position in 1819, in order to work in a more direct and practical way for the development of German industry and commerce. Having been elected a member of the diet of Würtemberg, he exposed in a petition to the government the vices of the administration, and was condemned in 1822 to ten months' imprisonment. He fled, and lived for some time in Switzerland and Alsace, but returned home in 1824, and was put in Asperg. As he declared that he wished to emigrate to America, he was pardoned after a short time, and he now settled in Pennsylvania, where he soon attracted the attention of the most prominent men by his work, *Outlines of a New System of Political Economy* (1827), in which he attacked the ideas of Adam Smith, and advocated an economical development on an exclusively national basis. Having discovered a rich deposit of anthracite on his grounds, he founded the two towns of Tamaqua and Port Clinton, and returned in 1833 to Europe in possession of an independent fortune; settled first in Hamburg, then in Leipsic, and at last in Augsburg, and began to agitate for the formation of a system of railway lines as the only suitable means of transportation. His writings, *Ueber das sächsische Eisenbahnsystem* (1833), *Ueber ein deutsches national Transportsystem* (1838), besides a large number of minor articles in the papers, were by no means without influence, but his ideas were too new and too far advanced to be fully appreciated; and as his negotiations in England for the establishment of a comprehensive commercial alliance between that country and Germany failed, he was seized with melancholy, and shot himself at Kupstein, in Tyrol, Nov. 30, 1846. (*Gesammelten Scriften*, 3 vols., 1850–51.)

Lis′ton (JOHN), b. in London, England, 1776; was educated in Dr. Barrow's school, and became second master of St. Martin's school, whence he was expelled for taking part in stage-plays with the pupils. He then went upon the stage, and became one of the best comic actors in England during the first third of the present century. His fame is celebrated by Lamb, Hood, and all the wits of the period. His reign at the Haymarket began in 1805, at Drury Lane in 1823, and at the Olympic in 1831. He left the stage in 1837, and d. Mar. 22, 1846.—His wife (MISS TYRER), though of almost dwarfish stature, was a favorite actress as well as singer.

Liston (ROBERT), F. R. S., b. at Ecclesmachan, Scotland, 1794; studied medicine in Edinburgh and London; practised at Edinburgh 1818–35; was lecturer on anatomy and surgery and surgeon to the infirmary: became professor of clinical surgery at University College, London, 1835; surgeon to the North London Hospital in 1843; examiner to the College of Surgeons 1846. D. Dec. 7, 1847. Dr. Liston was one of the ablest and most successful of operative and clinical surgeons, and wrote several able professional treatises.

Listow′ell, a v. of Perth co., Ont., Canada, on the Maitland River, is a very important trading centre, and ships large quantities of grain. It has 1 weekly and 1 monthly publication. Pop. of sub-district, in 1881, 2688.

Liszt (FRANZ), b. at Raiding, in Hungary, Oct. 22, 1811. His father, an accountant or steward of Prince Esterhazy, but of musical taste sufficient to appreciate the astonishing talent of his son, put him to the piano at six years of age. At nine he gave a concert, and so much interested certain noblemen that he was sent for instruction to Vienna. There he studied for eighteen months with Czemy and Salieri, making such progress that he gave a public concert in Vienna; emboldened by brilliant success, his father in 1823 took him to Paris; refused admission to the Conservatoire as a foreigner, he gave concerts and played before the duke of Orleans till the musical world was wild with enthusiasm. Flattery might have spoiled him had not his father held him severely to his work, compelling him, it is said, to execute daily twelve fugues of Bach, transposing them in different keys. In 1824–25 the boy achieved triumphs in the provinces and in England. At this time (1825) he composed an opera, *Le Château des Amours*, which has disappeared. Again in Paris, he took lessons in composition of Reicha. In 1827 his father died, and Franz fell into a morbid state, gave himself up to romantic fancies and religious enthusiasms, became a St. Simonian, and in 1830 composed a *Symphonie revolutionnaire*, which was never published. This condition lasted two or three years. The playing of Paganini revived his passion for art, and made him resolve to be the Paganini of the pianoforte. His labors were renewed, and his triumphs also. He astonished Europe with his mastery of the instrument and the ease with which he executed the most difficult works of Bach, Handel, Beethoven, and Weber. His gift at improvisation was as wonderful as his power of execution. As a pianist he is reputed the greatest. In 1848 he was made Kapellmeister at Weimar. Honors came thick upon him. The cities of Odenburg and Pesth presented him with the rights of citizenship; the Hungarian nobles gave him a sword of honor; the king of Prussia made him a member of the order of Merit; the faculty at Königsberg created him doctor of music; the grand duke of Saxe-Weimar appointed him chamberlain; in 1845 he was decorated with the Legion of Honor, and in 1861 was raised to the rank of commander. On Apr. 25, 1865, Liszt received the clerical tonsure in the chapel of the Vatican, and is now an *abbé*. His devotion to the Church is entire; in 1869 it was reported that he had presented to the pope 20,000 francs, the proceeds of a concert at Ratisbon. His art is now consecrated to religion. Grand masses of his composition, of the modern rather than of the ancient style, have been performed in the churches of France, Germany, and Hungary. Liszt was an admirer, patron, and friend of Richard Wagner, to whom he gave one of his two daughters in marriage; the other, wife of Émile Ollivier, is dead. The works of the artist consist of *Fantasias*, *Poemes Symphoniques* (12 in number), *Faust*, and the *Divina Commedia*, grand symphonies, two oratorios, *Die Heilige Elizabeth* and *Christus*, and *variations* innumerable. He is a writer as well as a musician, and in the department of literature as well as of art. In the *Gazette Musicale* he carried on a controversy with Thalberg; in 1852–54 published a life of Chopin (translated into English by Walter Cook, 1877), and essays on the *Tannhäuser* and *Lohengrin* of Wagner; in 1859 a dissertation on *Bohemians and their Music in Hungary*. Though a facile composer, Lizst has preferred playing other music than his own at concerts. He is a man of ardent impulses and lavish generosity. His instrumental music has more tumult than grace, more force and noise than delicacy, and often only the mastery of instrumentation saves it from the reproach of being grotesque and fantastical. His vocal compositions have little reputation. For several years Liszt resided in Rome, but since 1871 his home has been at Pesth, in his native land, where he enjoys a pension of £600 a year and a noble position.

O. B. Frothingham.

Lit'any [Gr. λιτανεία, "supplication"] was originally used in a general sense denoting any sort of prayer, whether public or private, whether penitential, intercessory, supplicatory, or deprecatory. It thus occurs in the writings of Eusebius and Chrysostom and in the laws of Arcadius. Some trace, however, of a more technical meaning is found in the epistle of Basil to the church of Neo-Cæsarea, where it seems to denote a religious proceeding somewhat similar to the so-called *rogationes*, which, according to Sidonius Apollinaris, came into use in Gaul in the beginning of the fifth century, and consisted in processions of the community, fasting and in sackcloth, for the purpose of procuring fine weather or rain, etc. Gradually both the form and the purpose of those *rogationes*, or litanies, were regulated by law. One of the *novels* of Justinian forbids litanies to be celebrated without the presence of the bishop and the clergy, and orders that the crosses which were carried about in procession should be borne only by priests and deposited nowhere but in the church. The synod of Orléans (511) prescribes for all Gaul that the litanies before Ascension shall be celebrated for three days, and that during those days all menials shall be exempt from work, so as to be able to attend divine service. A synod of Paris (573) ordered litanies to be held for three days at the beginning of Lent, and, in 590, Gregory I., on account of the pestilence which had followed a great inundation, ordered that a *litania septiformis*, or sevenfold procession, should be performed by clergy, laity, monks, virgins, matrons, widows, poor, and children. In 747 the synod of Clovestoe prescribed that litanies or rogations should be celebrated by all the clergy and people on April 25 and on the three days before Ascension, whence those days are still known in the English Church as "rogation days." Thus in course of time "litany" became, in the liturgical services of the Christian churches, a name applied to various supplicatory acts addressed to God or to the saints, or both, but applied especially to solemn prayers in which the people take responsive parts. The principal litany of the Roman Catholic Church is the Litany of the Saints; the Anglican churches have a service called the Litany and Suffrages; the Lutherans and some other Protestants have litanies. On some occasions the Greek and Roman Catholics and some Anglican parishes intone the Litany during a procession of the people.

Litchfield, on R. R., cap. of Litchfield co., Conn. (see map of Connecticut, ref. 4–C, for location of county), on the Naugatuck R. R., 30 miles W. of Hartford, between the Naugatuck and Shepaug rivers, is situated on high ground near a beautiful lake, the outlet of which affords excellent water-power. The town contains five post-villages—Bantam Falls, East Litchfield, Litchfield, Milton, and Northfield. The central village is the northern terminus of the Shepaug R. R., has several schools, a private lunatic asylum, paper-mill, oil-mill, satinet-factory, and furnaces for smelting and refining nickel ores, which are found in the vicinity. The surrounding scenery is eminently picturesque, and the village is shaded with ancient elms. It was from 1784 to 1838 the seat of the most celebrated law-school in America, founded by Judge Tapping Reeve, and conducted after his death (1823) by his associate, Judge James Gould, by whose name it was generally known during its later existence. It was also the seat of the first ladies' seminary in America. Litchfield has two parks, one of which contains a fine soldiers' monument. Pop. of tp. in 1870, 3113; in 1880, 3410, including 452 in borough.

Litchfield, city and R. R. centre, Montgomery co., Ill. (see map of Illinois, ref. 8–D, for location of county), 47 miles N. E. of St. Louis, Mo., and 42 miles due S. of Springfield, on the western edge of the Shoal Creek basin, has flouring-mills, grain-elevators, a foundry and a machine-shop, extensive car manufactory and repair-shop, a coal-mine, an Ursuline convent, flourishing public schools, and a Holly system of waterworks. It derives its prosperity from its manufactures, its production of coal, and its large grain-trade. Founded 1854, incorporated 1859. Pop. of city in 1870, 3852; in 1880, 4326.

Litchfield, Ky. See Leitchfield, Ky.

Litchfield, on R. R., cap. of Meeker co., Minn. (see map of Minnesota, ref. 9–D, for location of county), 78 miles W. of St. Paul, has a steam flouring-mill, a furniture-factory, good schools, and a U. S. land-office. The village is rapidly growing, has fine water-power, and is the centre of a rich, well-watered, and wooded agricultural district, noted for fine stock. Pop. of v. in 1870, 353; in 1880, 1250: in 1885, 1000.

Li'tchi, or **Li'chi** (*Nephelium litchi*), a fruit of the family Sapindaceæ (which see), found only in China and Cochin China. It grows in clusters upon a small tree resembling a horse-chestnut, is globular, about an inch and a half in diameter, and contains a sweet edible pulp with the arillus enclosing the solitary seed. This fruit is highly valued by the Chinese, who dry it for preservation, in which form it is often found in the stores in small quantities. The *longan* and *rambutan*, fruits much prized in China, but not exported or found elsewhere, are of the same family.

Lit'erary Prop'erty. This is a general expression used to set forth the ownership which an author has in his works, without reference to the point whether he claims it under a copyright or not. It accordingly includes the ownership of unpublished or manuscript works, letters, and, by analogy, pictures and statues. Inventions adapted to some practical use are not embraced in this article under this head. (See Patents. For the invention of a designation of property which may itself become the subject of ownership, see Trade-marks.) A convenient arrangement is to treat the subject of "literary property" under two principal divisions: I. Rules of the common law as to ownership in unpublished manuscripts and subjects of a kindred nature; II. Statutory rights (or copyright).

I. It cannot be successfully disputed that if a person composes a literary work, and does not choose to publish it, he has as complete an ownership in it as if he had produced a watch or other chattel. Conceding that he has no vested right simply in his ideas, he does have a title to them considered in reference to the outward form in which they are clothed. Accordingly, the regular legal remedies for the violation of rights of property would be applicable, and the usual incidents of property would attach. Still, for special reasons, unpublished writings cannot be taken by creditors in payment of debts. (*Bartlett* v. *Crittenden*, 5 McLean, 32.) A decree of Louis XV. of France of May 21, 1749, in favor of the French tragic poet, Crebillon (the produce of whose play while acting at the theatre was taken for his debts), declaring that the productions of the mind are not among effects seizable by creditors, is noticed by the elder Disraeli as a high honor to literature. (*Curiosities of Literature*, ii. 192.) An owner of this kind of property can sell it or dispose of it by will, or it may pass to his representatives at his death in the ordinary course of succession. The effect of the act of addressing a letter by an author to a correspondent has been frequently considered by courts of justice. The result of the discussions is, that while the author parts with the paper on which the letter is written, he still retains an ownership in the sentiments and expressions. By this divided ownership the receiver is entitled to the letter considered as an autograph, while if he publishes the contents he may be pursued by an action in court. The ownership of the receiver is corporeal, that of the author is incorporeal. The same result would happen if one should address in writing a poem or other literary work to a friend. A distinction between the ownership of the paper and of the poem would immediately spring up. Some jurists have confined the applicability of this rule to letters having a literary character. It is, however, believed that this distinction is not maintainable, and that in general a letter cannot be published by its receiver or any other person without the consent of the author, unless it may be to vindicate the receiver's character or to subserve the ends of public justice.

One of the most important instances, in the practical administration of justice, of this form of literary property is an unpublished play. A composer of such a work may keep it absolutely to himself, and make it as completely his own as any other species of property. So he may by appropriate acts cause it to become common property and wholly abandon ownership. In such a case he is said to "dedicate" it to the public. The act of dedication must be distinct and unequivocal, and cannot be presumed from the fact that he permits it to be exhibited on the stage in the ordinary manner. The most that can be claimed from such an exhibition is, that any person having the right to attend upon it may carry away with him as much as he is able from his unassisted memory, and may thus by means of his memory reproduce the play upon the stage. As to the last branch of this proposition, even, there would seem to be some doubt, since it may be plausibly maintained that all that the author intends to concede to the hearer is the right to the personal enjoyment or instruction of the occasion. However this may be, it is clear that there is no implied license to the audience to take notes, and by this means obtain sufficient knowledge of the play to represent it. If an actor becomes himself the author of a play, his performance of it in public, or that of a theatrical company, with his consent, for a compensation, cannot be regarded as any evidence of his abandonment of the manuscript to the public or to the profession of actors. Such a special use of an unpublished work for the author's benefit is perfectly consistent with the continuance of an ownership in it.

Rights of this kind appertain to aliens as well as citizens, having nothing to do with the statutes of copyright, and are accordingly of great consequence to foreign and non-resident authors, who, being unable by our laws to acquire a statutory copyright in their works, may still, by virtue of their ownership of an unpublished play, maintain an exclusive right to represent it upon the stage. Similar suggestions may be made as to lectures, whether written or oral. The act of delivering them before an audience confers no right upon the hearers to put copies of them on sale without the author's consent. Property in lectures is protected in England by a special statute (5 and 6 Will. IV. c. 65). The author in this country must rely upon general principles of law, and may resort to an injunction or action for damages. So the exhibition of a statue or a picture gives no license to a spectator to multiply copies and place them upon sale. These rules do not admit of evasion by the unauthorized production of abridgments of manuscripts or copies of works of art reduced in size.

Notwithstanding what has been said, it is clear that an author of a manuscript, etc. may absolutely lose all proprietary right in it by unequivocal acts of dedication to the public; as, *e. g.*, by placing printed copies of it on sale without obtaining copyright, or by obtaining a copyright in a foreign country and selling the work there.

Literary property may, in the stage of ownership now under consideration, be assigned, so that a distinction will spring up between an author and a mere proprietor. The sale of a manuscript will in general give the purchaser all the rights which the author of it, considered as an owner of an unpublished work, would possess. Whether he could take out a copyright or not could not be determined as a mere matter of reasoning, but would depend on the special provisions of the copyright statutes.

A question of some difficulty has arisen as to the point whether any legal protection can be given to a literary unpublished work which is unsound on the score of morality or contains doctrines subversive of public policy. This question must not be confounded with one which may arise under copyright statutes, as the considerations in the two cases are quite different. In the latter case there is sometimes a distinct provision that the copyright shall not protect an immoral or libellous publication. As to the case of a manuscript, it would appear that the following distinction should be made: no protection should be given to the author by the courts which would enable him to make his immoral work the source of gain or profit. On the other hand, if he simply desires to retain his right of property—*e. g.* to prevent others from publishing it altogether, as well as to refrain himself—every consideration of justice and expediency requires that he should be permitted to do so. Suppose that a person while in the immaturity of his powers composes a work extravagant or immoral in its views of the rights of society or of individuals, but that in later life his opinions are changed, and he comes to view with abhorrence doctrines that he once warmly approved, and he finds that some person against his consent has obtained possession of his manuscript and is about to publish it; shall he be prevented by law from suppressing such a publication? Great jurists have answered this question in the affirmative, on the theory that there *can be no property* whatever in such a manuscript. Their reasoning is unsatisfactory and inconclusive, and the true view would seem to be that the author is still the owner of the work, considered merely as an item of property, but cannot invoke the aid of the courts to enable him to make profit from that which is inherently vile and base.

The remedies for the violation of the proprietary rights of an author being given by the common law, may be sought in the State courts, notwithstanding a U. S. statute allows an action against a person who publishes a manuscript without the consent of the author or proprietor, such author, etc. being a citizen of the U. S. or a resident therein. It will be observed that the terms of this statute are not so comprehensive as the rule of the common law, as it confines the remedy to a "citizen or resident," and it appears to have been enacted for the benefit of those persons only who are entitled to the statutory copyright. Remedies, so far as this act extends, are cumulative, and may be sought either in the U. S. or State courts.

II. *Statutory Copyright.*—By this term is meant an exclusive right given by statutory law to an author or proprietor to multiply copies of his work and place them on sale, and in the case of a play the additional exclusive right of representation on the stage. Without this statutory protection the act of publication would be regarded by the courts as a dedication of the work to the public, and accordingly destructive of the author's right of property. The policy of the copyright law is to give the author, etc. protection in the sale of his work for a specified period, and then to throw its publication open to all. This theory is marked out in the U. S. Constitution, which gives power to Congress to secure to authors the exclusive right to their works for "limited times." The whole subject is under the control of Congress, and any legislation of a State affecting copyright would be inoperative and void. The result is, that if an author does not choose to publish his right to his manuscript is perpetual, and may be vindicated in courts of law on general principles of justice; if he prefers to publish, he brings himself within the purview of the law of Congress, must have his right only for such time as the statute prescribes, and must seek his remedies exclusively in the U. S. courts.

In general, any thing may be copyrighted which is the subject of literary ownership. More specifically, the term "copyright," as used in the existing enactments of Congress, applies to books, maps, charts, dramatic or musical compositions, engravings, cuts, prints, photographs and their negatives, paintings, drawings, chromos, statues, statuary, and models or designs intended to be perfected as works of the fine arts. The words "engraving," "cut," or "print," as here used, are to be applied only to works connected with the fine arts or to pictorial illustrations, and are not to be extended to prints or labels designed to be used for other articles of manufacture. These last may be registered in the patent office. In determining whether one of the above-named subjects can in a particular case be copyrighted, it is necessary to consider how far it must be original with the professed author. There are some compositions of such a high and elevated character that the question of originality cannot be successfully raised. It is conceded by all mankind. On the other hand, that there are other works of a much humbler sort, but still of a highly meritorious and useful nature, in which all the materials are existing in literature, and are well known to intelligent men, and open for resort to any one, and the only original feature is found in the selection, arrangement, or combination of materials. Instances of this kind are works on grammar, arithmetic, or geography, maps, charts, etc. etc. These, so far as they are the result of the work of the compiler or "author," are the subjects of copyright. He has no claim, however, to the materials which he did not originate. Any other person may resort to them and prepare a work from them, but he must not make use of the copyrighted book as a mode of collecting his materials. His correct course is to resort to the original sources of information. An illustration of these principles may be found in the case of a law reporter. He can have no copyright in the opinions of the judges, as of these he is not the *author*, while he might lay claim to a statement of the facts of the case, as well as to an abstract of the decision prepared by himself. A translator of a foreign work not the subject of a copyright here may have a copyright, as he is for practical purposes an "author." Any other person may translate the same work, and have himself a copyright. It was even held under the former law that a person might have a copyright in the translation of a work copyrighted here, though such translation were made without the author's consent. This rule was applied to an unauthorized translation into German of Mrs. Beecher Stowe's well-known work, *Uncle Tom's Cabin.* This anomaly has been corrected by a recent change in the law which permits an author in taking out a copyright to reserve the right of translation as well as of dramatization of his own works. So in the case of music, the composition of a new air or melody is sufficiently original, but it must be substantially a new work, and not a copy of a piece already in existence, with only such variations as any skilful composer can make. Under these rules there can be no copyright in a subject, but only in a particular mode of treating it. For example, one cannot obtain in this way an exclusive right to make maps of the city of New York, though he might acquire one in the results of his own labors and surveys. Any other person may make a like map from his own independent labors and surveys.

The word "book," as used in this class of laws, has a wide meaning. It is not restricted to volumes, but may include a single sheet. It has even been decided that for this purpose a sheet of paper containing diagrams representing a system of taking measures for and cutting ladies' dresses, with instructions for practical use, is a "book." There can be no copyright in a mere title as unconnected with a book. Where, however, a title is used to designate a work, particularly a periodical, it may become of great value, which will be administered by the courts under the law applicable to the "good-will" of trade in analogy to the rules appertaining to "trade-marks." (See TRADE-MARKS.)

There is a peculiarity to be noticed in the case of a copyright of a dramatic composition. In this case it is not merely an exclusive right to multiply copies for sale, but also to publicly perform or represent the play upon the stage. The term "dramatic composition," as thus used, includes all the parts which go to make up a scene in a theatrical representation; *e. g.* gestures, spoken words, etc. A character in a play who, according to the part assigned to him, goes through with a series of events without speaking, making use of motions and gestures, is as much an actor as one who uses his voice, and the one part must be regarded as embraced within the expression "dramatic composition" as well as the other. The only difference in the two parts is, that the one addresses the eye, and the other the ear of the spectator.

Under the existing law of the U. S. an author is not entitled to a copyright here unless he is a citizen of the U. S. or a resident. The same rule is extended to a proprietor, though a citizen, etc., who acquires the title of a foreign and "non-resident" author. In order to be a resident within the meaning of the statute, the foreign author must have formed an intention, at the time of recording in the proper office the title of his work, to make this country his permanent home. If an author entitled to a copyright dies before taking the benefit of the statute, his representatives are placed in his position. So an assignee of a manuscript has a right equivalent to that of the author.

The property in a copyright is of an incorporeal nature. It cannot, for example, be seized by a sheriff in the exercise of his common-law powers and sold on an execution. (See EXECUTION.) Should the sheriff, for instance, sell in this way a copperplate on which a copyrighted map was engraved, the purchaser would only acquire a title to the copperplate considered as a corporeal thing, with no right to print maps from it. The incorporeal right to publish maps could only be obtained in such a case through the action of a court of equity. It should, however, be remarked that under the existing bankrupt law a copyright passes to the assignee in bankruptcy as part of the debtor's assets.

An applicant for a copyright in this country must before publication deposit in the mail a printed copy of the title of the book, etc., or a description of the painting, drawing, etc., addressed to the librarian of Congress at Washington, and within ten days from the publication must also deposit two copies of the book itself, or in case of a painting, drawing, etc., a photograph of the same. Without these deposits the author or proprietor is not entitled to the copyright. A subsequent section of the law provides under a penalty that two copies of the *best* edition must be supplied, and that when any substantial change is made in a subsequent edition a copy of that must also be deposited. It is made by law the duty of the librarian of Congress, on payment of a fee, to make up and register as prescribed by law a formal statement (termed a "record") of the name of the book and the fact of the required deposit. No action can be maintained by a proprietor against an infringer unless the former has caused to be printed on the title-page or succeeding page of each copy of a book, or on the face of a map or photograph, a statement in a form prescribed by law of the fact of the entry in the librarian's office. The following brief statement may be used as an equivalent: "Copyrighted 18— by A. B." The regulations on this subject were much simplified by an act of Congress in 1870, the former law having required the record to be made in the district court of the U. S. of the district of the author's or proprietor's residence. A single office under the present law takes the place of a large number under the former system.

The term for which the copyright is granted in the first instance is twenty-eight years. If the author be then living, or be dead leaving a widow or children then living, there may be a renewal on complying with certain prescribed rules, for fourteen additional years. A copyright may be assigned by an instrument in writing. The assignment should be recorded within sixty days after its execution, or it will be void as against a subsequent assignee or mortgagee for a valuable consideration without notice. A simple assignment of an existing copyright does not carry with it the right of renewal.

The leading questions in the law of copyright concern infringement. The fact that a copyright is of an exclusive nature necessarily gives the proprietor a cause of action against one who infringes his right by placing copies on sale or reproducing on the stage his "dramatic composition." Infringement is a very plain matter when the copyrighted work is simply reproduced. It becomes a complicated and difficult question when only extracts or quotations are made, or when resort is had to the book to make the public acquainted with its contents or to criticise its style or the substance of its thought. It has long been established that the identity of a literary work consists in its ideas and its language. The thought is so associated with the form in which it is expressed that a copyright does not protect an author against the use of his thoughts in a substantially different form. It is for this reason that by general rules of law the unauthorized translation into another language or the dramatization of a copyrighted work is no infringement. Though the sentiment remains, the form is changed. On similar grounds a true abridgment, though made against the author's consent, is no infringement. This consists in a condensation of the author's language, and is substantially a different work. Where there is no such change it is an abuse of language to call the new work an "abridgment." The law as above stated has recently been modified by the express statutory provision, before referred to, allowing an author, if he see fit, to reserve the right of translation or dramatization. Dismissing these special cases of change of form from further consideration, it remains to inquire how far extracts or quotations may be made. When, for example, such quotations are made for the purpose of a review, the main inquiry is whether the act is a reasonable one as calculated to show the character of the original work. The critic must not go so far as to substantially publish the copyrighted work. The question thus becomes one of the *value* of the extracts made. This must be determined by the facts of each case. It has sometimes been thought that the true inquiry was whether there was an *intent* to infringe or steal. This is not satisfactory. The real point is, Has the author sustained substantial injury? The same general rule must be applied to other cases where extracts are made. There is a marked distinction in this branch of the law between a true abridgment and a compilation. In the former, as has been seen, there is a real and substantial condensation of the materials, and this has been made with intellectual labor and judgment. In a compilation there is the act of taking the very words of the author, or with such slight changes as to show servile imitation. The law at most tolerates the condensation, and does not permit the copying of the author's words to such an extent as to do him substantial injury. Compilation is to some extent permitted in dictionaries, gazetteers, cyclopædias, guidebooks, etc., where the main design and execution of the work are novel. In works of this class the materials must to a considerable extent be the same. Novelty and improvement in them in general consists in abridgment, changes in arrangement, more modern information, the correction of errors, etc. etc. It is scarcely necessary to add that an infringement may take place by publishing but a small portion of a work, if that be a vital part and cause a substantial injury to the proprietor.

The remedies for the violation of a copyright are, as has been shown, to be sought in the Federal courts, the circuit court under the acts of Congress having original jurisdiction. An appeal may be taken to the Supreme Court without reference to the amount in controversy. The regular remedies are an action for damages or an injunction from a court of equity preventing the continuance of the acts of infringement. As incidental to this relief, the court may direct an account to be taken of the profits realized by the infringer. The courts will not grant relief for an infringement in case the work copyrighted is immoral or libellous. This is expressly provided by the act of Congress, and the same doctrine without such a provision would be administered as a regular branch of equity jurisprudence. Where an infringement consists in making use of part of a copyrighted work in connection with other matter, the injunction will be so granted as to prevent the publication of that portion of the infringer's book which is open to objection, without reference to the fact that the order of the court may make the book, thus shorn of a portion of its contents, valueless. Severe penalties and forfeitures are also imposed by statute law upon persons who knowingly violate the provisions of the copyright acts. (For details the statutes should be consulted.)

Legislation upon the subject of copyright is found, in general, in European countries. It would swell this article beyond reasonable limits to state the rules prevailing there. As to England, reference may be made to the statutes of 8 Anne, c. 19, to 54 Geo. III. c. 36, and to 5 and 6 Vict. c. 45. In France this branch of the law is founded on the republican decree of July 19, 1793, and on the imperial decree of Feb. 5, 1810. The German confederation, by a decree of June 19, 1845, gave protection to literary property in general, and by a still earlier regulation (Aug. 22, 1841) prevented for a limited time the performance of musical compositions and the representation of dramatic pieces against the authors' consent.

It will have been observed that under our laws no copyright is granted to an author unless he be a citizen of the U.S. or a resident therein. Much complaint has been made of the injustice and inexpediency of this rule. As early as in the year 1838 an offer was made by the English Parliament to give the benefit of international copyright to authors in foreign countries whose governments would accord a similar right to English authors. Conventions have, under the terms of this statute, been made by England with a number of nations. The liberal disposition shown by England has not been reciprocated in this country. As the law now stands, an American author is more favored by English legislation than an English author by ours. Under the construction given by the English courts to their copyright acts, an American author who at the time of first publication of his work is within the British dominions, and publishes there, is entitled to their protection. No residence of an American author is necessary. His simple presence at some point within the British dominions is enough to give him protection throughout their entire range. While this rule requires that there must be no prior publication of the work beyond English limits, it will not be infringed if the publication at home and abroad takes place on one and the same day, nor will a fraction of a day be regarded. Some leading English jurists have gone still further, holding that protection is awarded by the law to a foreign author who makes his publication first in England, even though he does not go through the form of being actually present there, or in some part of the British dominions, at the time of publication. Such a narrow distinction seems useless and inconvenient, and the high example set by England would be still more beneficial if the broad doctrine could be enunciated that every author, no matter where he might reside or might happen to be, who published his work in England, either at or before the time of publication elsewhere, should be entitled to a copyright. (The leading decisions bearing upon this point are *Jeffreys* v. *Boosey*, 4 House of Lords' Cases, 815, A. D. 1854; *Routledge* v. *Low*, Law Reports, 3 House of Lords' Cases (English and Irish Appeals), 100, A. D. 1868; and *Low* v. *Ward*, Law Reports, 6 Equity, 415.) It is much to be desired that mutual arrangements may soon be made between the various nations whereby the subject of international copyright may be placed on a substantial foundation. The inherent justice of an author's claim should have universal acknowledgment, while at the same time due safeguards should be provided for the protection of society. No wiser scheme can be adopted than that which has met with general acceptance in the local law of the respective civilized nations. This is, to give an author an exclusive right for a limited time, and then make the work public. The next step forward is to have this local rule become one of general recognition, and have it take its place among settled and approved doctrines of private international law. The class interests of a portion of the community should not be allowed to stand in the way of this great act of justice, as well as of the highest and most far-sighted expediency.

Reference for further information may be made to Maugham *On Literary Property;* Shortt's *Law of Works relating to Literature and Art;* Curtis *On Copyright;* Law's *Digests of the Law of Patents and Copyrights;* Morgan's *Law of Literature* (1875); to the decisions of the Federal courts, and to Abbott's *Nat. Digest* and Brightly's do. (For the statutes of copyright see the *Revised Statutes of the U. S.*, § 4948–71, both inclusive.) T. W. Dwight.

Litharge. See Lead, by Prof. Henry Wurtz.

Lith'gow (William), b. in Lanark, Scotland, in 1583; traversed on foot Central Europe, Italy, Greece, and the Turkish empire, including Egypt and Palestine, whence he brought a collection of relics for James I. and his queen; visited in a second tour the northern states of Africa, returning through Hungary and Poland; and set out in 1619 upon a third journey, bearing royal letters addressed to all kings, princes, and potentates he might encounter. Arrested at Malaga on suspicion of being a spy, he was subjected to frightful torture; obtained his liberty with great difficulty through the British consul, and returning to England, was presented at court reclining on a feather bed. He published a volume of *Adventures* (1614) and a *History of the Siege of Breda* (1637). D. at Lanark in 1640.

Lith'ic Ac'id Diath'esis, a name given to that condition of the general system which favors the production of lithic acid or its salts in the urine. It has been, and still is by many, regarded as a peculiar diseased state in which the acid or its salts are produced in the blood, and separated therefrom by the kidneys; but those taking an opposite view—and we think this class embraces by far the majority of intelligent physicians—hold that the salts are formed in the urine, either in the pelvis of the kidney or the bladder, but *always* after it has been excreted; also, that the peculiar condition of the system favoring it is one of mal-assimilation. Lithic or uric acid occurs in the urine as small crystals of an amber color, varying in diameter from $\frac{1}{5000}$th to $\frac{1}{100}$th of an inch; they are usually either lozenge or drum shaped. It may also exist in combination with ammonia, soda, or lime, forming the urates of those bases. The urates form the sediment generally found in the urine in nearly all acute inflammations, fevers, gout, rheumatism, diseases of the liver, etc., and they indicate a highly acid condition of the fluid, by which they are precipitated from those substances which should hold them in solution. When deposited in any part of the urinary tract they may form into gravel or stone, and thus give rise to serious trouble. The treatment of the lithic acid diathesis should be directed to a correction of that condition of the general economy which has given rise to it. It is not a disease, but merely a symptom, showing that the aliment has not been properly distributed, and in four cases out of five we must look to abuses at the table for the source of the trouble. The practice of treating this condition by the administration of alkalies is now altogether out of vogue. Edward J. Bermingham.

Lith'ium and Lith'ia [Gr. λίθος, "stone"]. The alkali lithia, which is the oxide of the metal lithium, was discovered by Arfvedson in the laboratory of Berzelius in the year 1817, and in the mineral called *petalite.* It is now known to occur in *lepidolite, spodumene, amblygonite, triphylite,* some *tourmalines,* and other mineral species, and to be a frequent constituent, in small proportions, of mineral waters. The mineral amblygonite, which occurs at Hebron and Paris in Maine, contains more lithia than any other mineral—over 9 per cent. Spodumene, however, which contains some 5 per cent. of lithia, is a much more plentiful mineral, and has a number of American localities. Norwich, Mass., is one place among several where this is abundant; and this mineral might be made a considerable source of lithia in this country for medicinal and other uses. The elemental metal lithium was first obtained by electrolysis of the fused chloride by Bunsen. It is a silver-white metal, somewhat softer than lead, and lighter than any other known solid body, having a density of only .5835; so that it floats even on petroleum and naphtha. It has also the smallest equivalent weight of any element except hydrogen, this weight being only 7. *Hydrate of lithia,* corresponding to the hydrates of potash and soda, is a strongly caustic alkaline body like these, but is not deliquescent in the air, nor is it volatile at intense heats. It is obtained by igniting spodumene or other lithia-silicate in admixture with twice its weight of quicklime, dissolving in muriatic acid, adding sulphuric acid to precipitate most of the lime, then ammonia and oxalate of ammonia to throw down the rest, evaporating, igniting, redissolving out the sulphate of lithia, and decomposing this with a solution of baryta, which throws down the sulphuric acid and leaves in solution hydrate of lithia. The smallest traces of lithia are detectable by means of the spectroscope, which gives with pure lithia a spectrum consisting entirely of two lines—one a brilliant intense crimson, and the other a faint yellow. Lithia imparts to flame this beautiful crimson tint, and, were it cheap enough, would be a valuable agent in fireworks. An interesting practical application of the characteristic flame-color of lithia has been made of late years. In cases of suspicion that a well or cistern is being poisoned by percolation from a privy or drain, as happens often, a little lithia may be put into the supposed source of contamination. In case of percolation it will soon be easily detectable with the spectroscope, with chemical certainty, in the water of the well. *Chloride of lithium*, corresponding to common salt, the chloride of sodium, is easily prepared. It crystallizes in regular octahedra, which taste like common salt. It is, however, deliquescent, unlike the chlorides of sodium and potassium, and is more soluble than these. *Carbonate of lithia* is peculiar, as compared with the corresponding sodic and potassic carbonates, in being sparingly soluble in water, requiring a thousand times its weight of the latter. *Phosphate of lithia* likewise is but little soluble in water.

Cæsium and Rubidium.—When the spectroscope had been perfected by the illustrious Bunsen, one of its first achievements was the immediate discovery of two new alkali-metals, which occur in nature in minute quantities, generally associated with lithium. These are *cæsium* and *rubidium*. (See CÆSIUM, by PROF. CHANDLER.) The best source yet discovered of these two very rare and curious metals is the American lithium-locality, Hebron in Maine, where a variety of lepidolite or lithia-mica occurs which contains considerable cæsium and rubidium. Profs. Allen and Johnson of Yale College have made some admirable investigations of these metals from this source. HENRY WURTZ.

Lith'ium, Medicinal Uses of. *Lithium carbonate* and *citrate* are sometimes used in medicine as alkalies, and have been specially recommended in gout, because of their forming an easily soluble salt with uric acid. But their advantage over the alkaline potassium preparations for this purpose is perhaps not fully assured. The citrate is preferable to the carbonate, medicinally, from being more soluble and less disagreeable to the taste. EDWARD CURTIS.

Lithod'omus [Gr. λιθοδόμος, "building with stone"], a genus of stone-boring mollusks belonging to the family Mytilidæ or mussels. The type of the genus is the *Mytilus lithophagus* of Linnæus.

Lithofracteur. See EXPLOSIVES.

Lithog'raphy [Gr. λίθος, "a stone," and γράφειν, to "write"] is, as the name implies, the art of writing or drawing upon stone for the purpose of reproduction through the press. When stone is employed simply as a substitute for metallic plates, upon which to produce etchings, the process does not essentially differ from ENGRAVING (which see), of which it is a branch, and does not present any considerable advantage. Another process, more analogous to modern lithography, was invented as early as 1728 by Dufay, a member of the French Academy. As described by him, it consisted in executing a drawing with varnish upon stone, and employing an acid to eat down the unprotected parts, thus leaving the lines in relief. A process identical in principle was accidentally rediscovered at Munich in 1796 by Alois Senefelder, and by the application of a chemical principle became the germ of the modern art. Senefelder was a young dramatic author, who, being too poor to print his plays, conceived the idea of engraving them himself on the calcareous limestone which abounds in Bavaria. Not knowing the composition of the ordinary covering-varnish used by engravers, he devised as a rude substitute a compound of 3 parts of wax with 1 of soap, adding a small quantity of lampblack as coloring-matter. In a work published many years later (*Course of Lithography*, London, 1819) Senefelder thus related the curious incident which at this stage of his preparations supplied him with the key to a useful discovery: "I had just succeeded in my little laboratory in polishing a stone plate which I intended to cover with etching-ground to continue my exercise in writing backward, when my mother entered the room and desired me to write her a bill for the washerwoman, who was waiting for the linen. I happened not to have even the smallest slip of paper at hand, as my little stock of paper had been entirely exhausted by taking proof impressions from the stones, nor was there even a drop of ink in the inkstand. As the matter would not admit of delay, and we had nobody in the house to send for a supply of the deficient materials, I resolved to write the list with my ink prepared with wax, soap, and lampblack on the stone, which I had just polished, and from which I could copy it at leisure. Some time after this I was just going to wipe this writing from the stone when the idea all at once struck me to try what would be the effect of such a writing with my prepared ink if I were to bite in the stone with aquafortis. I at once hastened to put this idea in execution, and mixing 1 part of aquafortis and 10 parts of water, which I left standing five minutes on it, I found the work elevated the one-twentieth part of an inch. I now found that I could charge the lines with printing ink and take a number of impressions." Thus far, Senefelder had but repeated the experiment described by Dufay seventy years before, and employed upon copper plate by William Blake, the English painter and poet, in 1788. It was not until two years later that his increased knowledge enabled him to utilize in behalf of his process the ancient feud subsisting between oil and water. Thus perfected, the art of lithography depends upon three principles—the absorbent affinity of calcareous stone to water, its adhesive affinity to resinous and oily substances, and the chemical affinity of those substances to each other, combined with their repulsion of water. Hence, a drawing made upon a polished stone surface with a resinous or oily crayon or ink adheres so firmly thereto as to be irremovable except by mechanical means, and while water poured thereon is absorbed by the remaining parts of the stone, it is repelled by the crayon. When upon a surface thus prepared a colored oily or resinous substance is applied, it adheres by chemical affinity to the drawing, and not to the moist stone. In practice, a solution of vitriolic, nitric, or muriatic acid is first poured upon the stone, to neutralize the alkali of the crayon (technically called "chalk"), harden it, and also to slightly eat away the unprotected surface, preparing it to absorb more freely a weak gum-water in which it is next submerged to close its pores and keep it moist. The lithographic ink is then applied with balls or rollers, as in ordinary printing. After becoming thoroughly dry the stone is ready for the press, and must be wetted and inked for each impression. From 500 to 1500 perfect copies of crayon drawings may be obtained from the same block, 5000 or 6000 copies of fine ink drawings, and as many as 70,000 from those in coarser lines, the last print being nearly as good as the first. The economy of time as compared with copperplate printing is considerable, and the expense is much less than in any other method of artistic reproduction.

CHROMO-LITHOGRAPHY is simply a combination of a number of stones prepared in the manner above described, each being employed for a separate color, and representing a portion of the drawing or painting which it is intended to reproduce in fac-simile. The process is nearly the same as that described in CALICO-PRINTING (which see). As many as thirty stones are frequently requisite to copy a single painting, the utmost exactness being necessary in the adjustment of each in its proper place, as a variation of a fiftieth of an inch would mar the effect.

ZINCOGRAPHY (which see) is in its methods entirely analogous to lithography, of which it would be a branch were it not that the difference of the essential material would render such classification a misnomer. The latest and most interesting application of Senefelder's discovery is PHOTO-LITHOGRAPHY, which will be described under that head. PORTER C. BLISS.

Lithol'ogy [Gr. λίθος, "a stone," and λόγος, "science"], the science which treats of the characteristics and classification of rocks. (See GEOLOGY and MINERALOGY.)

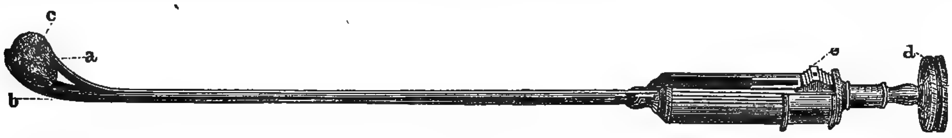
Lith'omarge [Gr. λίθος, "stone," and Lat. *marga*, "marl"], a hydrated silicate of alumina, constituting a fine clay allied to kaolin.

Lith'ophane [Gr. λίθος, "stone," and φανός, "clear"], a sort of ornamental porcelain transparency, to be used as a window-piece or for lamp-shades and fireside screens. The porcelain when soft is pressed with a raised stamp, which impresses figures upon the clay. Transmitted light brings out a variety of groups and figures, often nicely shaded and very pleasing. The lithophane is a French invention, but it has found its best market in Germany and Austria.

Lithot'omy and **Lithot'rity.** Urinary calculi are composed most frequently of substances existing in a state of solution in healthy human urine, such as uric acid, urate of ammonia, and the phosphates of lime and magnesia. Sometimes, however, they are composed of substances met with only in morbid urine, such as oxalate of lime, cystine, etc. Besides these ingredients, of which they mainly consist, calculi always contain more or less animal matter, such as dried blood, vesical mucus, etc. Occasionally, they are found to consist almost entirely of a single ingredient, but more frequently of two or more different constituents arranged in irregular concentric layers. In certain conditions these ingredients solidify and form concretions. The initial process in their formation commonly takes place in the kidneys; the product then descends along the ureter (a fleshy tube for conveying the urine) into the bladder, from which it is often expelled in urinating, and thus got rid of. If, however, it remains in the bladder, it becomes a nucleus upon the surface of which successive deposits of solid matter take place, until a calculus is formed, which in process of time may attain a formidable size—too great, in fact, to admit of its safe removal by any surgical operation. Any foreign substance introduced accidentally or intentionally into the cavity of the bladder will also become a nucleus upon which incrustations of solid matter will take place. Instances have occurred where bullets, fragments of surgical instruments, and other foreign bodies have formed the nuclei of stone in the bladder. Calculi may exist single or multiple in the bladder; where multiple, there may be two or more of nearly equal size, or there may be a large number of every variety of size from a pin's head to a horse-chestnut. When there is but a single calculus, it is more generally of a flattened, ovoid shape, or globular, though sometimes it may resemble an hour-glass in shape, or have any irregular form. Its surface is sometimes smooth, sometimes rough, uneven, and studded with pointed eminences. When two or more are found in the same bladder, their surfaces are marked by smooth facets, produced by their contact with each other. If a concretion remains permanently in the cavity of the kidney, it may in the process of its growth become moulded into the shape of the cavity. Calculi are met with in both sexes, though more frequently in males than females, owing in part to the greater facility with which the nucleus concretion can be expelled from the female than from the male bladder. No age is exempt from this malady; it has been met with in the infant at birth, and at all subsequent periods of life up to the most advanced age. Certain localities have been regarded as favoring the production of this malady by the properties of the drinking-water in use among the population.

The question of vital interest in connection with this subject is, By what means sufferers from this distressing malady can obtain relief? At all times there have been remedies advocated as possessing the property of dissolving the stone in the bladder, and patients afflicted with the disease, naturally shrinking as they do from the alternative of a surgical operation, have been too ready to give credence to the vaunted efficacy of such remedies, and by long perseverance in their use have lost precious time. The stone has thus been allowed to increase in size, and the danger from a surgical operation has thereby been enhanced, while the chances of recovery have been diminished. The removal of a stone by a surgical operation is the only reliable means of cure, and the earlier it is resorted to the better the chance of recovery.

Lithotomy and *lithotrity* are the terms which define the two surgical operations by means of which the extraction of a stone from the bladder is effected. *Lithotomy* (λίθος, "stone," and τέμνειν, to "cut") is a cutting operation by which an opening is made from the surface of the body into the cavity of the bladder at certain points where this organ lies nearest to the surface. Through the opening thus made an instrument (forceps) is introduced into the bladder, the stone seized and brought away. This operation has been in use since the earliest period in the history of surgical art. The operation is performed according to two principal methods: 1st. The hypogastric or supra-pubic method, by means of which the cavity of the bladder is reached through an opening made at the lowest point of the abdomen, exactly in the median line of the body. 2d. The perineal or sub-pubic method, by which the bladder is reached through an incision made in front of the anus, between it and the scrotum, in the space known as the perineum. This method is most frequently employed, as the safest and the one of widest application. It admits of three varieties in its mode of execution, distinguished from each other by the different directions in which the incisions required for its performance are made. First variety, known as the median operation, in which the incision is made exactly in the median line of the perineal space between the anus and scrotum. Second variety, termed the lateral operation, in which the incision, commencing at a point in the median line in front of the anus, is carried obliquely outward and backward to the left side of the anus. Third variety, known as the bilateral operation, in which the incision extends in a curved line across the perineal space in front of the anus, and to an equal distance on either side of the median line. Each of these varieties has had able and zealous advocates, who claim for them special advantages; the choice of operative methods must, however, be determined by a judicious discrimination of the conditions of each case that comes under consideration.



The lithotrite: *a*, *b*, jaws; *c*, stone; *d*, screw; *e*, spring catch.

Lithotrity (λίθος, "stone," and τείρειν, to "break down") or *lithotripsy* (λίθος, "stone," and τρίβειν, to "grind") is a bloodless operation by which a stone in the bladder is reduced to fragments small enough to be expelled through the natural canal in urinating. Though some traces of a conception of this method are found at an earlier period in the history of surgery, it was not till the second decade of the present century that Civiale of Paris undertook his experiments which resulted in the development of the method now in use, and which is ranked among the acknowledged resources of surgical art. On Mar. 22, 1824, a commission of the Academy of Medicine of Paris reported upon it as follows: "Desirous of avoiding, on the one hand, the enthusiasm which exaggerates everything, and on the other that prejudice which seeks to depreciate everything, we consider the new method proposed by Dr. Civiale for destroying stone in the bladder without the use of lithotomy as alike creditable to French surgery, honorable to the author, and consolatory to humanity; that, notwithstanding its insufficiency in some particular cases, and the difficulty of its application in others, it cannot fail to establish an epoch in the healing art, and to be regarded as one of the most ingenious and salutary resources." After a test of fifty years the expectations expressed in this report have been fulfilled, and lithotrity now holds an honorable rank among the resources of surgical art. The operation consists essentially in the introduction of an instrument known as a lithotrite, of adapted shape and size, through the natural canal into the bladder. With it the stone is seized and crushed by pressure exerted with the hand alone, or with a screw-power that may be applied at pleasure at the handle of the instrument. Another mode of crushing the stone is by percussion applied at the handle of the instrument by means of a hammer. A portion of the finer débris resulting from the crushing may be brought away in the jaws of the instrument. Unless the stone is quite small, the operation requires to be repeated at regulated intervals till the whole calculus is reduced to fragments small enough to be expelled with the urine. In his early experiments Civiale directed his efforts, after the seizure of the stone, to perforating its substance in different directions with drills, and thereby diminishing its resistance and facilitating its being crushed by pressure. Straight instruments alone could be employed for this purpose, and hence greater difficulty was encountered in their introduction into the bladder. These instruments, moreover, were complicated in their construction, and required a varied manipulation in their use, and were therefore more liable to injure the bladder and occasion serious accidents. These objections led to the early abandonment of the perforating process, and the substitution of the crushing process alone. This latter process is effected by means of curved instruments, which in their form more nearly resemble the catheters and sounds in common use among surgeons. The operation of lithotrity is particularly adapted to patients of adult age, in whom the expulsion of fragments is facilitated by the greater calibre of the urinary canal. In early life, under the age of fifteen years, and especially under ten years, the operation of perineal or sub-pubic lithotomy is successful in so large a proportion of the cases operated on that we scarcely need a better resource, especially as we now have the aid of anæsthetics by which patients are spared the pain of the operation. The descent of a concretion from the kidney into the bladder is accompanied by an attack, usually violent, of kidney colic. Its presence in the bladder itself is characterized by disturbance of its functions, such as frequent calls to urinate, sudden arrest of the outflowing stream, pain felt on the close of the act, and referred to the neck of the bladder and end of the penis, pain also from the jolting of a vehicle, and the appearance of blood in the urine. A practical injunction should be borne in mind by patients suffering from symptoms of stone in the bladder: to wit, that in the early stage of the disease, while the stone is of small size, its removal by the operation of lithotrity may be regarded as almost entirely without danger, and sometimes can be accomplished by a single operation. Hence the importance of having its presence ascertained by a skilful exploration of the interior of the bladder at the earliest period of its existence. If patients suffering from this malady would early avail themselves of lithotrity, which has none of the terrors of a bloody operation, much suffering might be averted and many lives saved. GURDON BUCK.

Lithua'nia [Lith. *Letura ;* Pol. *Litwa ;* Ger. *Litauen*] formed in the Middle Ages an independent and powerful state, comprising those large tracts of mostly low and level land which extend from the Baltic to the Black Sea, between the Niemen and the Düna in the N. and the Don and the Bug in the S. In the eleventh century the Lithuanians were tributary to the Russians, but in the twelfth they threw off the yoke. In 1235, Ringold formed the country into a grand duchy. In 1320, Gedemin conquered Volhynia, Kiev, and Tchernigov from Russia. In 1386, Jagellon united Lithuania with Poland, having married Hedwig, a daughter of King Lewis of Poland and Hungary. By the division of the Polish kingdom one small part of Lithuania came to Prussia, forming the present government of Gumbinnen, while the rest was incorporated with the Russian crown, forming the present governments of Vilna, Grodno, Moheelev, Vitebsk, and Minsk. The Lithuanians in race and language belong to the Lettic group (see LETTIC RACE), and for a full comparison of their interesting language with the cognate branches of the Indo-European stock see Bopp's great *Comparative Grammar* (3d ed., 1857).

Lit'itz, Lancaster co., Pa. (see map of Pennsylvania, ref. 6–H, for location of county), on the Reading and Columbia R. R., 8 miles N. of Lancaster, has a celebrated Moravian school, Lititz Academy, for boys, and another, Linden Hall, for young women, and is the seat of Sunnyside College for ladies, and of another school for boys. Lititz was founded in 1756 by the Moravians. The town was named in honor of the barony of Lititz in Bohemia, an ancient refuge of the Bohemian Brethren. It is a place of summer resort, and has a large and very fine spring. Pop. in 1880, 1113.

Lit'mus, or **Lacmus,** a coloring-matter obtained from *Lecanora tartarea* and other lichens, which are powdered, mixed, and decomposed with ammoniacal urine. Alum, lime, and potash are mingled with the mass, and the whole is dried with powdered chalk. It is used for coloring litmus-paper, an invaluable test in the chemical laboratory, becoming blue when wet with a liquid containing free alkalies, or red if acids be present.

Litre, the French standard measure of capacity in the decimal system. The litre is a cubic decimètre—that is, a cube each of the sides of which is 3.937 English inches; it contains 61.027 English cubic inches. Four and a half litres are very nearly equivalent to the English imperial gallon.

Lit'ta (POMPEO), COUNT, b. Sept. 27, 1781, at Milan; entered the military service in 1804; fought with distinction at Ulm, Austerlitz, and Wagram, and became chief of a battalion, but retired after 1814 into private life, devoting himself exclusively to the study of history. In 1848 he took charge of the ministry of war in the provisional government for a short time. D. at Milan Aug. 17, 1852. In 1819 appeared the first number of his splendid work, *Famiglie celebri d'Italia,* opening with the history of the Sforzas. At his death the work comprised the history of fifty-three families, and several more have been added since by Odorici and Passerini. The work, which was published by subscription only, and never brought into the general market, is magnificently printed, and enjoys a great reputation, both on account of the richness and accurateness of its information and its elegant style.

Lit'tell (ELIAKIM), b. at Burlington, N. J., Jan. 2, 1797; in 1819 began to publish and edit at Philadelphia the *National Recorder,* afterwards the *Saturday Magazine;* in 1822 established the *Museum of Foreign Literature,* and in 1844 founded *Littell's Living Age* at Boston, Mass. He drew up the Clay compromise tariff of 1833. D. at Brookline, Mass., May 17, 1870.—His brothers, JOHN STOCKTON and SQUIER, were writers of some note, the former having edited Alexander Graydon's *Memoirs of his Own Times* (1846) and Garden's *Anecdotes of the American Revolution;* and the latter having published a learned work on *Diseases of the Eye* (1837), and edited Dr. H. Walton's *Treatise on Operatic Ophthalmic Surgery* (1853).

Lit'tle (Capt. GEORGE), b. at Marshfield, Mass., in 1754; commanded the armed vessel The Boston, belonging to the State of Massachusetts, at the beginning of the Revolution; was first lieutenant on The Protector in 1779, when he was captured by a British frigate; escaped from prison at Portsmouth, England; took command of the sloop-of-war Winthrop, and cruised successfully during the remaining years of the war; commanded the national frigate Boston in 1798; was made captain in U. S. navy Mar. 4, 1799; captured several French ships, one of them, Le Berceau, after a severe conflict; retired in Oct., 1801, to his farm at Weymouth, Mass., where he d. July 22, 1809. He wrote *The American Cruiser* and *Life on the Ocean.*

Little (JAMES LAWRENCE), M. D., b. at Brooklyn, N. Y., Feb. 19, 1836, graduated in medicine at College of Physicians and Surgeons in New York 1860; was house surgeon to the New York Hospital 1861–62; in 1862 appointed surgeon-in-charge to the Park Barracks; in 1863 clinical assistant to Prof. Willard Parker in College of Physicians and Surgeons; in 1864 delivered his first course of lectures on fractures and their treatment (in that college), which were given annually until 1868, when he was appointed lecturer on operative surgery and surgical dressings; in 1880 resigned this position; in 1865 consulting surgeon to the North-western Dispensary; in 1868 surgeon to St. Luke's Hospital—a position which he held till his death; professor of surgery in the University of Vermont (retaining his residence in New York) 1875–85; in 1876 he was appointed surgeon to St. Vincent's Hospital; in 1879 consulting surgeon to Mary Fletcher Hospital, Burlington, Vt.; in 1880 appointed professor of clinical surgery in the medical department of the University of the City of New York; resigned in 1882; in the same year appointed professor of surgery in the New York Post-Graduate Medical School—a position which he held till his death. He was a permanent member of the American Medical Association and of the New York State Medical Society, fellow of the New York Academy of Medicine, and a member of the Pathological, County Medical, N. Y. Surgical, and Northwestern Medical and Surgical Societies. Dr. Little introduced into this country the treatment of fractures by the plaster-of-Paris splint. He had a large experience in the treatment of stone in the bladder, and was the first to puncture the bladder by aspirator (in 1872). He was the author of numerous professional papers of importance to medical literature. D. Apr. 4, 1885. M. P. JANES.

Little (Gen. LEWIS HENRY), b. at Baltimore, Md., in 1818; graduated at West Point in 1839; entered the 5th Infantry; was distinguished in the Mexican war at the battles of Monterey and Cerro Gordo; became captain Aug., 1847; resigned from the army May 7, 1861, to enter the Confederate service; became adjutant-general of Missouri forces on the staff of Gen. Price; was made brigadier-general for gallantry at the battle of Elk Horn; became commander of a division, and was killed at the battle of Iuka, Miss., Sept. 19, 1862.

Little Christians, a sect in Russia which in 1868 seceded from the national Church. They originated in the bishopric of Tsaritsin. Originally few in numbers, they have rapidly increased. They practise immersion, after which they assume a new name; they have no priests, no worship of saints, no holy oil, no images, no altar-pieces, no bread and wine in the Eucharist, but worship the sacred bread, and profess to have received a divine revelation.

Littledale (RICHARD FREDERICK), b. in Dublin Sept. 14, 1833, studied at Trinity College in his native city; was ordained in 1856, and held various curacies in the Church of England, but retired in 1862 on account of ill-health and devoted himself exclusively to literature. He published a new edition of Anselm's *Cur deus homo* (1863) and *Primitive Liturgies in Greek and English* (1868–69), besides a great number of minor essays, polemical, historical, exegetic, etc.: *Catholic Ritual in the Church of England* (1865), *Church Reform* (1870), etc.

Little Falls, R. R. junction, cap. of Morrison co., Minn. (see map of Minnesota, ref. 7–D, for location of county), on the E. bank of the Mississippi River. Pop. in 1870, 457; in 1880, 508; in 1885, 1224.

Little Falls, Herkimer co., N. Y. (see map of New York, ref. 4–H, for location of county), on the New York Central R. R., midway between Albany and Syracuse, and 22 miles E. of Utica, built against the sides of an abrupt declivity which rises some 500 feet and overlooks the Mohawk River, which falls at this point 45 feet within half a mile, forming a series of picturesque cascades and rapids, from which the name is derived. It has woollen, cotton, paper, and knitting mills, a foundry and machine-shop, a carriage-factory, the "Warrior" mower-factory, an excellent fire department, and 2 public parks. It is one of the largest cheese markets in the U. S. Pop. of v. in 1870, 5387; in 1880, 6910.

Little Glace Bay, coal-mining settlement of Cape

Breton Island and co. (N. S.), 15 miles E. of Sydney. Pop. about 400.

Little Hum'boldt River, the most important tributary of the Humboldt River, Nev., flows W. and then S. through Paradise Valley in Humboldt co. It has some 35,000 acres of excellent bottom-land, and 90,000 of bench-lands of the best character. The small brooks abound in trout. The elevation is some 4500 feet. There are abundant means for easy irrigation.

Lit'tlejohn (Abram Newkirk), D. D., b. in Montgomery co., N. Y., Dec. 13, 1824; graduated at Union College in 1845; received deacon's orders in the Protestant Episcopal Church in 1848; officiated at Amsterdam, N. Y., Meriden, Conn., and Springfield, Mass.; took priest's orders in 1850; rector of St. Paul's, New Haven, 1851–60, and since then of Holy Trinity church, Brooklyn, N. Y. He was for ten years lecturer on pastoral theology in the Divinity School at Middletown, Conn. In 1868 he was consecrated bishop of Long Island, and in 1874 undertook the charge of the American Episcopal churches on the continent of Europe. He is author of *The Philosophy of Religion,* a series of lectures, and has written largely for the *Church Review,* and published many sermons and addresses.

Lit'tle Kanaw'ha River rises in Upshur co., W. Va., and flows in a generally N. W. course, joining the Ohio at Parkersburg. It flows through the oil-region, and has wide and fertile bottom-lands. The Little Kanawha Navigation Co., by building three dams, have made it navigable 38 miles to Burning Springs. Great numbers of logs are floated to market upon its waters.

Little Rock, city and R. R. centre, cap. of Arkansas and of Pulaski co. (see map of Arkansas, ref. 3–C, for location of county), situated near the centre of the State, on the S. bank of the Arkansas River, 250 miles above its mouth, and on the Little Rock and Fort Smith, the Memphis and Little Rock, the St. Louis Iron Mountain and Southern, and the Mississippi Valley R. Rs., 125 miles S. W. of Memphis, built upon the first highland reached by ascending the river, which is here 400 yards wide, and navigable eight months of the year for large steamboats, smaller ones plying to Fort Smith, on the border of Indian Territory, 300 miles above. The rocky cliff on which the city stands, and from which it takes its name, is not more than 50 feet above the river, while the Big Rock, commencing 2 miles above, is a precipitous range rising abruptly some 500 feet. Little Rock is a commercial city, has several manufactories and possesses every facility for their establishment, its business connections being largely with Texas and the S. W. generally; has 20 churches, 4 banks, 2 daily, 7 weekly, and 2 monthly newspapers, 1 public library, 2 female colleges, one of which is under control of the M. E. Church, South, and the other under that of the M. E. Church, North; a convent and academy of Sisters of Charity, numerous public and private schools, U. S. arsenal, land-office, and courts, State Capitol building, prison, and asylums for deaf-mutes and blind, insane asylum, and a State library with 12,500 volumes. Streetcars provide means of communication within the city. The situation is dry and healthy, and the place has never been visited by an epidemic. Pop. in 1870, 12,380; in 1880, 13,138; in 1885, about 25,000.

State Capitol, Little Rock, Ark.

W. Jasper Blackburn, Ed. "Free South."

Little Sisters of the Poor, a Roman Catholic sisterhood devoted to works of charity, and especially to the care of those who are old and poor; first established at St. Servan, France, in 1840, by M. Le Pailleur. They have a number of houses in the U. S.

Lit'tlestown, on R. R., Adams co., Pa. (see map of Pennsylvania, ref. 6–F, for location of county), 3 miles N. of the Maryland line and 10 miles S. E. of Gettysburg. Principal business, farming. Pop. in 1870, 847; in 1880, 913.

Littleton, post-v. and tp. of Grafton co., N. H. (see map of New Hampshire, ref. 6–E, for location of county), on the Ammonoosuc River and the Boston Concord and Montreal R. R., 114 miles N. of Concord and 28 miles from the base of Mount Washington, White Mountains, in which it is the most important town, and a usual point of departure for tourists. It is a farming town, largely engaged, however, in manufacturing, lumbering, and providing accommodations for summer boarders; has a good high school, a woollen mill, a scythe and axe factory, and manufactories of stereoscopic views, doing a large business. Pop. of tp. in 1870, 2446; in 1880, 2936.

Littleton (Adam), D. D., b. at Hales-Owen, Shropshire, England, Nov. 8, 1627; was educated at Christ Church, Oxford, taking high rank in the classics; became rector of Chelsea, chaplain to King Charles II., and prebendary of Westminster 1674. D. at Chelsea June 30, 1694. Dr. Littleton was a fine Oriental scholar, and formed a library of rare books and manuscripts, so extensive that it brought him to bankruptcy. He wrote much on mystic numbers and other recondite subjects, and published many sermons; but his great work was the *Dictionary of the Latin, Greek, Hebrew, and English Languages* (1678; frequently reprinted). He was a descendant of Sir Thomas Littleton. (See Wood's *Athenæ Oxonienses,* vol. ii., and the preface to Ainsworth's *Latin Dictionary.*)

Littleton, or **Lyttleton** (Sir Thomas), b. in Devonshire, England, early in the fifteenth century; studied at Cambridge and at the Inner Temple, where he became a lecturer on law. Under Henry VI. he was steward of the king's household and king's sergeant (1455), performing the duties of judge of assize in the northern circuit. On the accession of the house of York to the throne of England, Edward IV. confirmed Littleton in his offices, appointed him one of the judges of the court of common pleas (1466), and a knight of the Bath (1475). D. at Frankley, Worcestershire, Aug. 23, 1481. He was buried in Worcester cathedral, where a marble tomb and statue were placed over his remains. Littleton's great work on tenures (*Les Tenures*) was written in Norman French, the first edition being without date, but supposed to be of 1481, translated into English in 1539, and given to the world with the authoritative commentary of Coke in 1628, since which time the editions have been innumerable, and the treatise has become the "Bible of the law" of England. It has often been printed with the French and English texts in parallel columns. The original name of Littleton was Westcote, which he exchanged for that of his maternal grandfather.

Littleton (Edward), Lord. See Lyttelton.

Lit'tle Tur'tle (*Me-che-cun-na-qua*), a Miami chief of great reputation for intelligence, shrewdness, and valor in warfare; is supposed to have received some education in Canada. He commanded in the battles which resulted in the defeat of Gen. Harmar on the Miami (Oct. 22, 1790) and of Gen. St. Clair at St. Mary's, Nov. 4, 1791; was present, though not in command, at the battle of Fallen Timbers or Maumee Rapids, Aug. 20, 1794, in which the Indians were defeated by Gen. Wayne; was one of the signers of the treaty of Greenville, Aug., 1795, which ended the war and conveyed to the whites an extensive region in Ohio, and visited Pres. Washington at Philadelphia in 1797, on which occasion he had an interview with Count Volney, the French philosopher, and received a pair of elegantly mounted pistols from Kosciuszko. D. at Fort Wayne., Ind., July 14, 1812.

Lit'tle Val'ley, cap. of Cattaraugus co., N. Y. (see map of New York, ref. 6–C, for location of county), on Little Valley Creek near the Alleghany River, on the New York Lake Erie and Western (formerly called the Erie) R. R., 8 miles N. of Salamanca and 38 miles E. of Dunkirk, has several steam-mills. Principal business, farming and dairying, the latter interest having been stimulated by the introduction of cheese-factories. Rock City, a singular geological configuration of conglomerate rocks, arranged in regular blocks, with sharp angles and perpendicular sides, presenting the appearance of squares, courtyards, and streets, stands on a hill within the township, 2000 feet above tide-water, 400 feet above the valley, and covers 100 acres. (For a scientific description of this interesting phenomenon see Prof. Hall's *Geology of New York.*) First settlement made here in 1807; township erected in 1818. Pop. of tp. in 1870, 1108; in 1880, 1196, including 566 in v.

Littora'le [Ger. *Küstenland*], province of the Austro-Hungarian monarchy, extends along the northern shore of the Adriatic from Venetia to Croatia, bounded N. and E. by Carinthia and Carniola. It consists of the counties of Görz and Gradisca, the margraviate of Istria, and the district of Trieste, and comprises an area of 3085 square miles, with 600,525 inhabitants, mostly of Slavic descent.

Littré (Maximilien Paul Émile), b. at Paris Feb. 1, 1801; studied medicine and the Semitic languages; from 1830 to 1851 was one of the editors of the liberal journal the *National*, and in 1854 the principal contributor to the *Journal des Savants*. He translated from the German the *Life of Jesus* by Strauss, wrote some works on medicine and on positive philosophy, being a prominent disciple of Auguste Comte. His principal work is the *Dictionary of the French Language* (4 vols., 1863–73), which is a kind of condensed encyclopædia. In 1871 he was elected to the National Assembly, and chosen a member of the Academy in the place of Villemain. D. June 2, 1881. Félix Aucaigne.

Lit′trow, von (Joseph Johann), b. Mar. 13, 1781, at Bischof-Teinitz, in Bohemia; studied at the University of Prague; became professor of astronomy at Cracow in 1807; removed in 1810 to Kazan, in 1816 to Buda, and in 1819 to Vienna, where he d. Nov. 30, 1840. Under his direction the observatory of Vienna was much improved, and his lectures drew great audiences. His most prominent writings are *Die Wunder des Himmels* (1834), often republished; *Theoretische und praktische Astronomie* (3 vols., 1822–26), and *Atlas des gestirnten Himmels.*—His son, Karl Ludwig, b. at Kazan, Russia, July 18, 1811, was his assistant in the Vienna Observatory from 1831; made important discoveries on the revolution of Venus and on eclipses; became director in 1842; published valuable astronomical registers, and was employed in 1847 in connecting Austria and Russia by triangulation. D. Nov. 16, 1877.

Lit′urgy [*λειτουργία*, "a public service;" in the LXX., what belongs to the office of priest or of Levite; in the New Testament, ministry of any kind, and also priestly service, equivalent to *ἱερατεία*], in a general sense a prescribed form of public worship; in a stricter ecclesiastical sense is confined to that service which was probably the only stated service peculiar to the first Christians in Jerusalem—viz. "the breaking of bread," that highest act of Christian worship, which the Lord Jesus instituted as a perpetual memorial of the one propitiatory sacrifice of himself by himself, and as a means of bestowing himself to the faithful in holy communion. In a short time this service must have become, in some respects, fixed. In the breaking of the bread and in the blessing of the cup they who had witnessed the first consecration could not but have repeated the words and acts which they had heard and seen—words and acts deemed so important that they were by revelation imparted to the apostle "born out of due time." And soon around this nucleus were clustered common prayers and praises and ritual observances; not always the same in every country to which the apostles bore the blessings of Christ's body and blood, but naturally becoming fixed as the repetition of wants and feelings which do not often vary. Did the apostles commit to writing one or more forms of the eucharistic service? A precomposed service is not perforce written. The teachings and rites of other religions have been communicated orally; and it has long been asserted that the early Church had not any written service of the altar. The chief reason for this opinion is the historic fact that when the sacred books were demanded in times of persecution no liturgy was ever delivered up, although portions of the Scriptures were often seized. But, on the other hand, Tertullian seems to assert plainly the existence of such books, "which many accidents put into the hands of those who are not of us." And so soon as the Church became dominant memory was not trusted, but written forms used, and this without mention of change of custom. That written liturgies were used by the apostles, and that vestments appropriate to the service were worn by them, some writers think to be made more than probable by scriptural intimations of ordinances delivered to the churches, and especially by St. Paul's care to have brought to him "the cloak left at Troas, and the books, especially the parchments." Such confirmation of previous conviction may provoke a smile on the part of one who doubts. But not so with the criticisms of late liturgiologists. Besides recognized quotations from heathen authors, there are found in the Epistles passages introduced with the words, "And so it is written," and the like. Where are they written? Certainly not all in the older Scriptures. Some may have been parts of hymns and spiritual songs, for they have a rhythmical measure; others are found in the primitive liturgies—the very words. Can it be that the scriptural writer quoted from these? If so, more is suggested than an answer to our present question. It is possible that these passages in the liturgies may be taken from the Scriptures, as very many texts are; and so it has been often asserted. But when we come to examine the collocation, the contrary becomes probable; the conviction seems forced on us that the apostles, writing to the churches, find their thoughts naturally clothed in language with which all are familiar from their constant use in the divine service. (The reader is referred to Neale's *Essays on Liturgiology and Church History.*)

Although in the many liturgies which have come down to us from former ages there are many differences, yet there is a similarity, if not identity, in parts which enable the critic to trace them all back to few sources. There are five principal families: (1) That of St. James, or Jerusalem; (2) of St. Mark, or Alexandria; (3) of St. Thaddeus, or the East; (4) of St. Peter, or Rome; (5) of St. John (with whose name that of St. Paul is associated), or of Ephesus. And these primitive liturgies, by their common structure, apart from all else, suggest a common origin. At various times the tendency to divergence has been checked, but in earlier ages no attempt was made to produce uniformity. At the time of the Reformation each bishopric seems to have been entitled to its own use, all being variations of that formed by Augustine, probably from those of the ancient British and French churches, which were of Ephesian origin. A common "order" was afterwards imposed throughout England, and it was even made penal to have in one's possession a copy of one of the old service-books. We have no MS. of a primitive liturgy of a date earlier than the tenth or ninth century, but in substance more than one can be traced to about the date of the oldest of MSS. of the Bible. W. F. Brand.

Liudprand, or **Liutprand,** one of the principal chroniclers of the tenth century, b. about 922, belonged to a noble and distinguished Lombard family, and was educated at the court of Pavia as page to King Hugo of Italy. Under Hugo's successor, Berengarius, he was made chancellor and sent on a diplomatic mission to the court of Byzauz 949. Afterward, however, he fell into disgrace, entered the service of the emperor Otho I., and was by him made bishop of Cremona in 962 and employed in many important negotiations with the pope and the Byzantine court. D. 972. Three works by him have come down to us, and have great value as historical sources: *Antapodoseos Libri VI.*, a narrative of the events from 887 to 949, evidently written in order to avenge himself upon Berengarius and his queen, Willa, *Historia Ottonis* (960–964), and *Relatio de Legatione Constantinopolitana* (968). They are all found in Pertz, *Monum. Hist. Germ.*

Livadi′a, town of Greece, in the district of Attica and Bœotia, on the Hercyna. In its vicinity is the cave of Trophonius, so celebrated in ancient times for its oracle. Pop. 5000.

Live′ly (Edward), D. D., professor of Hebrew and divinity in the University of Cambridge, England, was a learned Orientalist and one of the translators of King James's version of the Bible. He published *Annotations* on several of the minor prophets (1587), and *Chronologia of the Persian Monarchie* (1597). D. 1605. (See Rev. A. W. McClure's *Translators Revived.*)

Live Oak, R. R. junction, cap. of Suwannee co., Fla. (see map of Florida, ref. 1–E, for location of county), 83 miles E. of Tallahassee, has a fine court-house, several cotton-gins and presses, a furniture-factory, and a turpentine distillery. It is connected with Jessup by a branch railroad, has considerable trade in cotton and sugar, and is the seat of Brown University and of Bethlehem College. Pop. in 1880, 458.

Liv′er [Gr. ἧπαρ; Lat. *jecur;* Ger. *Leber;* Fr. *foie*]. The liver is the largest gland in the body; it is appended to the alimentary canal, and is now known to have several distinct functions. The weight is about five pounds, and the specific gravity one and a half greater than water. This organ is situated in the abdomen in the right hypochondriac region, extending across the epigastrium to the left hypochondrium. It reaches, superiorly, the sixth rib, while its anterior border inferiorly approaches the lower margin of the thorax. The form is flattened, broad and thick towards the right extremity, and thinner and narrower towards the left. The superior surface is convex, while the inferior surface is irregularly concave. Upon the posterior border the liver is thick and rounded, with a thin and sharp anterior border. In the abdomen the position is oblique; in the erect posture the convex surface is directed upward and forward, with the concave downward and backward. The diaphragm, covering the superior convex surface, separates the liver from the under surface of the right lung and from the heart. Anteriorly, it is in relation with the diaphragm and transversalis muscle, and at the epigastrium with the sheath of the rectus muscle and linea alba. The inferior concave surface is in relation with the stomach anteriorly, a portion of the duodenum, transverse colon, and right kidney, and by its left extremity with the upper end of the spleen. The diaphragm intervenes between the vertebral column and posterior border of the liver, while the anterior border is free, and in relation with the transversalis muscle and round ligament at the notch. The liver possesses five ligaments, by means of which it is retained in place, called the broad, the coronary, the two lateral, and the round ligament. By five fissures, named longitudinal, fissure for the ductus venosus, transverse fissure, fissure for gall-bladder, and fissure for vena cava, the liver is divided into five lobes; these lobes are designated right and left lobe, lobus quadratus, lobus Spigelii, and lobus caudatus. The liver is covered by the peritoneum externally; the folds of this membrane as it passes from the surface of the organ form four of the ligaments above enumerated. The round ligament is the result of the obliteration of the umbilical vein of the fœtus. The proper coat of the liver is a dense and thin fibrous membrane, very adherent to the substance of the organ, and in intimate relation with the peritoneum. Attached to the liver, in the shallow fossa upon the under surface of the right lobe, lying parallel with the longitudinal fissure, is a membranous sac, the gall-bladder. The gall-bladder is divided into a body, fundus, and neck. The body is the middle portion; the fundus the expanded extremity which approaches the notch in the free border; the neck, the portion which, narrowing, enters the right extremity of the transverse fissure and forms the *cystic duct*. The cystic duct is about one and a half inches in length, and has the diameter of a crow's quill. At the transverse fissure the duct unites with the excretory duct of the liver, *the hepatic duct*, forming by this junction the *ductus communis choledocus*. The ductus communis choledocus, with a length of three inches, passes through the right border of the lesser omentum, and opens into the duodenum, passing obliquely between its coats. (For the minute anatomy of the liver and gall-bladder see HISTOLOGY.)

The Physiology of the Liver.—The liver as a gland stands alone in the economy, on account of the complexity of function which it possesses. The physiology of glands in general points to but one function for each; in the case of the liver, however, may be enumerated (1) the secretion of bile (which is both a secretion and an excretion), and (2) the glycogenic or sugar-producing property. Under the head of bile is included both a secretion of importance to digestion—in fact, necessary for life—as well as an important excretion.

How is the Bile secreted?—According to the views of some physiologists, there are two distinct systems in the liver—one for the secretion of bile, accomplished by the little racemose glands* attached to the gall-duct as it ramifies in the substance of the gland, and one for the production of sugar, the hepatic or liver cells. This theory, however, does not seem to be correct, as there are animals, as the rabbit, in which the small glands above referred to do not exist, at the same time that both bile and sugar are produced by its liver. We are therefore obliged to consider that there is no anatomical or physiological evidence that the bile is secreted anywhere but in the lobules or acini by means of the hepatic cells. At this point the small bile-capillaries take up the material and carry it to the gall-bladder, where it is stored up for future use. A question of interest arises as to whether the bile be formed from venous or arterial blood. The hepatic artery has been tied, and bile was secreted still. From the experiments of Oré it is shown that when the portal vein is obliterated bile continues to be formed from the blood of the hepatic artery. Hence we conclude that bile may be formed from either venous or arterial blood.

Quantity of Bile.—From experiments on animals, with a fistula in the gall-bladder and the ductus communis choledocus tied, it has been estimated that the quantity of bile secreted in twenty-four hours in a healthy man weighing 140 pounds is 2½ pounds.

Flow of the Bile.—During the period in which the digestive functions are inactive the gall-bladder is constantly receiving bile from the liver. As soon, however, as stomach digestion is completed, and the food passes into the duodenum by means of the distended condition of the surrounding organs, a sufficient amount of pressure is exerted upon the walls of the gall-bladder to force out the bile, through the ductus communis choledocus, into the small intestine. The flow of bile continues during the period of intestinal digestion, after which no more passes into the duodenum: the gall-bladder still receives this fluid from the liver, and in this manner it is stored up for future use. The bile, then, is constantly formed by and discharged from the liver. This peculiarity belongs to the liver, for it is a well-established fact that *secreting* glands are only active at certain times, their functions not being constantly required.

Properties of the Bile.—As the bile flows from the hepatic duct directly, it is a somewhat viscid fluid, which, after remaining in the gall-bladder, has its viscidity increased by the further admixture with mucus. The color of the bile varies greatly with the animal from which it is obtained, being in the human subject, when procured immediately after death, of a dark golden brown. Pig's bile is clear yellow; dog's, dark brown; ox bile has a green color. The specific gravity of human bile varies from 1018 to 1026. The reaction of fresh healthy bile is alkaline. There is no characteristic odor, but it readily undergoes putrefaction, giving forth a most offensive stench. The taste is extremely bitter. When shaken the bile becomes frothy, owing to its mucous and saponaceous constituents. The composition of human bile may be seen from the following table:

Composition of Human Bile.

Water	915.00	to	819.00
Taurocholate or cholate of soda	56.50	"	106.00
Glycocholate or cholate of soda (?)	traces.		
Cholesterine	1.60	to	2.66
Coloring-matter, bilirubin	14.00	"	30.00
Lecithine, margarine (?), oleine, and traces of soaps	3.20	"	31.00
Choline	traces.		
Chloride of sodium	2.77	to	3.50
Phosphate of soda	1.60	"	2.50
" " potassa	0.75	"	1.50
" " lime	0.50	"	1.35
" " magnesia	0.45	"	0.80
Salts of iron	0.15	"	0.30
Salts of manganese	traces.		
Silicic acid	0.03	to	0.06
Mucosine	traces.		
Leucine, tyrosine, xanthine	3.45	to	1.21
	1000.00		1000.00

The ingredients of the bile which possess the greatest amount of interest are what are termed *biliary salts*, first known under the name *biliary matter* (Berzelius) and *picromel* or *biliary resin* (Thénard), to whose original papers, mentioned below, the reader is referred. Most of our present knowledge has been obtained from the investigations of Strecker, Lehmann, and Dalton.

Coloring-matter of the Bile.—Chemistry, so far, has shown us that there are two principal biliary coloring-matters—viz. *bilirubine* and *biliverdine*. Both substances are nitrogenous: the first of a reddish-yellow color and crystallizable; the second imperfectly crystallizable, and of a green hue. Besides these two coloring-matters, we may mention biliphæine, bilifuscine, and biliphrasine, which, however, are simply modifications or derivatives of bilirubine and biliverdine.

The Physiology of the Liver.—We have already referred to the functions of this organ, and have seen that it secretes bile and forms sugar. Let us first consider the functions of the bile. There are two distinct functions of the biliary fluid. In the first place, it is a secretion formed from the blood by the liver, and discharged into the alimentary canal for purposes of digestion. Here, after modifying the digestive process, a part is absorbed into the system, and a part (cholesterine) passes out of the economy. That the bile is necessary to life we have seen, for when this fluid is allowed to escape through a fistula an animal will die of inanition in from twenty-seven to thirty-eight days. Physiologists are not yet acquainted with the exact action of the bile as a digestive fluid; some considering that it is for the purpose of causing the movements of the intestine (peristaltic action), others that it supplies alkalinity to the absorbing vessels of the villi, which hastens the introduction of fat into the blood; while, on the other hand, it has been claimed that the bile forms an emulsion with fats to a great extent, and in this manner aids the secretion from the pancreas, so as to completely digest fatty materials. We can only state that the bile performs some part in the digestive process; what it may be is at present unknown. The biliary salts, with certain other constituents of the bile, are absorbed in the intestine, as they cannot be found in the fæces, and are not seen to accumulate in the blood when the liver is diseased or extirpated.

The Bile as an Excretion.—Although it is well known that cholesterine is found in small quantity in the crystalline lens and spleen, by far the larger amount is met with in the brain and nervous system. A series of experiments have shown that the blood acquires cholesterine in passing through the brain and nerves of the extremities, and therefore there can be no doubt but that the blood takes up this substance from the nervous system generally; the cholesterine representing the wornout nerve-tissue, as urea does that of muscle. By a further series of observations by Prof. Flint, Jr., the fact is established that in cases where there is paralysis, or any form of disease which interferes with nerve-function, the blood coming from the part or parts affected contains little or no cholesterine. Furthermore, when the liver becomes affected (which would prevent its separating the cholesterine from the blood) the cholesterine collects or accumulates in the blood to such an extent as to produce a poisoning called *cholesteræmia.* We have already alluded to the fact that although cholesterine is discharged into the intestines in order to be thrown out of the system, before it reaches the external world it becomes changed into *stercorine* in the alimentary canal, and is found as such in the fæces. In cases where the function of the liver is interfered with by disease the fæces contain no stercorine. As yet no exact chemical relations have been established between cholesterine and stercorine.

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*The function of these glands is undoubtedly to form mucus, which is always found in the bile as it comes from the hepatic duct.

The Glycogenic or Sugar-forming Function of the Liver.—In 1848, Bernard, the illustrious French physiologist, showed that the blood coming from the liver contained sugar of the variety found in the urine of persons suffering from *diabetes mellitus.* When an animal is fed exclusively upon animal food, which contains no sugar, and the blood going to the liver is examined carefully, no sugar is to be found in it; but when the blood coming from the liver is analyzed, sugar is always present, even though the time were chosen when the digestive function was quiescent; in fact, in starving animals the blood of the hepatic veins always contains sugar. These experiments point to the fact that the blood acquires sugar in its passage through the liver. Bernard further examined the blood from various parts of the body, made extracts of all the tissues, and found sugar only in the tissue and blood of the liver. As the blood passes from the hepatic veins it becomes mingled with that of the venæ cavæ, and in its passage through the lungs the sugar either entirely or in great part disappears. We can then conclude that the liver, unlike any other gland in the body, is a secreting as well as an excreting organ, and, like the ductless glands, it forms a substance (sugar) which is delivered directly into the blood.

Literature.—Oré, *Inférence de l'Oblitération de la Veine porte sur la Sécrétion de la Bile, Comptes Rendus* (Paris, 1856); Longet, *Traité de Physiologie* (Paris, 1869); Robin, *Leçons sur les Humeurs* (Paris, 1867); Bidder und Schmidt, *Die Verdauungssäfte* (Leipsic); Dalton, *Treatise on Human Physiology* (Philadelphia, 1871); Bernard, *Liquides de l'Organisme* (Paris, 1859); Robin et Verdiel, *Traité de Chimie anatomique* (Paris, 1853); Lehmann, *Physiological Chemistry* (Philadelphia, 1855); Bérard, *Cours de Physiologie* (Paris, 1851); Milne Edwards, *Leçons sur la Physiologie* (tom. 7, Paris, 1862); Flint, Jr., *The Physiology of Man* (New York, 1867–70); Pettenkofer, *Notiz über eine neue Reaction* (auf.); Galle und Zucker, *Annalen der Chemie und Pharmacie* (Heidelberg, 1844); Bernard, *Leçons de Physiologie expérimentale* (Paris, 1855); Ib., *De l'Origine du sucre dans l'Economie animale, Archives général de Médecine* (Paris, 1848); Ib., *Sur les Effets des Substances toxiques et médicamenteuses* (Paris, 1857); Ib., *Recherches sur une nouvelle Fonction du Foie* (Paris, 1853); Frerichs, *Verdauung,* Wagner's *Handwörterbuch der Physiologie* (Braunschweig, 1846); Strecker, *Untersuchung der Ochsgalle, Annalen der Chemie und Pharmacie* (Heidelberg, 1848); Todd, *Cyclopædia of Anatomy and Physiology* (London, 1839–47, vol. iii.); Sanderson, *Handbook for the Physiological Laboratory* (Philadelphia, 1873); Bennett, *Text-book of Physiology* (Philadelphia, 1873); Dalton, *Spectrum of Bile, N. Y. Medical Journal* (1874). J. W. S. ARNOLD.

Livermore (ABIEL ABBOT), b. in Wilton, N. H., Oct. 30, 1811; educated at Exeter; graduated at Harvard College 1833, and at the Divinity School 1836; settled in Keene, N. H., 1836, in Cincinnati 1850; in 1857 removed to Yonkers and became editor of the *Christian Inquirer,* a Unitarian paper in New York; since 1863 has been president of the Theological School at Meadville, Pa. Mr. Livermore has been a contributor to magazines, and is the author of several works: *A Commentary on the Four Gospels* (2 vols., 1841–42), *A Commentary on the Acts of the Apostles* (1844), *Lectures to Young Men* (1846), *The Marriage Offering,* a prize essay on the Mexican war (1850), *Discourses* (1854), *A Commentary on Romans* (1854). He was also one of the compilers of the book of hymns known as the *Cheshire Collection* (1845). O. B. FROTHINGHAM.

Livermore (GEORGE), b. at Cambridge, Mass., July 10, 1809: educated at the public schools; was carefully trained for a mercantile life, and after some experiences at different places entered into business at Boston as a wool commission-merchant, in which he became, and remained through life, one of the prominent business-men of that city, taking pride in being known in that capacity. Early in life he began to devote his leisure to historical and antiquarian researches, in which he became a recognized authority, and in the specialty of editions of the Bible in different languages his collection was probably the finest in America. He was fond of large-paper copies and illustrated editions, in which his library was very rich. He was in 1849 honored with an election to the Massachusetts Historical Society, of which he was an active and influential member, as also of the American Antiquarian Society, the American Academy of Arts, and the Boston Athenæum, of all which he was often an officer. He frequently wrote for the newspapers and reviews upon subjects of a bibliographical or historical character, all his contributions being marked by a pure and vigorous style and displaying extensive research. Among these papers may be mentioned those in the *Cambridge Chronicle* on the *New England Primer* (1849), in the *North American Review* on *Public Libraries* (1850), and his important essay, *An Historical Research respecting the Opinions of the Founders of the Republic on Negroes as Slaves, as Citizens, and as Soldiers,* read before the Massachusetts Historical Society Aug. 14, 1862, printed in the *Proceedings* of that society, and separately in four other editions on superior paper, making a volume of 215 pages. Mr. Livermore was a liberal contributor of his time, strength, and money to the Union cause during the civil war, was instrumental in securing for the Historical Society the invaluable library of Mr. Dowse, and was beloved by all his acquaintances as a high-minded Christian gentleman and scholar. D. at Cambridge Aug. 30, 1865. Beautiful tributes to his memory were paid—by Rev. E. E. Hale in his sermon entitled *The Public Service of a Private Man,* and by Hons. R. C. Winthrop and Charles Deane in addresses before the society which he had adorned.

Livermore (MARY ASHTON), b. at Boston, Mass., Dec. 19, 1821, daughter of Timothy Rice and wife of D. P. Livermore, a Universalist minister; has written largely for periodicals, labored with much ability in behalf of the Sanitary Commission during the civil war, and has taken a prominent position as a writer and public speaker upon woman suffrage and various social and religious questions. In 1870 she was editor of *The Woman's Journal* at Boston, Mass.

Liv'erpool, next to London the largest city, and without any exception the largest seaport, of the United Kingdom of Great Britain and Ireland, is situated in lat. 53° 24′ 6″ N., lon. 2° 59′ 5″ W., on the estuary of the Mersey, 4 miles from the Irish Sea, one hour's distance by railway from Manchester, six hours' from London and Edinburgh, and eight hours' by steam from Dublin. In 1647 it was made a free port, and in 1697 it was declared an individual parish, but it had at that time only about 5000 inhabitants, and its shipping numbered only about 80 vessels. Its growth began in the eighteenth century, and became very rapid in the latter part of it. In 1760 its population had increased to 25,700 souls, and its shipping to 1245 vessels, and in 1800 to 77,700 and 5000 respectively, and it has since gone on increasing. Its population in 1851 was 375,955; in 1861, 443,938; in 1871, 493,346; in 1881, 552,425, of whom 271,640 were males and 280,785 females. In 1866 there cleared from its port 12,685 vessels, of 4,464,445 tons burden, of which 3267 were British vessels, of 2,345,658 tons, 1361 foreign, of 620,810 tons, and 8157 belonging to the coast-trade—namely, 4418 sailing vessels and 3639 steamers; to the port itself belonged 2998 ships—namely, 2569 sailing vessels, of 1,326,317 tons, and 429 steamers, of 205,664 tons. In 1873, 15,104 vessels, of 6,339,376 tons, entered the harbor, and 15,006 cleared it; of the entering vessels, 7923 were sailing vessels and 7083 steamers: 4042 were foreign and 9408 employed in the coast-trade. To the port itself belonged 1866 sailing vessels, of 990,867 tons and 563 steamers, of 412,464 tons. In 1880, 20,249 vessels, of 7,933,620 tons burden, entered the port, and the tonnage belonging to the city (1,554,871) was greater than that of any other city in the world. The development of this gigantic traffic, which is surpassed only by that of the port of New York, is partly due to the growth of the manufacturing industry of the neighboring inland towns and the establishment of perfect means of communication between these places and Liverpool. The Bridgewater Canal, connecting the Trent and the Mersey, was opened in 1773; the railway to Manchester in 1830, to Birmingham in 1837, to London and Preston in 1838. Thus Liverpool became the chief port of exportation from Great Britain; nearly one-half of all British exports are shipped from its docks. The value of British produce and manufactures exported in 1880 from Liverpool amounted to £84,029,651. But another and perhaps still greater influence on the development of the commerce of Liverpool was derived from the rise of the U. S. About four-fifths of all the traffic which takes place between North America and Great Britain is carried on through the port of Liverpool, there being five lines of steamers to New York alone, besides others to Philadelphia, Boston, Halifax, New Orleans, etc. The abolition in 1833 of the monopoly of the East India Company, which gave Liverpool a chance of participating in the trade with the East, and the rise of the Australian colonies, have also contributed to make it the most important place of importation in the United Kingdom. Half of all the grain, bacon, hams, lard, madder, palm oil, etc. which is imported to England is received here, and here is held the largest cotton-market in the world, and soon probably it will have the largest wool-market. In 1880 the total value of imports, consisting mostly of grain and food, raw produce, and materials for manufacture, amounted to £107,460,187. In addition to this tremendous importation and exportation, an important manufacturing industry is carried on in the city. Its sugar-refineries and soap-factories are very extensive. Its shipbuilding establishments are also in very active operation. It was one of the first branches of industry started here, and it was largely developed in the latter part of the eighteenth century; from 1777 to 1782, 15 vessels of war were launched here, ranging from 16 to 50 guns. In the years 1880–81 there were launched from its yards 33 iron ships, of 53,971 tons burden. Attempts, however, at establishing cotton-mills in or near the city have uniformly failed, while engineering works of various kinds have gradually grown up and are carried on on a large scale. The pottery manufacture, which a century ago was very flourishing, is now nearly extinct, while excellent watches and chronometers are still made.

Liverpool is the most densely peopled city in England. In 1868 it contained 96 persons to an acre, while Manchester contained only 81, Birmingham 44, and London 40. A generation ago it was also one of the filthiest and unhealthiest cities in Europe, and in the beginning of this century certain of its quarters were world-famous as the most frightful haunts of vice, crime, and misery. But in these respects great improvements have been made and are still making, and Liverpool is now fairly on the way to become a magnificent city. Its accommodations for traffic are most splendid. The docks, stretching along the Mersey 5 miles on the Liverpool side and 2 miles on the Birkenhead side, are unsurpassed by any in the world. They cost £10,000,000 to construct, and are masterpieces of engineering art. A full description of them will be found in the article on DOCKS. Three railway lines cross the city from the docks in huge tunnels under the houses, while the Lancaster and Yorkshire Railway is carried above the houses on a splendid viaduct to Tithebarn street, where stands one of the largest dépôts in the world, its glass roof covering an area of 84,000 square feet. The public buildings more recently erected are on a grand and magnificent scale, such as St. George's Hall, with Corinthian columns 40 feet high, and a hall for public meetings, concerts, etc. 161 feet long and 75 feet wide; the exchange, forming the three sides of a square, with the town-hall on the fourth, and the Nelson monument in the centre; the Free Library and Museum, etc. Broad and handsome streets have been run through several of the most crowded parts of the city; it has been amply provided with good water and gas; numerous hospitals, asylums, and other institutions for the relief of the sick, poor, and destitute have been founded; good educational institutions, from the elementary school to the scientific association with its library, observatory, botanical garden, etc., have been established; dignified and beautiful places of worship and decent and elegant places of amusement have been built, and an effective police has been procured. CLEMENS PETERSEN.

Liverpool, seaport of Nova Scotia, cap. of Queen's co., has considerable trade in fish and lumber. The town is well built and attractive. It has a good harbor, into which flows the river Mersey. It has 1 weekly newspaper, a bank, and a lighthouse on Coffin's Island; lat. 44° 3′ N., lon. 64° 36′ W. Pop. of sub-district, 3104.

Liverpool, Onondaga co., N. Y. (see map of New York, ref. 4–F, for location of county), on the E. shore of Onondaga Lake, 4 miles N. of Syracuse, on R. R. and the Oswego Canal, has an academy, cigar-factories, several large mills, and an extensive manufacture of willow baskets. The leading industry, however, is the manufacture of salt in a large number of works. Pop. in 1870, 1555; in 1880, 1350.

Liverpool (CHARLES JENKINSON), FIRST EARL OF, b. in Oxfordshire, England, May 10, 1727; educated at Oxford; entered Parliament, and became under-secretary of state in 1761; was joint secretary of the treasury in 1763; lord of the admiralty in 1766; lord of the treasury in 1767; vice-treasurer of Ireland and privy councillor in 1772; master of the mint in 1776; and secretary of state for the war department in Lord North's administration from 1778 to 1782, in which capacity he had much to do with determining the course of military operations in the U. S. during the closing years of the American war of independence. On retiring from the latter office he enlisted in the political circle which was grouping itself around the younger Pitt, by whom he was appointed in 1784 president of the board of trade, and held that post during the whole seventeen years of Pitt's first administration. He was created Baron Hawkesbury in 1786, and earl of Liverpool June 1, 1796, and d. in London Dec. 17, 1808. He published a *Collection of all the Treaties of Peace between Great Britain and Other Powers from 1648 to 1783* (3 vols., 1785).

Liverpool (ROBERT BANKES JENKINSON), SECOND EARL OF, b. in London June 7, 1770; educated at Oxford; entered Parliament in 1790, before attaining his majority; took rank as a ready debater; went on a special mission to Coblentz in 1791; succeeded (by courtesy) to the title of Lord Hawkesbury in 1796; was appointed secretary of state for foreign affairs in the Addington cabinet, and negotiated the Treaty of Amiens in 1801; became home secretary under Pitt in 1805, and again in 1807; and succeeded to the earldom of Liverpool in Dec., 1808. On the death of Pitt (1806), and again on the fall of the Fox and Grenville administration (1807), he had refused the premiership, but accepted it on the assassination of Mr. Perceval (May 11, 1812), with the title of first lord of the treasury, and remained at the head of the administration fifteen years, until an attack of paralysis (Feb. 17) occasioned his resignation in Apr., 1827. D. Dec. 4, 1828.

Livery of Seizin. See FEOFFMENT.

Liverworts. See HEPATICÆ.

Liv′ia Drusil′la, a daughter of L. Livius Drusus Claudianus, b. in 56 B. C. and married early to Tiberius Claudius Nero, to whom she bore two sons, Tiberius and Drusus. While pregnant with the latter she made the acquaintance of Augustus, and fascinated him so much that he compelled her husband to cede her to him, while at the same time he divorced his own wife, Scribonia. Their marriage was very happy. But behind the bland reserve of her appearance she concealed a plan of enormous ambition and cruelty, and she pursued it without scruple. As the years passed away all the members of the family of Augustus were ruined one after the other, and the old emperor at last found himself alone in the palace with Livia and her son Tiberius, whom he adopted and made his heir. All Rome execrated the empress. She survived Augustus fifteen years, but she soon lost her influence under the reign of Tiberius. She d. at Rome in 29 A. D.

Livingston, on R. R., cap. of Sumter co., Ala. (see map of Alabama, ref. 5–B, for location of county). Pop. of v. in 1870, 500; in 1880, 738.

Livingston, Gallatin co., Mon. (see map of Montana, ref. 4–D, for location of county), on Northern Pacific R. R. at junction of branch R. R. to National Park. Pop. not in census.

Livingston, cap. of Overton co., Tenn. (see map of Tennessee, ref. 5–H, for location of county), 100 miles E. of Nashville and 18 miles E. of the Cumberland River, has an academy. Principal business, farming and stock-raising. Pop. in 1870, 240; in 1880, 312.

Livingston, cap. of Polk co., Tex. (see map of Texas, ref. 4–J, for location of county), 100 miles N. N. E. of Galveston. Pop. in 1880, 135.

Livingston (BROCKHOLST), LL.D., b. in New York Nov. 25, 1757, son of William Livingston; left Princeton College to join Gen. Schuyler's staff in 1776; served on Arnold's staff, and attained the rank of colonel; was private secretary to John Jay in Spain in 1779; was admitted to the bar in 1783; became a judge of the New York supreme court in 1802, and was from 1806 to 1823 an able, upright, and accomplished judge of the U. S. Supreme Court. D. at Washington, D. C., Mar. 19, 1823.

Livingston (EDWARD), b. at Clermont, Columbia co., N. Y., May 26, 1764, a son of Judge Robert R. Livingston (1719–75); graduated at Princeton in 1781, and began the practice of law in New York; was a Jeffersonian member of Congress 1795–1801; in 1802 was U. S. district attorney; was twice chosen mayor of New York (1801 and 1802), and at the same time was a judge of a municipal court; in 1803 became involved in pecuniary difficulties, and in 1804 removed to New Orleans, and attained a most brilliant reputation as a lawyer; in 1808 became involved in a lawsuit with regard to lands in New Orleans claimed by the general government, but ultimately won the case. At the battle of New Orleans he acted as aide to Gen. Jackson. Mr. Livingston spent many years in preparing civil and criminal codes for Louisiana—labors which won for him a wide fame in Europe and in Spanish America. He was a member of Congress 1823–29; U. S. Senator 1829–31; secretary of state 1831–33; minister to France 1833–35. He was made a member of the French Academy of Moral and Political Sciences. He afterwards fixed his residence at Rhinebeck, N. Y., where he d. May 26, 1836. His chief works are *Judicial Opinions* (1802), *Report of the Plan of the Penal Code* (1822), *Penal Law for Louisiana* (1826), and *Penal Law for* *the U. S.* (1828). His *Complete Works on Jurisprudence* were published in New York in 1873. The revision of the civil code of Louisiana (1824) was the joint work of Livingston and M. Moreau-Lislet, though chiefly from the pen of the former. (See his *Life*, by C. H. Hunt, 1864; *Recollections of Livingston*, by M. Davezac.)

Livingston (Gen. HENRY BEEKMAN), son of Judge R. R. Livingston (1719–75), b. at Livingston Manor, N. Y., in 1750; raised a military company in Aug., 1775, with which he accompanied Gen. Montgomery's expedition to Canada, and for distinguished gallantry at the capture of Chambly was voted a sword of honor by Congress. He became aide-de-camp to Gen. Schuyler Feb., 1776, and colonel of the 4th battalion New York Vols. Nov., 1776, but resigned in 1779. Bred to the law, he attained successively the posts of attorney-general, judge, and chief-justice of the supreme court of his native State, was president of the New York Society of the Cincinnati, and appointed a brigadier-general in the war of 1812. D. at Rhinebeck, N. Y., Nov. 7, 1831.

Livingston (JOHN HENRY), D. D., b. at Poughkeepsie, N. Y., May 30, 1746: graduated at Yale College in 1762; began the study of law, but afterwards studied theology at Utrecht, Holland; was ordained at Amsterdam 1770; became pastor of the Dutch church in New York; preached at Albany, Kingston, and Poughkeepsie during the war; was appointed professor of divinity 1784; opened a seminary at Bedford, L. I., in 1795, which was discontinued two years later, and became in 1807 president and professor of theology at Queen's (now Rutgers) College, New Brunswick, N. J., where he d. Jan. 20, 1825. He published *Psalms and Hymns* and some religious writings, and was considered the father of the Reformed Dutch Church in America.

Livingston (PHILIP), a signer of the Declaration of Independence, b. at Albany, N. Y., Jan. 15, 1716; graduated at Yale in 1737; became a prosperous merchant and official of New York City; was Speaker of the house of the colonial legislature in 1768, a member of the Continental Congress 1774–78, and president of the provincial Congress 1775. He was one of the founders of the New York Chamber of Commerce and of the Society Library, and materially aided Yale and Columbia colleges. D. at York, Pa., June 12, 1778.

Livingston (ROBERT R.), b. in New York State in 1719; became a distinguished lawyer; was judge of the admiralty court 1760; justice of the New York supreme court 1763; representative in the assembly 1759–68, and commissioner in 1767 and 1773 to locate the boundary-line between New York and Massachusetts. D. at Philadelphia Dec. 9, 1775.

Livingston (ROBERT R.), LL.D., known as "Chancellor" Livingston, b. at New York Nov. 27, 1747, a son of Judge R. R. Livingston and a brother of Edward Livingston; graduated at King's (now Columbia) College in 1765; became a successful lawyer; was recorder of New York 1773–75; a member of the Continental Congress 1775–77 and 1779–81; was on the committee which reported the Declaration of Independence, but was prevented by circumstances from signing it; was secretary of foreign affairs 1781–83; chancellor of New York 1777–1801; was instrumental, while U. S. minister to France (1801–04), in effecting the purchase of Louisiana; was the assistant of Fulton in perfecting steam-navigation; was one of the introducers of merino sheep into the U. S., and held with great efficiency various public positions. D. Feb. 26, 1813.

Livingston (WILLIAM), LL.D., a brother of Philip, b. at Albany, N. Y., in 1723; graduated at Yale in 1741; became a prominent lawyer and journalist; removed in 1773 to Elizabethtown, N. J.; was elected in 1774 and 1775 to the Continental Congress; became in 1775 brigadier-general of militia; was governor of New Jersey 1776–90; was a member of the convention which in 1787 drew up the Federal Constitution. He was a writer of considerable ability, though he published nothing but occasional pamphlets. D. at Elizabethtown, N. J., July 25, 1790.

Liv'ingstone (DAVID), M. D., LL.D., b. at Blantyre, near Glasgow, Scotland, Mar. 19, 1813. His parents were very poor, and could give him no aid to acquire a scholarly education. His religious enthusiasm, however, in connection with a passion for travelling in foreign countries, created early the idea of a missionary life in his mind; and first by attending an evening school while employed during the day in the cotton-mills, and later on by working hard during the summer and studying during the winter, he contrived to prepare himself thoroughly for his task. In 1840 he offered his services as a missionary to Africa to the London Missionary Society, and shortly after was ordained and proceeded to Port Natal in South Africa. Here and on several other mission-stations he worked for nine years, together with Robert Moffat, whose daughter he married, but, although at that time preaching and not exploration was his chief aim, yet he sent much valuable information to the Geographical Society of London and to Petermann's *Geographische Mittheilungen*, in Gotha. In 1849 he made his first journey of exploration in search of Lake Ngami, which he discovered Aug. 1 same year, and whose borders and outlet he explored. In 1853 he crossed the continent from the Zambesi to the Congo, whence he proceeded to Loando, the capital of Angola, where he arrived in June, 1854, after eighteen months' travelling. In September he returned, crossing the continent once more, this time from Loando to Quilimane, on the Indian Ocean, where he arrived May 20, 1856. He then made a visit to England, where in 1857 he published his *Missionary Travels and Researches in South Africa*, which made his name popular not only in England, but in all Europe. In 1858 he returned to Africa, and, supported by the government and accompanied by several scientific associates, he started from Quilimane on an exploring journey up the Zambesi, which lasted five years, and during which his wife, who accompanied him, died at Shupanga, Apr. 27, 1862. In 1864 he returned to England, and in 1865 published *A Narrative of an Expedition to the Zambesi*. Shortly after he again left England, starting on his third great journey, but more than one year elapsed before any communications were received from him. It was then rumored that he had been killed by the natives near Lake Nyassa, and an expedition under the command of Mr. Young went out in search of him. Mr. Young did not find him, but later on letters from him arrived dated July, 1868, and May, 1869. Again more than one year elapsed without any communications, until the New York *Herald* sent out Mr. Henry M. Stanley in search of him, who found him in Ujiji in the autumn of 1871. As it was Livingstone's idea to remain in Africa and continue his explorations one more year, the Royal Geographical Society of London sent out early in 1873 a relief expedition under the command of Lieut. Cameron. When this expedition reached Unyanyembe (Aug. 4), one of Livingstone's associates met it with the report that he had died at Chitambo's village, Ulala, on May 1, 1873. On Oct. 16 his corpse reached Unyanyembe, whence it was brought to England and buried in Westminster Abbey, where a memorial tablet marks his resting-place. His *Last Journals* were published in 2 vols. in London in 1874, edited by Rev. Horace Waller. (See Stanley's *How I Found Livingstone*, 1873.) CLEMENS PETERSEN.

Liv'ius Androni'cus lived in the third century before our era, and was b. at Tarentum, a slave of Greek descent. He received his liberty from M. Livius Salinator, and began to represent tragedies and comedies (which he composed after Greek models) in Rome in the middle of the century. He also translated the *Odyssey* into Latin, and contributed much to make the Romans acquainted with Greek literature. In the time of Horace his compositions were still used in the schools, and his works were extant in the fourth century of our era, but only a few insignificant remnants have come down to our time, edited by Düntzer (Cologne, 1835) and by Ribbeck, *Trag. Lat. Rell.*

Liv'nee, or **Livny,** town of Russia, in the government of Orel, on the Sosna. The district of Livny is one of the most fertile and populous of Central Russia, thickly studded with large and thriving villages, which bring their grain, hemp, cattle, tallow, and skins to the town of Livny, whence they are sent to Moscow, St. Petersburg, and the Baltic ports. Pop. 12,970.

Livo'nia [Ger. *Liefland*], government of Russia, bordering on the Gulf of Livonia, and comprising, together with the island of Oesel, an area of 17,801 square miles, with 1,126,000 inhabitants. The surface is low, flat, and often marshy, dotted with numerous lakes, and covered with forests. Toward the S. E., however, it rises and forms a plateau about 500 feet high and intersected with numerous valleys. The soil is not very productive. Swamps and peat-bogs occupy a large portion of the ground, and vast sand-wastes stretch along the Baltic coast. Rye, barley, oats, buckwheat, flax, and hemp are raised, and many cattle reared. In the towns the inhabitants are mostly of German descent, mixed with Russians, Poles, and Jews; in the country they are of Finnish origin. Cap. Riga. The country was a Swedish possession from the Peace of Oliva (1660), when it was conquered from Poland, to the Peace of Nystadt (1721), when it was ceded to Russia.

Livonia Station, N. Y. See APPENDIX.

Livor'no, town of Italy, in the province of Novara, about 8 miles S. W. of Vercelli. It is mentioned in ecclesiastical history under the name of *Liberone* as early as the fifth century. Pop. 5797.

Livre [Fr. for "pound;" Lat. *libra*], the former French standard unit of weight, was to the pound avoirdupois as 17.267 to 16. Also, a former French coin, superseded in 1795 by the franc, which is to the *livre Tournois* (the old standard) as 81 to 80, the Parisian livre being to these figures nearly as 100. Still other livres were in use.

Liv'y (TITUS LIVIUS), b. at Patavium in Northern Italy in 59 B. C., lived chiefly in Rome, where he enjoyed the favor of Augustus and maintained intimate intercourse with the young Claudius, but returned in his old age to his native city, and d. there in 17 A. D. He was married, had at least one son and one daughter, and enjoyed great celebrity among his contemporaries, but nothing further is known of his personal life. According to Seneca, he wrote several dialogues and essays on philosophy, which have been lost, but the work by which he won a lasting fame was his *Annales*, containing the history of Rome from the foundation of the city to the death of Drusus, 9 B. C. It consisted originally of 142 books, and the short introductions with which the first, twenty-first, and thirty-first open seem to indicate that it was divided into groups of ten books or *decades*, each decade comprising an independent epoch. But of these 142 books only 35 have come down to us—namely, the entire first decade, i.–x., embracing the period from the foundation of Rome to the year 294 B. C.; the entire third decade, xxi.–xxx., embracing the period from 219 B. C. to 201 B. C.; the entire fourth decade, and one half of the fifth, xxxi.–xlv., embracing the period from 201 B. C. to 167 B. C. Of the rest only a few and inconsiderable fragments are still extant; all the so-called *epitomes*, however, short extracts of or indexes to each book, have been preserved. The first printed edition (Rome, 1469) contained only 29 books, namely—i.–x., xxi.–xxxii., xxxiv.–xl. The remaining six books were discovered in fragments in 1518, 1531, and 1616, and for more than two centuries the whole learned world was put into general commotion every now and then by a rumor that the entire work had been discovered, until in the seventeenth century all libraries had been ransacked in vain, and all hope of the recovery of the lost treasure was given up. The best modern editions are by Drakenborch (Leyden, 1738–46, and Stuttgart, 1820–28), Twiss (Oxford, 1840–41), Madvig (Copenhagen, 1861 *seq.*), and Weissenborn (Berlin, 1861 *seq.*). There are English translations by Philemon Holland (1600), Baker (1797), John Hayes (1744), and in Bohn's *Classical Library* (1850). Considered as a work of science, modern scholars have not given the highest praise to the *Annales*; the studies on which the representation rests are generally not exhaustive, and often not accurate. Nor can great praise be given to the book considered as a work of art. Its general character is that of a fluent narrative, which interests on account of the great importance of its contents, and pleases because it has no very striking peculiarities. Its most prominent feature is a strong feeling of the greatness of the Roman people; but with the author this feeling is a vanity rather than an inspiration, and in his work it is a means of flattery rather than a means of moral elevation. Thus, while the historical value of the *Annales* cannot be over-estimated on account of the scarcity and in many cases the absolute lack of other historical documents, the educational and æsthetic worth of the book is somewhat limited. CLEMENS PETERSEN.

Lixivia'tion and **Lixivium** [Lat. *lix*, "ley"; *liquid* and *liquor* are affiliated words]. Lixiviation is the method of extracting ingredients soluble in water from porous substances, like ashes or earth, by placing the latter in some receptacle, through which the water may be made to percolate. It is distinguished from another chemical method of accomplishing this called DECANTATION. (See this word.) The vessel for lixiviation usually has a perforated bottom, upon which straw or coarse gravel is first spread, and then the material to be lixiviated is filled in. All our American potash is thus obtained from wood-ashes, and much of the saltpetre of commerce thus from nitrous earth. Much economy is often arrived at by a construction which enables the first water poured on the mass to remain in it for some time until it has finished its solvent action, and then drawing off at the bottom. Sometimes then, on pouring through fresh water, it will be found soon to run through nearly pure. Concentrated leys are thus obtained without boiling down. The second water is not allowed to mix with the first, but kept to pour through a fresh mass of material. H. WURTZ.

Lixu'ri, town of Cephalonia, one of the Ionian Islands, is well built, manufactures coarse carpets and cotton fabrics, and carries on a considerable trade and shipping business. Pop. 6000.

Liz'ard [Lat. *lacerta*], a name commonly used by authors as synonymous with *saurian reptile* (the order Saura), a term exclusive of the loricate reptiles, the amphisbæna tribe, and the serpents. Popularly, it is often made to embrace some other true reptiles, and a large number of tailed batrachians. The order embraced many immense animals now extinct, whose remains are found by the geologist. The living species are all scaly; generally have four visible legs (a few are serpentine in shape), all are produced from eggs (some few species are hatched before birth), and none, it is believed, are truly poisonous. They are far more common in hot than in cool regions, and (in species) in the Old than in the New World. The typical genus, *Lacerta*, is of the family Lacertidæ. These families, as now estimated, are very numerous; that of the Ameividæ may perhaps be assumed as a typical one for America. This family includes the variegated lizard (*Teius Teguexin*), six feet long. It is a bold, active, carnivorous creature, fierce in self-defence, inhabiting South America. Its flesh is eaten. (See also, for further information, MONITOR, GECKO, CHAMÆLEON, IGUANA, and the names of the more important genera.)

Llama. See LAMA.

Llandudno, a much-frequented watering-place in Carnarvonshire, North Wales, picturesquely situated on a sheltered bay of the Irish Sea, at the mouth of the Conway. Two lofty promontories, Great Orme's Head and Little Orme's Head, protect the bay against the sea.

Llanel'ly, town of South Wales, 16 miles S. E. of Caermarthen, stands on a creek of the Caermarthen Bay, at the mouth of the river Lougher, and has manufactures of copper, tin, and iron wares, which are sent to Liverpool, and a considerable trade in coal. The average annual value of its exports amounts to over £150,000. Pop. in 1881, 19,655.

Llano, cap. of Llano co., Tex. (see map of Texas, ref. 4–G, for location of county), 75 miles N. W. of Austin. Pop. in 1870, 188; in 1880, 213.

Lla'no Estaca'do [Sp., "staked plain," so called from the stake-like boles of a yucca-plant which grows there], an elevated plateau of N. W. Texas and S. E. New Mexico, having an area of 44,000 square miles and an elevation of from 3200 to 4700 feet, the general slope being northward. It has very few streams and water-holes, and a sparse coating of grass in the wet season. Its scanty shrubs have enormous roots, which afford the best attainable supply of fuel. In 1852, Lieut. (since Brig.-Gen.) Pope, U. S. A., sunk artesian wells at various points upon the Llano, with a view to developing a water-supply for a railroad to the Pacific, but without very encouraging results.

Lla'nos [Sp., from Lat. *planus*, "level"], the name of those vast plains or steppes in the northern part of South America which surround the lower and middle course of the Orinoco. In the dry season they are scorched by the sun and nearly transformed into a desert, and the large herds of wild horses and cattle which inhabit these plains become almost crazy from thirst, and run furiously along, tortured by poisonous insects and raising immense clouds of dust. In the wet season the plains are mostly inundated, and become an immense sea where the herds swim from hill to hill carrying their young ones on their backs to protect them against the alligators. In spring and fall, or rather during the period which separates the dry and the wet season, the llanos present the most luxuriant pasturages, and are a true paradise for cattle.

Llan'quihue, a southern province of Chili, lying between Valdivia, the Andes, the Gulf of Ancud, and the Pacific Ocean. Area, 8350 square miles. Pop. 43,342. It is a plain slightly elevated above the sea, covered with forests, diversified by several beautiful lakes, and watered by the river Maullin. The soil is extremely fertile, the climate healthy. Coal is abundant. A large part of the population consists of Germans, who are prosperous agriculturists, fruit-growers, and cattle-farmers. The roads are good, and there are 50 public schools. Cap. Puerto Montt.

Llere'na, a walled town of Spain, in the province of Badajos. Pop. 6196.

Llewel'yn ap Grif'fith, prince of Wales, succeeded David in 1246; revolted from his allegiance to the English crown 1256; ravaged the frontier 1262; was joined by De Montfort 1263; defeated Mortimer 1264; made peace with Henry III. 1268; was summoned to attend Parliament at Westminster by Edward I., but refused to appear, 1274 and 1276; unsuccessfully offered a ransom for his bride, Eleanor de Montfort, who had been captured by English vessels in the Channel, 1275; resisted a formidable invasion of the English, but finally submitted; was taken to Westminster and surrendered his territories 1277; returned to Wales and married Eleanor 1278; was reconciled to his brother David, and renewed the war with the English 1282, but was surprised and killed by Mortimer Dec. 11, 1282.

Lloren'te (Juan Antonio), b. at Rincon del Soto, near Calahorra, Spain, Mar. 30, 1756; studied theology at Tarragona and Madrid; was ordained priest (1779); became doctor in canon law, advocate in the royal councils, vicar-general of the bishopric of Calahorra (1782), chancellor of the University of Toledo, member of the principal academies, commissary (1785), and secretary-general of the Inquisition (1789). His intentions in accepting that post were of a reformatory character, and two unsuccessful attempts were made by him to correct the inveterate abuses of the Inquisition, the latter of which occasioned his imprisonment for a short time, and the exile of his friend and protector, the minister of justice, Jovellanos. In 1806 he was employed by the favorite Godoy to write a work in opposition to the traditional privileges claimed by the Basque provinces—*Noticias historicas sobre las tres provincias Bascongadas* (3 vols., 1806–08). Llorente adhered to the French intervention; was made a councillor of state by King Joseph, and director-general of national estates (1808), in which capacity he was charged with the suppression of the convents. On the extinction of the Inquisition its papers were placed in his hands, with a commission to prepare its history. Charged with embezzlement of immense sums, he was removed from his offices, but reinstated; was exiled on the return of Ferdinand VII. in 1814; resided for a time in England, and afterwards in Paris, where in 1817–18 he published both in Spanish and French his celebrated *Critical History of the Inquisition in Spain* (4 vols.), *Historical Memoirs on the Spanish Revolution* (3 vols., 1815–19), a brief autobiography (1818), *Critical Observations on the novel Gil Blas* (1822), *Complete Works of Las Casas* (2 vols., 1822), and *Political Portraits of the Popes* (1822); the latter work obliged him to leave Paris and return to Madrid, where he was well received, and d. Feb. 3, 1823. Llorente was a writer of considerable talent, and his works were once very popular with the anti-Catholic element in Europe; but they cannot be trusted for the accurate statement of facts, and have consequently fallen into comparative discredit. His sentiments and conduct were time-serving, and by no means patriotic, nor can he be considered a conscientious advocate of liberal principles. Of his *History of the Inquisition* an abridged English translation was published in 1823.

Porter C. Bliss.

Lloyd (Thomas), b. at Dolobran, North Wales, in 1649; educated at Oxford, but became a Quaker, and suffered much persecution as a preacher; accompanied Wm. Penn to America in 1684, and became acting governor, with the title of president of the council, of Pennsylvania 1684–86, and 1690–91, and deputy-governor 1691–93. D. July 10, 1694.

Lloyd (William), D. D., b. at Tilehurst, Berkshire, England, Aug. 18, 1627; was educated at Oriel and Jesus colleges, Oxford; became a fellow 1646; took holy orders 1656; was prebendary of Ripon, Salisbury, and St. Paul's; chaplain to Charles II.; vicar of St. Mary's, Reading; and archdeacon of Merioneth; became bishop of Exeter 1676, of St. Asaph 1680, of Lichfield 1692, and of Worcester 1699, and d. at Hartlebury Castle Aug. 30, 1717. Bishop Lloyd took an active part in the troubles occasioned by the so-called "Popish plot" of 1678, and was one of the celebrated seven bishops who protested against the Declaration of Indulgence to Romanists and dissenters by James II., for refusing to publish which they were committed to the Tower, tried, and acquitted. He was almoner to William III. and to Queen Anne; wrote *Considerations touching the True Way to Suppress Popery* (1684), a *History of the Government of the Church of Great Britain* (1684), a *Dissertation on Daniel's Seventy Weeks*, a *System of Chronology* (1712), a *Harmony of the Gospels*, and other theological works, and furnished valuable materials to Bishop Burnet for that prelate's *History* of his own times.

Lloyd's, the name by which the first floor of the London Exchange is known, being the centre where the business of maritime insurance is transacted, and where the earliest shipping intelligence from all parts of the world is posted for the information of subscribers, whether merchants, shippers, or underwriters. The board of underwriters have rooms here, and receive reports from their agents in every port throughout the world visited by the ships they insure. The system is so arranged that the individual underwriters risk no more than £100 to £150 on any single vessel. Their concerns are administered by a committee of twelve members. There is a vast "merchants' room," provided with newspapers from all parts of the world, and a "captains' room," where ship-auctions are held and convivial gatherings frequently meet. The establishment derives its name from Lloyd's coffee-house, which was originally the head-quarters of the board of underwriters; the name is now applied generically to similar institutions elsewhere, the most celebrated of which are the Austrian Lloyd at Trieste (established 1823 by Baron Bruck) and the North-German Lloyd at Bremen. *Lloyd's List* was printed as a weekly from 1716 to 1800, since which time it appears daily, with the fullest shipping intelligence. The Austrian Lloyd has a *giornale*, established in 1834.

Llumayor, or **Lluchmayor,** an inland town of the island of Majorca. Pop. 8526.

Loach [Fr. *loche*], a name given to fishes of the family Cobitidæ, which is related to the carp family (Cyprinidæ). There are no representatives of the group in America. In England there are two species—*Cobitis tænia* and *Nemachilus barbatulus*. The *Nemachilus barbatulus* or common loach, a European fish of the family Cobitidæ, is sometimes used as food. It lives at the bottom of clear streams. The lake loach (*Misgurnus fossilis*) of Central Europe buries itself in mud, and has a bad flavor. The name "four-eyed loach" has been very improperly attached by some popular writers to the *Anableps tetrophthalmus* of British Guiana.

Load'stone [Ang.-Sax. *lædan*, to "lead"], the natural magnet, a mineral consisting essentially of magnetic iron ore, which is a compound of the peroxide and protoxide of iron. It strongly attracts the magnetic needle, but does not itself always possess polarity.

Loam [Ang.-Sax. *lam*, "clay"], a mixture of sand and clay, with an addition of about five per cent. lime and some animal and vegetable matter. A loamy soil is intermediate in character between sandy and clayey soils, and is that best adapted to general agriculture. It is lighter and warmer than a clay soil, stronger and more retentive than a sandy one.

Loan [Ang.-Sax. *læn*, from *lihan*, "to lend"]. This term has in law two diverse though closely analogous significations. In one sense it denotes a delivery of money or of a chattel by one person to another for the use of the latter, for which an equivalent is to be returned at a future day; as if, for example, railroad stock is lent to be replaced by other stock of the same kind of an equivalent value, or if money be loaned, for which the same sum is to be repaid, either with or without interest. The equivalent need not, however, be of the same kind as the article lent, for stock or money or other article loaned may be repaid by money or by any article of the same value, if the parties so agree. In the other sense, loan denotes a delivery of an article to another for his temporary use, on condition that this identical article, and not merely its equivalent in value, shall subsequently be returned to the lender. In this latter sense, though not in the former, a loan is a species of bailment. The popular use of the word is quite similar to its legal use. Thus, it is common to speak of lending money or of lending a book or other article, though in the one case it is understood that an equivalent sum of money, and not the identical fund lent, is to be repaid, and in the other that the book itself or other article is to be returned. The rules of law relating to these two different classes of loans are so dissimilar that it will be necessary to consider each class by itself.

I. If the loan be of the first kind, making the borrower responsible for the return of an equivalent in value, and the thing loaned be not money, but some article of personal property, the lender may bring an action in a court of law for the recovery of damages equal to its value, or of the sum agreed to be given in return, if default be made in rendering the equivalent at the time appointed, according to the terms of the agreement. But the thing itself to be given in return cannot be obtained by action in such a court, unless it be a sum of money. Interest will usually be recoverable upon the value of the article from the time of default. In courts of equity, however, a suit may sometimes be maintained for the specific performance of such a contract, and a decree obtained requiring the delivery of the article to be given as an equivalent. Thus, a contract to replace stock which has been loaned by other stock of the same kind may be specifically enforced in equity when such stock is of uncertain value and not always readily obtainable in the market. But the general rule is that contracts for the delivery of personal property will not be specifically enforced, since the recovery of damages usually affords a complete and satisfactory remedy. Even a contract for the delivery of stock will not be enforced in equity when the shares are at any time procurable, so that the recovery of damages would enable the plaintiff to purchase them. Whenever an award of damages will enable the plaintiff to supply himself with the article to be delivered, an action at law will be alone maintainable. (See Specific Performance.) Loans of this kind are sometimes made with intent to evade the laws against usury. The English statute of usury, from which those in this country have been usually copied in their general outlines, applies to loans "of any moneys, wares, merchandise, or other commodities whatsoever." If, therefore, the intent of the parties to a loan of a chattel and the effect of the transaction are to violate the usury laws, the same penalties will be incurred as in the case of a loan of money. Thus, in a loan of stock the agreement of the parties may require the return of an amount of stock whose value shall not only be equal to that of the stock loaned, but include also a higher rate of interest than the law allows. But it has been held that a loan of stock to be replaced by the same number of shares will not be usurious, though the value of the stock may be subject to great fluctuations. (See Usury.) But the most common loans of the class under consideration are loans of money to be repaid in money. The contract for repayment may be either express or implied. It is commonly the practice in making an express contract to evidence it by a promissory note, bill of exchange, bond, duebill, or other written obligation, though this is not to be deemed necessary. The time of repayment and the rate of interest may be determined at the pleasure of the parties, provided the usury laws be not infringed. The statute of limitations will begin to run in favor of the defendant, and interest will be computable as damages in favor of the plaintiff, from the expiration of the term of credit agreed upon, if default be then made in repayment. If it be agreed that the debt shall bear interest, but no rate is fixed upon, the legal rate will be computed from the date of the loan. (See Limitations, Statute of; Interest.) The loan establishes the relation of debtor and creditor between the parties, and not that of bailor and bailee. The same is true of loans with implied contract for repayment. The law presumes that when money is loaned to and received by another without any express agreement for its repayment, a lawful debt is created which may be recovered by action. Interest is computable from the time of the loan at the legal rate. The statute of limitations also begins to run from the same period. The action for "money lent" is one of the so-called actions upon the "common counts." It will not be sufficient to sustain this action merely to prove that the plaintiff delivered money to the defendant, for this *prima facie* is only evidence of payment by the plaintiff of his own debt. It must be shown that the transaction was in reality a loan of money. It is not necessary to prove that the defendant requested the loan to be made, for the receipt by him of the money is sufficient to establish his obligation to make repayment.

II. The second variety of loans constitutes that class of bailments technically termed in law *commodatum* (Lat., "thing lent"). (See Bailment.) The article lent is delivered to the borrower or bailee exclusively for his own use and benefit, no reward or compensation being payable to the lender for such use, and is itself to be returned to the lender. The bailor, as in other cases of bailment, remains the general owner of the property, while the bailee acquires a special or qualified right of ownership while it remains in his possession, and is thus enabled to maintain an action against any person other than the lender who does injury to the property or converts it to his own use. The bailor may also maintain an action in such cases, but a recovery by either bailor or bailee will bar the other's right of action. As the bailment is entirely for the advantage of the bailee, he is bound to use great diligence in caring for the article loaned, and will be responsible even for the slightest negligence if it be thereby lost or injured or impaired in value. But if the injury or loss be occasioned by inevitable accident, sudden disaster, theft, burglary or other cause which could not be anticipated nor provided against, the bailee will incur no liability, but the bailor must bear the loss. The article may be used by the borrower for the purpose for which it was loaned, but he must not exceed the privilege given him. For any loss or deterioration resulting from its ordinary and reasonable use he will not be responsible, but if the injury be occasioned by his recklessness or remissness he must make good the loss. The property is to be returned in the same condition in which it was delivered, subject to ordinary wear and tear. A gratuitous loan creates a trust that is strictly personal, and the thing loaned can be used only by the bailee, in the absence of any special agreement to the contrary, or of a license by the owner that some other person may use it. Thus, it has been held that the loan of a horse to a person for him to ride did not justify him in allowing his servants to ride. The degree of care which the bailee is to exercise will vary with the nature of the property loaned and the circumstances under which the loan is made. Greater diligence and precaution are requisite in keeping secure and protecting from injury articles of great value than in caring for those of comparatively little worth. In like manner, greater care would be necessary in times of special danger or in lawless districts, where property is particularly exposed to injury, than in times when little or no danger is to be apprehended or in orderly and law-abiding communities. What shall be considered "slight negligence" in any particular instance must depend upon the special facts of the case. The property loaned is to be returned to the owner at the expiration of the time agreed upon for the continuance of the bailment, or, if no such stipulation be made, at the expiration of a reasonable time. If after the termination of the bailment the borrower refuses to deliver up the property after proper demand has been made, although it still remains in his possession, he is guilty of conversion, and may be sued in an action of trover for the value of the goods or in an action of replevin for the recovery of the goods themselves. (See Conversion, Trover, Replevin.) He cannot detain the property as a pledge for any demand he may otherwise have against the bailor. (See the works of Story and Edwards on *Bailments;* also treatises on *Contracts.*)

George Chase. Revised by T. W. Dwight.

Loan and Building Associations, incorporated companies which during the last twenty years have assumed considerable importance in the cities and large towns of the U. S., especially in Philadelphia. The following account of their mode of organization and operation is derived from an article in the Philadelphia *Public Ledger* of Mar. 5, 1874: "They are ordinarily organized by a few friends, who subscribe for shares, and then induce others to join them, all agreeing to pay the sum of one dollar per month until the value of each share shall be $200, when a division of the funds will be made, and the society dissolved. Not more than 2500 shares can be subscribed for, and ordinarily there are from 1500 to 2000 shares. The directors, who are elected annually by the stockholders, conduct the business of the association. At each monthly meeting the money on hand after the collection of the dues is loaned to the stockholder who offers to give the highest premium, which sometimes amounts to 35 or 40 per cent. where the amount of the premium is deducted from the amount of the loan. The stockholder who borrows the money is required to give security, generally real estate, for the payment of his monthly dues and the interest on the whole amount of the loan, including the money actually received and the premium. The interest on the money loaned, with the double interest on premiums (which are really twice loaned), and the fines for non-payment of dues, are the sources of profit. Thus, all the money which a society divides at the end of its term is paid in by the stockholders. There are no sources of revenue *outside* of the society itself. If a society with 2000 shares runs out in ten years, there has been paid on each share $120, taking no account of fines. If 1500 shares have been borrowed on, their owners have paid not only $80 more on each of these shares than the non-borrowers who hold 500 shares, but have also paid an amount of interest sufficient to give $80 on each share to the non-borrowers. Apparently, the non-borrowers receive all the profits, but it must be remembered that the borrower has paid no more 'dues' on his stock than the non-borrower, but has had the use of his money for from one to ten years, and then the only question as to his profits is, whether he has paid an excessive rate for the use of that money. If without capital he has been enabled to buy a home for himself and pay for it in monthly instalments, the chances are that the borrower has obtained a fair return for his investment. If he bought wisely, and his property, during the time he was paying for it, largely increased in value, his profits may be larger than those of the non-borrower, for the latter has not these incidental sources of profit. Finally, however high a premium he may have paid, if he did not exceed the *average* of premiums, he did not pay a high rate of interest, because when the average premium is high the society runs out sooner and less money is paid on each share for 'dues.'

"There are many different systems under which building societies are worked. In some, the premium is deducted from the loan; in others, the premium is not deducted, but is paid with interest in monthly instalments; in some, only one series of stock is issued, all the members going out at the same time; in others, new series are issued at regular intervals, bringing in new borrowers and thus keeping up the demand for money. In a 'series society,' which is one of the latter kind, the premiums are usually high, and each series winds up its affairs in a correspondingly shorter time, sometimes within seven years and six months. In the latter event the non-borrower only pays $90 and receives $200, while the borrower makes heavier monthly payments for a smaller number of months than he would in the single series society. But whatever the system may be, the cardinal principle underlying all is the same. In all building societies there is the incidental advantage that a member having once commenced to save a few dollars a month is compelled to keep up the good habit or else relinquish a part of the profits which he would otherwise obtain. But if through misfortune or carelessness he is obliged to withdraw, he still gets reasonably good interest on his money, and sometimes a share (but not a full share) of the profits.

Still greater advantages are, that there are comparatively few members in each society, so that the management in case of necessity can be more readily changed than in most mutual corporations, and that the officers never have enough money on hand at any one time to tempt them to dishonesty, nor to cause serious loss in the event of a defalcation."

Loan'go, kingdom of Western Africa, extending along the shore of the Atlantic from the equator to the river Congo. The coast is flat, but fertile, the interior unknown. The inhabitants are a rude and barbarous race. Their religion is idolatry and superstition; their morals allow the slave-trade and polygamy, a man's wives being transferable with his other property; their political institutions consist in an absolute despotism. But they have some skill in the manufacture of baskets, colored mats, and grass-cloth; and some trade in palm oil, wax, and ivory is carried on in their two principal towns—Loango, situated in lat. 4° 39′ S., and Kabinda, on the N. bank of the river Congo. The former of these towns is said to have 20,000 inhabitants.

Lö'bau, town of Germany, in the kingdom of Saxony, noted for rock-crystals called "Löbau diamonds," and for the mineral springs in its vicinity. Pop. 7372.

Lobau, an island in the river Danube, 6 miles below Vienna, taken by Napoleon I. May 19, 1809, occupied by the French army after the battle of Aspern, May 22, was the place whence the invading forces were concentrated in June, and where the celebrated passage of the Danube was made July 4 and following days, 1809. This island gave the title of count to Gen. Mouton, one of the French heroes of the campaign.

Lobau', de (GEORGES MOUTON), COUNT, b. Feb. 21, 1770, at Phalsbourg, France; enlisted as a volunteer in the army in 1792; became aide-de-camp to Meusnier in 1793, to Joubert in 1798, to Napoleon in 1805; and was made a general of division in 1807, after the battle of Friedland. His title of count of Lobau he received after the battle of Aspern. He was rough and blunt, but courageous and firm. After the Russian campaign he was at the head of the organization of a new French army, and in the battle of Waterloo he commanded the sixth army corps on the right wing. After the Restoration he was banished from France, and not allowed to return until 1818. In 1828 he was elected a member of the Chamber of Deputies, and he took a prominent part in the revolution of 1830, assumed the command of the national guard instead of La Fayette, was made a peer and marshal in 1831, and put down with great success the insurrections of 1832 and 1834. D. at Paris Nov. 21, 1838.

Lobe'ira, de (VASCO), b. in Portugal about 1360; was distinguished in the military service of Ferdinand IV., king of Castile, and wrote the celebrated romance of *Amadis de Gaul*. He was knighted by John I. of Portugal after the battle of Aljubarrota, 1386, and d. at Elvas, Portugal, in 1403.

Lobel' (MATTHEW), best known under the Latinized form LOBELIUS, b. at Lille, Flanders, in 1538; studied medicine at Montpellier; practised his profession at Antwerp and Delft after travelling through Switzerland, Germany, and Northern Italy; became physician to the prince of Orange, and was employed by the States General; settled in England before 1570; made extensive botanical collections in England; devoted himself especially to vegetable physiology and the correction of errors made by Dioscorides; published *Stirpium Adversaria Nova* (London, 1570), containing nearly 1300 species, with 272 small figures; *Plantarum seu Stirpium Historia* (Antwerp, 1576), *Icones Stirpium* (Antwerp, 1581), and a treatise on *Balsams* (London, 1598). Lobel accompanied an English embassy to Denmark in 1592, returned to England, became botanist to James I., and d. at Highgate Mar. 2, 1616. A fragment of a vast botanical cyclopædia projected by Lobel was edited by J. Parkinson in 1655. The idea of natural families may be found in Lobel's works, and an important botanical genus was called *Lobelia* in his honor.

Lobe'lia [named by Plumier in honor of Matthew *Lobel*, botanist to King James I.], a genus of plants of the natural order Lobeliaceæ, of which the most important species is the *Lobelia inflata*, or "Indian tobacco," as it is commonly called. This is a very common indigenous annual or biennial herb, growing wild in waste spots throughout Canada and the U. S. It has a fibrous root, and a solitary straight hairy stem rising about a foot high. The flowers are small and of a light blue color; the leaves oval, serrated, and hairy. The entire herb, dried, is used in medicine under the name *lobelia*. Its properties depend on an alkaloid, *lobelina*, which is a thick, oily, transparent, volatile fluid, with a pungent taste resembling tobacco. Lobelia is a powerful nauseating emetic, producing in full dose an effect like that of tobacco—namely, long-continued, distressing nausea and vomiting, with purging, copious sweating, and great muscular relaxation. In overdose it is a potent acro-narcotic poison. Lobelia is too severe an emetic to be used to produce vomiting, and its medicinal employment is in non-emetic doses as a relaxing agent in asthma and allied spasmodic diseases. EDWARD CURTIS.

Lobelia Cardinalis, the cardinal flower, so named from the intense red color of the blossoms, is the most showy of our indigenous species, and is prized in cultivation. The low and bright-blue-flowered lobelia, largely used as a bedding-plant, is *L. Erinus*, from the Cape of Good Hope.

Lobelina. See LOBELIA.

Loblolly Bay. See GORDONIA.

Lo'bo (JERONIMO), b. at Lisbon about 1595; entered the order of the Jesuits in 1609, and went in 1622 as a missionary to Goa, whence he proceeded to Abyssinia in 1624. Here he worked with great success, but was at last expelled in 1634, and returned to Portugal to persuade the Christian powers to make a crusade against Abyssinia. Having failed in this, he went once more to Goa in 1640, whence he returned in 1656, and d. at Lisbon Jan. 29, 1678. His *Historia de Ethiopia* (Coimbra, 1659) made a great sensation and was translated into many foreign tongues—into French in 1674, into English by Dr. Johnson (1735).

Lo'bos Islands [Sp. *lobo*, "seal"], or **Seal Islands,** three small islands in the Pacific Ocean, 12 miles off the coast of Peru, to which country they belong, in lat. 6° 29′ S., lon. 80° 53′ W., form the gathering-place for innumerable seals, and contain large deposits of guano.

Lob'ster [supposed to be cognate with the Latin *langusta*, the name of a distantly related form (*Palinurus*) of the Mediterranean and European seas generally], a name especially applied to crustaceans of the species of the genus *Homarus*, but also extended to several other kinds of very different groups. The typical lobsters, or *Homari*, are closely related to the fresh-water crawfishes (*Astacus* and *Cambarus*) of the northern hemisphere, and with them and some other genera (*Astacoides*, *Paranephrops*, *Chæraps*, *Engæus*, *Nephrops*, and *Nephropsis*) constitute the family of Astacidæ. They differ especially from the crayfishes in the rostrum, which is straighter and denticulated, or armed with many teeth on each side; the union by soldering of the last ring of the thorax with the penultimate; the transformations which it undergoes in its progress from the egg to maturity; the marine habitat; and the larger size of the species; and these characters are associated with a number of anatomical peculiarities. The eyes are orbicular; there are nineteen pairs of gills. They become red when subjected to the action of boiling water or acids, this being due to a change in the pigmentary matter. In the stomach at the pyloric position are three movable chitinous pieces, instrumental in digestion, which, from a supposed resemblance to a seated female, is known as "lady;" it is shed with the shell. In connection with the outer wall of the intestine, the liver is developed as a greenish organ with a mixture of fat-cells, and this is called by the lobstermen "tow alley." The female chiefly spawns in spring or early summer, and carries her eggs (which number from about 2000 to 12,000, according to the size of the mother) under the abdomen or tail, conglomerated by a viscid secretion; they are globular, and when unimpregnated red, but when impregnated and maturing almost blackish. The young emerge from the egg as small and actively-swimming "schizopods," or animals very different in appearance from the adults. After several months they assume the form as well as habits of the adult.

Three well-determined species represent the genus in different seas—viz. (1) *Homarus gammarus* or *vulgaris*, the common European lobster, abundant in Northern Europe, and especially Norway; (2) *Homarus Americanus*, the common American lobster, very nearly related to the preceding, abundant from New Jersey northward, and particularly, in the U. S., on the coast of Maine; and (3) *Homarus Capensis*, a small lobster found at the Cape of Good Hope. The northern species are much larger, the American, when adult, varying between one and two feet, and weighing two to fifteen pounds, and the European generally from eight to ten inches, although occasionally rivalling the American in size, and exceptionally, it is *supposed*, exceeding three feet in length. They live, in warm weather, near the coast, by preference on rocky bottoms and where algæ thrive, but the American species, S. of Cape Cod, is also to be found on sandy and gravelly bottoms. In the winter they retire into deeper water, descending as low as sixteen to twenty fathoms on steep coast-slopes. They swim freely, but not strongly. They feed on the roe of fish, dead fish, and such other animals as they are able to catch. The food is caught by them when on the ground, and is eaten at leisure and in a state of rest. Although voracious, they are able to live for some time without food. They shed their shells periodically in the warm months, like the crabs.

Lobsters are very generally esteemed as an article of food, and their capture employs a large amount of capital and many men in this country as well as Europe. In this country they are almost exclusively caught in "lobster-pots," or baskets constructed on the plan of some rat-traps, having funnel-shaped ends, with a hole in the middle through which the animal may enter, but from which he is precluded from departing by the extension of his claws. These are baited generally with fish of little or no value, and sunk by means of stone to the bottom, their locations being indicated by floats. Similar traps are used in Europe, but formerly, on the coast of Norway, they were caught entirely with wooden tongs of about twelve feet in length. In other places (*e. g.* Heligoland) a bag-net with an iron hoop, called "plumpers," is used, a long line being attached to it and moved at the top by a piece of wood. No precise statistics have been collected respecting the number of lobsters caught and consumed in the U. S., but it is very large, and has been vaguely estimated at "several millions" annually. "In Boston the number of lobsters sold annually cannot be much short of 1,000,000," according to Capt. Atwood, an experienced fisherman. In Boston the male lobster is preferred, and the supply is chiefly furnished from the northern shore of Massachusetts and the Maine coast, while in New York the females are the most salable, and the stock is chiefly derived from the contiguous coasts up to Cape Cod, that place being the chief market of export for New York after June. The size being the same, the females furnish the most meat. The sexes are nearly equal in number, according to Mr. S. I. Smith, although the males are supposed to greatly preponderate by the fishermen. In Long Island Sound and Southern New England the fishery season commences towards the end of March or early in April, and about the middle of the latter month they are sent to the markets in large numbers, while towards the North the season is later. In winter the supply is principally derived from Maine, and they are found at that season in the comparatively deep water. The proper breeding-season varies with circumstances, as well as with the latitude and temperature of the water, but it commences in the southern waters in April or May. It, however, extends through several months, and in Vineyard Sound, it seems, about "one in twenty" has eggs even as early as December. Complaints have lately been loud that the fisheries are being impoverished, and demand a close season and other regulations. In Massachusetts the minimum salable limit is 10½ inches.

Norway is the great source of supply in Europe of the lobster, and from it are exported large numbers to England and Holland. Originally, it seems to have been despised by the natives, and the fisheries were first developed in the Norse waters by the Dutch. Their vessels commenced to visit Norway for lobsters in the seventeenth century, chiefly, and at first exclusively, sailing from Zierikzee. From Flækkefiord lobsters were exported as early as 1660, and in 1674 ten lobster-vessels filled from it; from 1690 the Dutch regularly visited Karmö, and the following places gradually became lobster-ports: viz., "Mandal, Flækkefiord, Egersund, Tananger or perhaps Stavanger, Akre in the island of Karmö, and Leervig in the island of Stordö." The Dutch also introduced the lobster-baskets, and at the commencement of their operations, by donations to the clergy, interested them in their behalf. At first the price was one skilling (about a cent) each, but afterwards it was raised to two and more. Originally, the export trade was carried on entirely in Dutch bottoms, but gradually the English took a share, and after the war which broke out between Holland and England in 1776 the trade was entirely wrested from the Dutch and taken by the English, who still hold it almost exclusively.

The number of lobsters exported from Norway has fluctuated according to circumstances. Between 1815 and 1818, the annual export ranged between 512,780 and 680,300. "The number of lobsters exported in 1821 and 1822," says Boeck, "amounted to over 1,000,000 a year, and increased still more during the following years, although it was not so large in 1823 and 1824, on account of the unfavorable weather. From 1825 to 1830 the average number of lobsters exported annually was 1,268,000, and in 1827 and 1828 the highest number was reached—viz. 1,500,000. These large numbers, however, were caused not by the fisheries being just as productive, or more so, in the old lobster-stations, but by the circumstance that new English companies, seeing the great profit to be derived from this trade, commenced to export lobsters from places from which they had never been exported before." "The exports from Staranger and Egersund meanwhile decreased very much, having been reduced to 67,000 per annum in the latter place in 1827, when the exports from the whole of Norway amounted to 1,429,703. After 1830 the exports began to decrease even in the new districts, so that the annual average quantity of lobsters exported during the five years 1831–35 was only 640,000. The only places that kept the lobster-trade alive were the new districts, while all the old ones decreased rapidly, some of them to such a degree that, according to the governors' reports, the lobster-trade must be considered almost extinct in 1835."

Farseeing men had feared the results of the excessive and unregulated fisheries, and the fishermen and all others interested became at length alarmed. Laws were from time to time (*e. g.* 1830, 1838, 1845) proposed and discussed in the "Storthing" or Norwegian parliament, parliamentary inquests were also held, and the aid of experienced naturalists was invoked; but for a long time a close season was opposed by the fishermen and traders, who hoped for a revival of the trade, and contended that the depression was only temporary. Gradually, however, almost all became convinced that legal restrictions of the fisheries as to time and size of lobsters taken were necessary; and finally, in 1848, laws were passed regulating the fishery. It was provided (1) that lobsters should not be caught or sold from the fifteenth of July till the end of September; (2) that the king, however, at the request of local authorities, might remit time before or after August, which must always remain a close month; (3) a penalty of twenty-four skillings for every infraction of the law was provided for; (4) it was provided that the police courts should have jurisdiction of the cases; and (5) a period of eight days after the periods designated was added for the exportation of lobsters. The result of this law was that much fewer were exported in 1849 and 1850 than in previous years, but afterwards the number increased, and, although fluctuating, the gain continued, till in 1865 nearly 2,000,000 (1,956,276) were exported. The law also became so popular with the dealers that they were even inclined to go to the other extreme, and desire a still longer close season. Now that alarm is being felt respecting the lobster fisheries of this country, the experience thus referred to may be of use. Several documents respecting the subject may be found in the *U. S. Commission of Fish and Fisheries Reports*, to be soon published.

The name, in combination with a qualifying prefix, is also popularly applied, in addition to other marine species of Astacidæ, to species of the families Palinuridæ and Scyllaridæ. THEO. GILL.

Lobworm. See ANNELIDES.

Local Preachers, an order of lay preachers in Methodism, much more numerous than its regular or "itinerant" ministry throughout the denomination. In the U. S. they number about 22,000. The order was established by Wesley early in the history of the Methodistic movement, and its members have become historically important as the founders of the denomination in the U. S., Canada, Nova Scotia, Australia, and Africa. They are laymen, engaged in secular life, but having natural or acquired gifts for public discourse, and devoting their Sundays to preaching, mostly in poor or incipient churches. In large cities, especially in England, their weekly appointments are systematically arranged and published quarterly on a printed plan. They are formally "licensed," and many of them are ordained, in order that they may assist the regular clergy in the administration of the sacraments, and they are all amenable to the quarterly and district conferences of the Church. They have, in most countries, "local preachers' associations." In England they publish *The Local Preachers' Magazine*. In the U. S. many local preachers have been eminent for talent and usefulness. The regular or travelling ministry has always been recruited from their ranks; in fact, no candidate can be admitted to the annual conference on the regular pastorate unless first licensed as a local preacher. ABEL STEVENS.

Loca'na, town of Italy, in the province of Turin, situated in a strikingly wild valley of the same name, 25 miles W. of Ivrea, has some trade in the agricultural, and more especially in the dairy, produce of the surrounding district. Pop. 5784.

Loches, town of France, in the department of Indre-et-Loire, on the Indre. Its castle was the royal residence of several kings of France, and was used by Louis XI. as a state prison, and witnessed as such the most horrible atrocities. It is now a departmental prison. Near it, in 1409, Agnes Sorel was born, and her tomb is in the chapel of the sub-prefecture. Pop. 5096.

Lochlev'en, a castle on an island in Lake Leven, Fifeshire, Scotland, noted as the place where Mary queen of Scots was imprisoned from July, 1567, until her escape, May 2, 1568. The place is now of no military or strategical importance, but was in the sixteenth century a stronghold of first rank.

Loch'rane (OSBORNE A.), b. at Middletown, Armagh, Ireland, Aug. 22, 1829. While pursuing his academic course in 1846 he indulged in a popular assembly in such violent denunciations against the English authorities that his father thought it advisable to place him beyond the reach of prosecution, and accordingly sent him to New York, where he arrived Dec. 21, 1846. Not tarrying there long, he made his way to Athens, Ga. The elegance and eloquence of a temperance address delivered by him won the admiration of the late Joseph Henry Lumpkin, chief-justice of the State, who urged the boy-orator, then a clerk in a drug store, to study law, promising him assistance. By dint of labor at night he soon mastered his task, and was admitted to the bar at the fall term of 1849. With a few books and scanty means he opened an office at Savannah Mar., 1850, and in October of the same year he moved to Macon, where he formed a professional connection with Henry G. Lamar, an able and prominent lawyer, whose daughter he had married. His rise at the bar was rapid and brilliant. In Sept., 1861, he was promoted to the bench of the Macon circuit, to which position he was twice afterwards elected by the legislature, but resigned in 1865. He then removed to Atlanta, and in Aug., 1870, upon the request of the bar, was appointed judge of that circuit; in Jan., 1871, was appointed chief-justice of the supreme court of the State, but resigned in December of the same year, and resumed practice at the bar. Many of his speeches, addresses, and orations have been published in pamphlet form, generally circulated, and greatly admired for their classic taste and beautiful imagery in illustration. A. H. STEPHENS.

Lock [from the Ang.-Sax. *loc*], a piece of machinery provided with a spring and bolt for receiving and corresponding to a key, the two together serving to fasten doors, chests, drawers, and the like. That locks and keys were used by the ancients is attested by many writers. The Egyptians, according to Sir Gardner Wilkinson, used wooden locks and iron keys; a specimen of the latter he picked up among the tombs at Thebes. It is described as a straight shank five inches long, with a bar at right angles with it, on which were three or more projecting teeth. At the upper extremity was a ring which served as a handle. So far back as the commencement of Jewish history keys are mentioned, and in Judges iii. 23–25, where the residence of Eglon, king of Moab, is described, we find that the doors of the summer parlor were locked by Ehud, and that subsequently the servant took a key and opened them. The most remarkable lock of ancient times was the Egyptian pin-lock, which consisted of a wooden case fastened to a door, having a bolt passing horizontally through a cavity within it. In that part of the case immediately above the bolt were several small cells, each containing a pin, and in the top of the bolt under these pins was an equal number of holes. The effect of the construction was that when properly arranged the pins fell into the holes in the bolt and fastened it in the lock-case. In the exposed end of the bolt was a cavity, extending slightly beyond the holes occupied by the pins, into which the key was thrust. The latter was a piece of wood with pins arranged so as to correspond with those in the lock, and projecting upward as far as the upper surface of the bolt. So, when the key was put into the cavity and pressed upward, its pins filled the holes in the bolt, and by so doing pushed up those which had fallen from the upper part of the lock-case. Thus, the bolt could be withdrawn, as the pins were raised into their cells and all obstruction was removed. Locks of the same kind have been in use in the Faröe Islands for centuries. The Romans not only had locks and keys, but it is evident, from specimens in the British Museum and elsewhere, that warded locks were known to them; many keys whose construction points to this conclusion have been discovered both at Herculaneum and Pompeii. The Chinese have shown considerable aptitude for lockmaking, and some of their wooden constructions embody the principle on which the celebrated Bramah lock was made about 100 years ago.

A modern lock to be of practical service needs to be a masterpiece of mechanical art. As inventions of new complication of tumblers or wards or springs have appeared, so has the ingenuity of man discovered the means of triumphing over the obstacles, or, in other words, of picking almost every lock that has been invented. The qualifications of a perfect lock are numerous and not easy to define. An authority on the subject, Mr. Nicholson, has, however, summed them up succinctly in the following order: (1) that certain parts of the lock should be variable in position through a great number of combinations, one only of which should allow the lock to be opened or shut; (2) that this last-mentioned combination should be variable at the pleasure of the possessor; (3) that it should not be possible, after the lock is closed and the combination disturbed, for any one, not even the maker of the lock, to discover by any examination what may be the proper situation of the parts required to open the lock; (4) that trials of this kind should not be capable of injuring the lock; (5) that it should absolutely require no key, and be as easily opened in the dark as in the light; (6) that the opening and shutting be done easily, and by a process as simple as a common lock, either with or without a key, as may be desired; (7) that the keyhole be defended, concealed, or inaccessible; (8) that the key may be used by a stranger without his knowing, or being able to discover, the adopted combination; (9) that the key be capable of adjustment to all the variations of the lock, and yet be simple; (10) that the lock should not be liable to be taken off and examined, whether the receptacle be opened or shut, except by one who knows the adopted combination.

Into an explanation of all the terms applied by locksmiths to their wares it is unnecessary to enter. The chief distinctions between the best-known locks, however, are not out of place. Locks for drawers, chests, and the like are constructed to open on one side only, and are fitted with keys made with a pipe to slip on and turn on a pin called the *drill-pin*. But what are called *inside* and *outside* locks, fixed to doors which have to be locked sometimes on one side and sometimes on the other, have solid keys with stems thicker than the flat part, so as to form an axis fitting into the upper part of the keyhole. Keys for this kind of lock must be symmetrical, or alike on each side of a line through their middle, in order to fit the lock either way. Locks placed on outer doors are generally known as *stock* locks; those on chamber doors are called *spring* locks, and when a lock is hidden in the thickness of the wood to which it is fastened it is called a *mortice* lock. Locks on the outside of doors are known as *iron-rim locks* and *brass-case locks*. The locks that are most used nowadays are variations on the old warded and tumbler locks, the puzzle or letter locks being almost entirely out of date. The latter attracted much attention before the invention by Mr. Bramah was effected, and as early as the days in which Beaumont and Fletcher flourished mention is made of letter locks in the play of the *Noble Gentleman*. These locks could only be opened by setting a number of rings to a certain combination of letters, so that no one who was not in possession of the secret was able to open the lock; hence the term *puzzle-lock*. This combination was at first fixed and could not be changed. Subsequently, the rings were made double, the inner one having the notch in it which the bolt had to pass, and the outer one capable of being fitted on to the inner in any position, by unscrewing some part of the lock, so that the rings might be set to any combination at pleasure. Locks of this kind are insecure, because the pressure of the bolt can be felt on some of the rings more than on the others, and our own countryman, Mr. Hobbs, has declared that wherever that is the case the lock can be picked. The same gentleman opened a dial lock at Liverpool in a few minutes, and at the Great Exhibition in London in 1851, he opened a French lock and set it to a new combination, so that the exhibitor himself was unable to open it. The reasons for the unpopularity of the puzzle, letter, or dial locks, which are all three akin, are obvious: they are difficult to handle, and the danger of forgetting the word which sets the combination is always imminent. The unfortunate Louis XVI. of France took great delight in experimenting on locks of this kind and others, whence the saying, "He is a capital locksmith, but a very bad king."

In ordinary locks the bolt shoots out to catch in some kind of staple or box, or a staple enters a hole in the edge of the lock, and is then acted upon by the bolt. The key enters its receptacle, and the shaft acts as a pivot around which the web or flat part of the key may move. Thus, the web acts upon the bolt; the key impels it one way, certain springs act upon it in another, and the balance between the two forces determines the locking or unlocking of the bolt. In order to render the opening of the lock difficult without the right key, pieces of metal are secured to the inner surface of the lock to obstruct the progress of the key unless the latter be provided with open spaces which will cause the key to clear the obstruction. These pieces of metal are called *wards*. The shape of these wards is not, however, difficult to discover. The insertion into the hole of a blank key—that is, a key without wards—covered with wax, and the subsequent filing of the key where the obstructions in the lock have made marks in the wax, are sufficient for the provision of a key capable of opening the securest of warded locks. Moreover, what are known as *skeleton keys*, used by burglars with considerable profit, are sufficient for the opening of locks of this kind. These *skeletons* are not cut into the form of the wards, but have simply a blank space through which the wards may pass, the only part of the key that does any work being the edge farthest from the pipe. This is the theory of the *master key*, by which one key may be made to open any number of locks variously warded, such as is used by the superintendent in large manufactories, asylums, and hospitals.

The most conspicuous feature in the formation of our best modern locks is the *tumbler* or *lever*, which falls into the bolt and prevents it from being shot until it has been raised or released by the action of the key. The *single-tumbler* lock has a tumbler turning on a pivot with a square pin, which drops into a notch in the bolt when it is either open or shut, so that before the bolt can move the tumbler must be lifted by the key. The origin of the *tumbler* has never accurately been traced, but more than a century ago it is clear that the system was known in France; however, in the year 1778 was patented Barron's lock, which may be justly described as the foundation of all the modern improvements in lockmaking. In the ordinary tumbler locks the lock could be opened if the tumbler were raised sufficiently high to allow the bolt to work, but Barron's lock rendered the bolt immovable if the tumbler were raised either not sufficiently high or too high. Moreover, the lock possessed two tumblers, instead of one, which added greatly to the security of the structure. The bolt has in its middle a "gating," or open slit, notched on both edges, the notches being fitted for the reception of studs fixed to the tumblers. If the studs of the tumblers rest in the lower notches, they require to be elevated to the general level of the gating before the bolt can be moved; whilst if the tumblers are raised too high, the studs will enter the upper notches and prevent the shooting of the bolt. The lower edge of each tumbler is acted on by the steps of the key during its circular movement, the leverage of the key being so adjusted as to raise the tumbler to the desired height. Ten years after the patenting of Barron's lock, Mr. Joseph Bramah, the inventor of the hydraulic press, brought out a lock which differed very considerably from those which had gone before it. Its chief peculiarities are a barrel or cylinder, the absence of fixed wards and of tumblers working on a pivot at one end, and the introduction of a system of sliders. The body of a Bramah, according to Mr. Hobbs, may be considered as consisting of two barrels, the outside one fixed, and the inner rotating within it. The inner barrel has a projecting stud, which, while the barrel is rotating, comes in contact with the bolt in such a way as to shoot or lock it. Thus, the stud serves the same purpose as the bit of an ordinary key, rendering the construction of a bit to the bramah unnecessary. When the barrel is made to rotate to the right or left the bolt can be locked or unlocked, and the rotation is effected by means of *sliders* which correspond to the *tumblers* of Barron's invention. Mr. Bramah published a treatise in which he modestly declared that his lock entailed such security that it was not within the range of art to produce a key or other instrument by which a lock on his principle could be opened. However, in 1851, Mr. Hobbs of Boston proved the fallacy of this declaration by picking a Bramah by means of the tentative process, which will be described immediately. The Bramah lock, in its improved form, however, is one of the safest locks that can be used, though it must be remembered that as the patent has expired years ago, many imitations are in the market which may be picked as easily as the old warded lock. The principles of the invention may be briefly worded: Mr. Bramah rejected the use of fixed wards, using instead movable guards or sliders. The number of these sliders varied from four to six and eight. As no wards were used, the key was smaller and easier to be carried, and moreover the smallness of the keyhole contributed in no small degree to the safety of the lock. In 1818, Mr. Chubb of London patented his celebrated lock, which ever since that date has enjoyed great popularity. It consists of Barron's *tumblers* more or less numerous, with few or no fixed wards, and without false notches. It contains at least six double-acting tumblers, all of which must be raised to a certain height before the bolt can pass. The most captivating point about Chubb's locks was, however, the *detector*, consisting of a lever which, if any undue elevation was given to the tumblers in an attempt to pick the lock by means of a false key, caught in and detained the bolt until with a twist of the proper key it could be released. This *detector* as at first constituted, however, was utilized by Mr. Hobbs of Boston as a means of picking the lock by the "tentative" process described in the *Encyclopædia Britannica* many years ago, but entirely forgotten until revived by American locksmiths. The process consists of moving one tumbler at a time by means of some instrument, and ascertaining by touch when the stump is opposite the "gating." As Mr. Hobbs proved, the fact is easily made known, and as each tumbler is held in its place until the whole number are free, the bolt is at last easily moved. At the date of the invention Chubb's locks enjoyed considerable notoriety, especially after the attempt made by a convict at Portsmouth dockyard to pick a lock made by the firm. The convict had been a lockmaker, and he was offered a free pardon from the government and £100 from Mr. Chubb if he succeeded in opening the lock. The necessary tools were supplied him, but after three months' trial, during which the detector was constantly overlifted, he gave up the attempt, stating that Chubb's were the securest locks he had seen, and it was impossible for any man to pick them with false instruments. The convict, however, was beaten in his own work by Mr. Hobbs, who used the *detector* to indicate just the necessary height to which each tumbler must be raised.

In the year 1831 a system of clockwork was introduced as a feature in lockmaking by a Mr. Rutherford, a bank agent of Jedburgh, Scotland. The clockwork regulated the interval which must elapse before the lock could be opened by its key. The object was to ensure the safety of the lock during a journey or until the bag or box was conveyed to a certain locality. When the lock is used for boxes or anything portable, the clockwork must be regulated by a spring; when it is fixed to safes and the like, a descending weight and pendulum can be used. The bolt is prevented from moving by a circular stop-plate fixed with a notch in its rim. The stop-plate works round by clockwork, and until the notch is opposite to the bolt the latter cannot be shot backward or forward. The plate may be made to rotate either slowly or quickly, so that a lock may be regulated so as to open so many hours or minutes after it has been locked. In 1836, Mr. Meighan invented an alarum lock, in which the bell was placed inside the lock itself, but the invention does not appear to have attained any great degree of popularity. It was not until the year 1841 that an invention in this country created a stir in the art of lockmaking. In that year Dr. Andrews of Perth Amboy, N. J., brought out an instrument afterwards known as the "permutation" lock. The principle of this invention consists in the use of rings attached to the key, which may cause an almost endless variety of changes. When the bolt is turned the lock may not be moved except by the same combination of rings upon the key. The advantages of the system are obvious; the internal mechanism of the lock is changeable at pleasure, so that even if the key be obtained possession of for a few minutes, and an impression taken, the owner subsequently may be able by a fresh adjustment of the rings to change the whole construction of the key. The lock is furnished with tumblers and a detector. On the same principle Mr. Newall of New York invented a "permutation" lock of a rather more complicated nature, with two sets of tumblers, instead of a twofold movement to each tumbler. These tumblers were called primary and secondary, and effectually doubled the capacities of the keys. Dr. Andrews's lock succumbed to Mr. Newall's picking, and the last-mentioned lock was picked by Mr. Pettit, who accepted Mr. Newall's offer of $500 to any one who could pick his lock. By no means discouraged, the inventor went to work to find out how to keep the interior of the lock from view and the insertion of delicate instruments, and the result, not without many suggestions and additions, however, was the patenting of the famous lock concealed from view called the "Parautoptic." This famous and complicated piece of mechanism went through various stages, in one of which it was picked by the "smoke" process. A smoky flame introduced into the lock will leave a smutty deposit on the outer edges of the tumblers, which will be removed by the bits of a key if inserted immediately afterwards. A light is then thrown into the lock by means of a mirror, the key-marks become visible, and a false key may easily be made. In 1847 the Parautoptic in its completed form was exhibited in Vienna, where it gained for its owners the honor of a gold medal, and in 1851 the lock was patented in England, and was introduced to the commercial world by Mr. Hobbs. That year was famous in the history of lockmaking, and Mr. Hobbs was undoubtedly the hero of the hour. At the Great Exhibition in Hyde Park he declared to several scientific men that all locks manufactured up to that date in England were easy to pick, and to prove his words he opened one of Chubb's detector locks in a few minutes. As the fairness of the experiment was called into question, Mr. Hobbs made another trial on a Chubb lock in a private house before a number of gentlemen, and picked the lock in the space of twenty-five minutes. Having vanquished Chubb, Mr. Hobbs now turned his attention to Bramah, which firm had exhibited for many years in their establishment a patent padlock with the offer of 200 guineas to the artist who could make an instrument which would open it. Arbitrators were appointed, and Mr. Hobbs commenced operations on July 24, and on Aug. 23 exhibited the lock open to the arbitrators. Having accomplished this feat, Mr. Hobbs offered the same reward to any one who would pick Newall's Parautoptic, and the challenge was accepted by Mr. Garbutt of London, who, however, failed to accomplish his purpose within the period prescribed, thirty days. Thus the supremacy of American locks was fully established at that date, although in 1855 Mr. Linus Yale, Jr., of Philadelphia, succeeded in picking the Parautoptic, by means of the impression process. That gentleman declared that as long as the key is of "winged" form, and in its use rubs an impression on the tumblers, all the parautoptic locks can be picked. Previous to this date Mr. Yale had invented an instrument called the "magic" lock. In this extraordinary invention the bits of the key are attached to the shaft, and seem to be part of the same piece; when, however, the key is thrust into the lock, they are picked up by a pin which enters the centre of the shaft through them. When the shaft is turned, a number of wheels are set in motion which separate the bits from the shaft, and carry them into the interior of the lock, at the same time the wheels close up the keyhole with a solid block whilst the bits are arranging the tumblers for the drawing of the bolt. Neither the "tentative" nor the "smoking" nor the "impression" process has succeeded in picking the "magic" lock, which has received well-merited praise from English locksmiths.

Perhaps the best English lock is that invented by Mr. E. B. Denison, Q. C., which Mr. Hobbs declared to be the only lock of English invention secure against any known method of picking. This lock appeared in 1852, but was not patented, as the inventor held that patents are an obstruction to the progress of science, and waste on the whole more than they gain for real inventors. The advantages of the Denison lock are obvious. It has large and strong works, with a keyhole so narrow that no instrument strong enough to injure the lock can be introduced, nor a reflector to observe the bellies of the tumblers. The bolt is not only shot by turning a handle, but also locked without using a key. It cannot, however, be opened without a key. Notwithstanding its many virtues, however, the Denison lock has never found great favor in England, as the improved Chubb locks still hold their popularity. Since Mr. Hobbs proved that the *detector* in a Chubb lock afforded guidance to a person attempting to pick it, the English firm has obviated the difficulty by giving the tumblers an unequal bearing, so that if a lock-picker feels the obstruction of the detector he cannot tell whether the tumbler which he is lifting be raised too high or too low. Since the year of the lock-controversy (1851) American locksmiths have sustained the reputation gained at that era so memorable in the history of lockmaking; but, although the number of patents taken out since that date is great, the inventions are not of sufficient novelty to need detailed description. Since the year 1851 no less than 270 locks have been patented in London alone.

W. J. DIXON.

Locke (DAVID ROSS), better known under his *nom-de-plume* of "Petroleum V. Nasby," b. at Vestal, Broome co., N. Y., Sept. 20, 1833; learned printing in the office of the Cortland *Democrat;* was successively editor and publisher of the Plymouth (O.) *Advertiser*, the Mansfield (O.) *Herald*, the Bucyrus *Journal*, and the Findlay (O.) *Jeffersonian*, and editor of the Toledo *Blade*. In 1860 he began to publish his "Nasby" letters, several series of which have appeared in book-form. He is the author of many political pamphlets. His latest production is *The Morals of Abou ben Adhem* (1875).

Locke (JANE ERMINA), b. at Worthington, Mass., Apr. 25, 1805; d. at Ashburnham, Mass., Mar. 8, 1859. Her maiden-name was Starkweather, but in 1829 she married John G. Locke of Boston. They resided in Lowell from 1833 to 1849, and afterward in Boston. She published a volume of poems at Boston in 1842, *Rachel; or, The Little Mourner* in 1844, *Boston*, a poem, in 1846, *The Recalled; or, Voices of the Past* in 1855, and in the same year a eulogy in verse on Daniel Webster. Her poems were much appreciated in their time. Her husband published a genealogy of the Locke family.

Locke, and his Philosophy. I. The distinguished English philosopher, JOHN LOCKE, was b. at Wrington, Somersetshire, Aug. 29, 1632. His first studies were pursued at Westminster College, London. In 1651 he became a member of Christ's College, Oxford, where he resided till 1664. Here his mind received that bent which gave him his subsequent renown as a philosopher. It was partly from the reading of Descartes, whose clearness of exposition Locke, without accepting his views, greatly admired, so in contrast with the crude instructions of the university, and who must thus receive the merit of preparing against himself his most noted adversary. But it was in part, and directly, the influence of a discussion with five or six students in his rooms at Oxford, when, as he says, the thought came to his mind that the only sure ground of harmony in judgment must be found in a preliminary determination of the possibilities of the human mind. This "thought," which became the *Essay*, was taken up and laid aside, and written upon at intervals through a period of more than twenty years, and only finished in 1687. In 1664, Locke was secretary of legation at Berlin; in 1667 he became acquainted with Lord Ashley, afterwards earl of Shaftesbury, who, in gratitude for medical advice thought to have saved his lordship's life, received the young philosopher as a member for a number of years of his family. During this time he directed the education of Shaftesbury's son, and that of his grandson, who became the elegant philosophical writer in Queen Anne's reign. Locke was brought, through his friend and patron, into the society of Buckingham, Halifax, and other distinguished men. When Shaftesbury became lord chancellor he gave to him the office of the presentation of benefices. But both soon fell into disfavor, and from 1675 to 1679, Locke was in France, mainly at Montpellier with Herbert, later earl of Pembroke, and to whom he dedicated his *Essay*, having also free intercourse with men of eminence at Paris. From 1683 to 1688, on account of the state of his own country, he deemed it wise again to reside abroad. The revolution of 1688 enabled him to return from Holland to England, where he filled several civil offices, and had others proffered, which on account of age and ill health he declined. His last years were spent in the study of the Scriptures, and ministered to by Lady Masham, a daughter of Ralph Cudworth. D. at Oates, a firm believer in the Christian religion, Oct. 28, 1704.

II. THE PHILOSOPHY OF LOCKE.—1. *Reasons for its Great Popularity and Influence.*—The *Essay on the Human Understanding*, which contains Locke's system, did not appear in London until 1690. But four editions, revised by the author, were issued before his death, and a fifth, with his last emendations, the year after, a tenth in 1731, and the thirteenth in 1748. Meantime it was translated into French, then becoming the universal language of Europe; and this translation, made in 1700, passed through five editions in fifty years. It was also translated into Latin—into Dutch and German several times, and since into modern Greek. These various editions and translations indicate the popularity and extensive influence of the *Essay*. As *reasons* for this may be mentioned—first, the author's public and social position, coupled with the clearness and assurance, if not always the self-consistency, of his utterances. Although wanting the condensation and philosophic exactness of such writers as Kant, his English would rank among the best prose of his time; and his familiar style, derived from the refined society in which he moved, was a help to his popularity, as his public life was already an introduction to his authorship. Secondly, his adherence to the cause of civil and religious liberty. In his work on *Civil Government* he advocated the rights of the people against the arbitrary rule to which they were being subjected. In 1684, and by order of His Majesty, he was expelled from his benefice at Oxford, and was an exile on account of his too free opinions. He might have met with Sir Philip Sidney's fate if, instead of being secreted in Holland, he had fallen into the power of the king. On the accession of James II., William Penn proposed to procure for him a pardon, but the philosopher's noble reply was, "There is no need of pardon where there is no crime or fault." But the above reasons, however powerful as auxiliaries, would not suffice but for the third—that the times favored such a work. The psychological field was not much explored, and in attempting it Locke showed an independence which drew attention to him. At the same time, good men, especially in England, were disposed to accept of what was regarded as authority, and to assume that religion could find its support in faith, without any help from philosophy, or even against it. And unchristian thinkers found a support for their favorite theories in the current and accepted philosophy of Locke. Hence, "towards 1750," says Cousin, "the principles of Locke were spread through Europe; they were developed everywhere else, as well as in England." This would seem to declare the time of its appearance favorable to *such* a system as that enounced by Locke. "Placed between the seventeenth and eighteenth centuries, he forms the transition from one to the other. In fact, run over all the sensualistic philosophers of the eighteenth century, there is not one who does not invoke the authority of Locke; and I do not speak merely of metaphysicians, but of moralists, publicists, and critics. Locke is the chief, the avowed master of the sensualistic school of the last century." (*Cousin.*)

2. *What the Lockian Philosophy is.*—Its aim is "to inquire into the original certainty and extent of human knowledge." With this in view, the author strives to show (bk. i.) that there are no "innate ideas"—ideas being used for whatever is in the mind. If any of these are innate, then the expression of them—for example, "whatever is, is," or "it is impossible the same thing should be and not be"—must be accepted by all human beings, not a child or savage excepted. But, it is said, idiots, children, and savages do not accept them, therefore they cannot be innate. Such is the reasoning. The obstacles thus removed, the origin of knowledge is discussed (bk. ii.). Fortunately for us, the author's positions can be given concisely almost in his own words: "Let us suppose the mind to be, as we say, white paper, void of all characters, without any ideas; how comes it to be furnished? Whence has it all the materials of reason and knowledge? To this I answer, in one word, from experience; in that all knowledge is founded, and from that it ultimately derives itself." Again he says—and the passage is a fundamental postulate of this philosophy—"Our observation, employed either about external, sensible objects, or about the internal operations of our own minds, perceived and reflected on by ourselves, is that which supplies our understandings with all the materials of thinking. These two are the fountains of knowledge from whence all the ideas we have, or can naturally have, do spring." These are called "sensation" and "reflection." And it is important to observe that the latter must wait on the former. "I see no reason to believe that the soul thinks before the senses have furnished it with ideas to think on." That is, the mind can only act upon what is given to it from without, furnishing nothing original from itself. In the last analysis the materials of knowledge are "ideas" of sensation due to perception.

3. *Criticism of this Philosophy.*—The first valid objection to it is its faulty *method.* The primary and essential work of the psychologist is to examine all the facts of consciousness, and to present no theory not sustained by these. Instead of this true method, Locke lays down a hypothesis of the origin of knowledge which the facts of consciousness do not sustain. Then in his treatment of innate ideas he virtually assumes rational intuitions as elements of knowledge to be the same as a conscious recognition of propositional truth; *e. g.* if one has an idea of existence, he must know the import of "whatever is, is." And there is a constant want of distinguishing between the condition and the cause—between the chronological condition for the development of rational truth, and the real cause of its existence at all in the mind; the former being our sensible connection with the external world; the latter, the original constitution of the soul—*i. e.* the reason itself. So in the *matter* of it this philosophy has no support for substance and real being. Locke's ontology needs what his system, carefully guarded in its leading postulates, will not allow. Certain of his statements, indeed, taken by themselves, must involve intuitive truth. Some of the consequences deduced from his hypothesis Locke would deplore as much as any one. But his immediate followers, instead of exposing and correcting his radical defect, proceeded to make a rigorous application of his theory of the origin of ideas, and what he calls sensation and reflection becomes, consistently with his own position, sensation only. And so, after it has helped Berkeley to eliminate the external world from the sphere of reality, it enables Hume to say that it is vain to look for reality either within or without; according to the accepted philosophy, all is phantasm, and we cannot reach substance by any possibility of thought. The legitimate tendency of the system must be, and has been to a greater or less extent, skepticism in religion, utilitarianism in morals, and materialism in philosophy.

J. R. Herrick.

Lockesburg, cap. of Sevier co., Ark. (see map of Arkansas, ref. 5–A, for location of county), 81 miles S. W. of Little Rock. Pop. in 1880, 256.

Locke's Island, or **Lockport,** seaport of Shelburne co., Nova Scotia, on Ragged Island Bay, has considerable West India trade and fisheries. Pop. in 1881, 1918.

Lockhart, on R. R., cap. of Caldwell co., Tex. (see map of Texas, ref. 5–H, for location of county). 30 miles from Austin. The celebrated Lockhart Springs are located here. Principal business, farming and stock-raising. Pop. in 1870, 560; in 1880, 718.

Lockhart (John Gibson), D. C. L., b. at Cambusnethan, Lanarkshire, Scotland, in 1797; studied at Glasgow University 1807–10; graduated from Baliol College, Oxford, in 1817 as bachelor of law; passed advocate at Edinburgh 1816; became in 1817 a contributor to *Blackwood;* in which his articles were remarkable for vigor and scholarship; married in 1820 the daughter of Sir Walter Scott; was editor of the *Quarterly Review,* London, 1826–53; received in 1843 the sinecure auditorship of the duchy of Cornwall; was one of the writers of the *Noctes Ambrosianæ.* D. at Abbotsford, then the seat of his daughter, Lady Hope Scott, Nov. 25, 1854. His principal works are *Valerius* (1821), *Adam Blair* (1822), *Reginald Dalton* (1823), and *Matthew Wold* (1824), novels; *Don Quixote,* with notes (1822), *Spanish Ballads* (1824), *Life of Burns* (1825), of *Bonaparte* (1829), and of *Scott* (1837–39).

Lock Ha'ven, city and R. R. centre, cap. of Clinton co., Pa. (see map of Pennsylvania, ref. 3–E, for location of county), on the Philadelphia and Erie R. R., and on the right bank of the West Branch of the Susquehanna River, equidistant between Philadelphia and Erie, has a State normal school, good waterworks, several extensive machine-shops and iron-foundries, and is lighted by gas. The principal industry is the manufacture of lumber, there being in the city limits 9 saw-mills and 4 large planing-mills. An excellent boom for the staying of logs floating in the river is here located. About 35,000,000 feet of lumber are annually shipped from this point. Pop. in 1870, 6986; in 1880, 5845.

Lockjaw. See Tetanus.

Lock'port, Will co., Ill. (see map of Illinois, ref. 3–G, for location of county), on the Chicago Alton and St. Louis R. R. and the Illinois and Michigan Canal, 33 miles from Chicago. The principal business is farming. Pop. in 1870, 1772; in 1880, 1679.

Lockport, city and R. R. centre, cap. of Niagara co., N. Y. (see map of New York, ref. 4–C, for location of county), on the New York Central R. R. and on the Erie Canal, 65 miles W. of Rochester, 18 miles from Niagara Falls, 25 miles from Buffalo, and 8 miles, air-line, from Lake Ontario. It derives its name from a double tier of five locks, of 12 feet lift each, by which boats are passed up and down the "mountain-ridge," a height of 60 feet. Some 35,000 cubic feet of water pass this point every minute during the season of navigation, only one-fifth of which on account of lockages, the four-fifths in some part turning machinery before reaching the canal-level below. Lockport is located near the geographical centre of one of the most profitable grain and fruit growing counties in the State. There is received for apples alone from $1,000,000 to $1,750,000 annually. It has important manufacturing interests, including the Holly Company, which employs 300 skilled mechanics in constructing the Holly waterworks, now in use in more than 60 cities and villages in the Union; also manufactures of engines and steam-dredges, self-centring turning-lathes, tackle-blocks, bran-duster and smut-machines, window-sash, doors, cornices, etc., patent medicines, shirt bosoms, etc., and large quarries of blue limestone. It contains a union school system, embracing the entire corporation, with an imposing central structure wherein are taught collegiate branches, and all free to actual residents of the city; 2 homes for the friendless, and several other benevolent organizations, and a fine opera-house. Pop. of city in 1870, 12,426; in 1880, 13,522.

Lockwood (Belva Ann Bennett). See Appendix.

Lockwood (Henry Hall), b. in Kent co., Del., Aug. 17, 1814, was educated at West Point and graduated in 1836; entered the 2d artillery regiment and served against the Seminoles in Florida, but resigned his position in the army in 1837, and was in 1841 appointed professor of mathematics in the U. S. Naval Academy. In 1861 he was made colonel of the 1st regiment of Delaware volunteers, and shortly after brigadier-general. He led an expedition to the Eastern Shore of Virginia in Nov., 1861; commanded the defences of the Lower Potomac from January to June, 1863; was engaged at Gettysburg July 1–3, 1863, and in the Richmond campaign, May and June, 1864, participating in the actions near Hanover, May 30–June 1; and commanded the troops which were sent to defend Baltimore against the raid of Early in July, 1864. After the close of the war he was appointed professor of natural and experimental philosophy in the U. S. Naval Academy; he has published a number of military treatises.

Lockwood (Samuel), b. in Connecticut in the beginning of the present century, entered the U. S. navy, and became a midshipman in 1820, lieutenant in 1828, and commodore in 1867. He served in 1826 in the sloop Warren, which was engaged in suppressing piracy in the Greek waters. In 1847–48 he commanded the steamers Petrel and Scourge, and assisted at the capture of Vera Cruz, Tuxpan, and Tabasco. In 1861–62 he commanded the blockade of Wilmington and Beaufort, and of York River and Newport News. In 1864 he retired.

Lock'yer (Joseph Norman), F. R. S., b. at Rugby, England, May 17, 1836; educated chiefly on the Continent; was clerk in the war-office in 1857; became skilled in mathematics and astronomy by private study; edited the

Army Regulations (1865); was for a time connected with the royal commission on instruction; became a fellow of the Royal Astronomical Society 1866; F. R. S. 1869; editor of *Nature*, etc.; was Rede lecturer at Cambridge 1871–73, and chief of the eclipse expedition to Sicily in 1870; has written valuable papers on the sun and the planet Mars, *Lessons in Astronomy*, *The Spectroscope*, etc., and various reports and memoirs, chiefly upon astronomy and physics.

Lo'cle, town of Switzerland, in the canton of Neufchâtel, on the Bied. Its manufactures of clocks and watches are very celebrated, and the most extensive in the world. Its manufactures of lace are also important. The surplus water of the Bied is discharged into the Doubs through an artificial tunnel constructed to prevent inundation of the Valley of the Bied. Pop. 10,464.

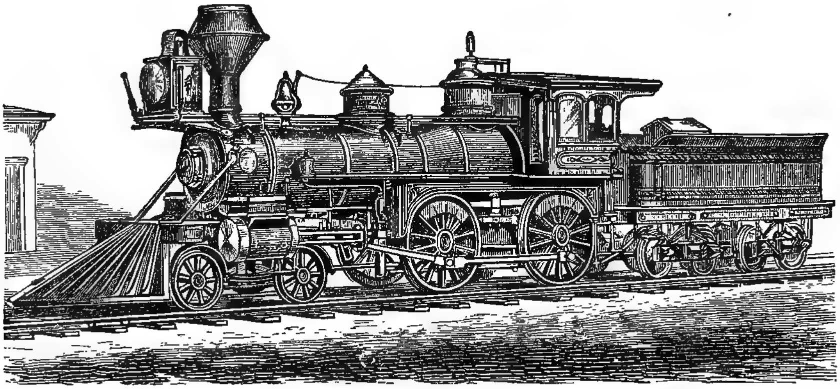
Lo'cock (Sir CHARLES), BART., M. D., F. R. S., b. at Northampton, England, Apr. 21, 1799; studied at the University of Edinburgh, where he graduated in medicine 1821; established himself in his profession in London, and in 1840 was appointed, on the recommendation of Sir James Clarke, physician accoucheur to the queen, by whom, in recognition of his services, he was created a baronet Apr. 14, 1857, at which time he retired from the active practice of his profession. In the same year he was chosen president of the Royal Medical and Chirurgical Society, and became in 1863 honorary president of the Obstetrical Society. He was a magistrate and deputy-lieutenant for Kent, and in 1865 was an unsuccessful candidate for Parliament in the Conservative interest. D. at Binstead Lodge, Ryde, July 25, 1875.

Locomotion of Animals. See MECHANICS, ANIMAL, by PROF. W. P. TROWBRIDGE, PH.D., LL.D.

Locomo'tive [Lat. *locus*, "place," and *movere*, *motum*, "to move"]. The form of engine shown in the engraving represents quite accurately a very large proportion of the locomotives found upon American railroads. Other varieties, some differing widely from this, are used both upon our own roads and in other parts of the world, but in all their essential elements they may be compared with it. The principal parts are the boiler, containing within itself the firebox or furnace; the frame, the steam-cylinders, the valve-gear, the driving-wheels, and the truck-frame with its wheels.

The body of the boiler is cylindrical, and to it, at the back end, between the driving-wheels, the rectangular outer firebox is riveted. The fire-grate is placed at the bottom of the inner firebox, and the heated gases pass from the burning fuel through the tubes, which extend forward through the body of the boiler to the front end. The water is contained in the spaces around the outside of the tubes, and also in the water-leg or space between the inner and outer fireboxes. A dome is placed upon the top of the boiler to give a larger internal steam-space, and also in order that the mouth of the pipe through which the steam is led to the cylinders may be raised up within it as high as possible above the surface of the water. The parallel sides of the outer and inner fireboxes are held to each other by stay-bolts, which are screwed in through both plates. The top or crown-sheet of the inner firebox is nearly flat, and it is stayed by deep bars which reach across it from side to side. To these bars the sheet is held up by numerous bolts or rivets, and the bars themselves are supported partly by resting at their ends upon the side-sheets or plates of the inner firebox, but chiefly by sling-stays, which hang down from the shell of the boiler above the crown-sheet. The shell of the boiler is extended forward about three feet beyond the front end of the tubes, forming the smoke-box, within which the waste gases collect after passing through the tubes, and upon which is placed the chimney through which they escape into the air. Near the top of the chimney a deflector is placed to break up the coarser cinders that may be projected against it by the force of the draft, and a wire netting fine enough to prevent their escape into the air. On wood-burning locomotives this netting is so fine that a medium-sized pin cannot be thrust through the mesh. Directly under the chimney is placed the draft-pipe, by which uniformity in the flow of gases is secured from the lower as well as the upper tubes into the chimney. Beneath the draft-pipe a nozzle is placed upon the end of the exhaust-pipes, and through it the waste steam of the cylinders is discharged. By this means a draft is induced through the tubes and through the fire, and by this intermittent discharge into the chimney of the steam from the cylinders the well-known puff of the locomotive is produced.

FIG. 1.



Locomotive.

The throttle-valve, by which the admission of the steam to the cylinders, and thus the starting of the engine, is controlled, is placed at the entrance to the steam-pipe, close beneath the cover of the dome, which can be readily removed to give access to the interior of the boiler. The steam-pipe extends down and forward through the front end of the boiler into the smoke-box. Two separate pipes then lead to the steam-nozzles on the cylinder, through which the steam passes into the steam-chest. The cylinders are placed outside of and close against the frames, being bolted directly to them, and also by the flanges of an intermediate saddle-piece to the smoke-box, or front end of the boiler. The steam-chest, containing the slide-valve, is placed on the upper side of the cylinder, in which the ports are so cast that the steam may pass into the chest from the steam-pipe, out of it to either end of the cylinder, and also out to the exhaust-pipe in its final escape, the distributing passages being alternately covered by the slide-valve. The motion of the piston in the cylinder is transmitted through the piston-rod to the cross-head, and then by the connecting-rod to the crank-pin, which is fitted into the driving-wheel. The piston is made of cast-iron, and runs steam-tight in the cylinder by means of iron packing-rings and a set of steel springs, which press the rings radially outward against the walls of the cylinder. Rings made of square steel wire are often used, the rings being bent to a circle a little larger than the diameter of the cylinder, and then sprung into grooves which are turned in a solid piston to receive them. By their own elasticity the wires are kept close against the cylinder. The cross-head is held by a key to the outer end of the piston-rod, and it is guided in its reciprocating motion by four steel slide-bars which are set parallel with the centre line of the cylinder. The connecting-rod is attached at one end to a wrist in the cross-head, and at the other end to the crank-pin in the driving-wheel; and it thus transmits the pressure upon the piston to the wheel, and to the point of contact or of resistance upon the rail. This rod, and the parallel rod which connects the two driving-wheels, are fitted at both ends with brass boxes and tapered keys, by which they are held close upon the crank-pins in the wheels. The rocker is placed close behind the slides, and through it is transmitted the reciprocating motion of the eccentrics upon the driving-axle to the slide-valve, by means of the eccentric rods, the reversing link, and the valve-stem.

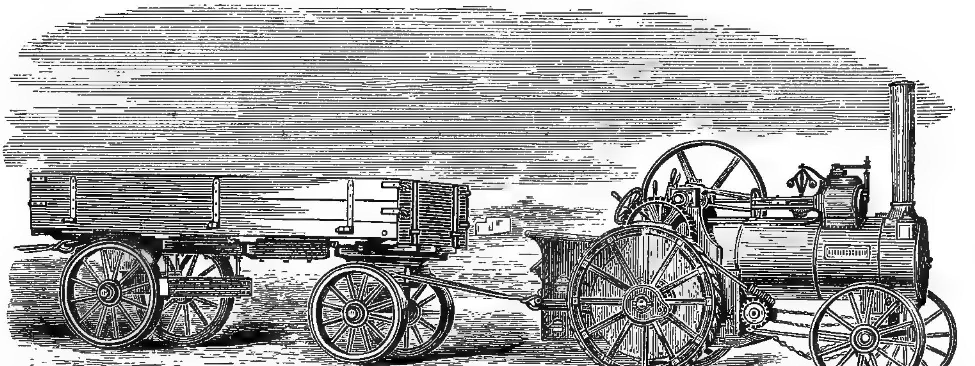
The iron frame-bars are placed one on each side of the boiler, and they are attached to it rigidly near the forward end. A cross-beam of oak holds them to each other at the extreme front, and to this beam is attached the pilot or cow-catcher, which aids in clearing the track of obstructions. The saddle to which the cylinders are attached serves as the means of fastening the frames to the boiler, as it rests upon them, and is held to them and to the smokebox by bolts which are driven solid into accurately drilled holes. The jaws of the frame which hold the driving axleboxes are forged solid with the long side-bars, which lie close on each side of the outer firebox. The frames are held rigidly to the firebox laterally, but clasps are put round them, so that the whole body of the boiler may expand backward from the front end as it becomes heated. At the back end of the frames a cast-iron plate is put in between them, which serves both in holding them to each other and also in coupling on the tender. The axleboxes of the driving-wheels are free to slide vertically in the jaws of the frame, so that the wheels may yield more perfectly to the inequalities of the road. The weight of the engine over the driving-wheels rests upon the spring-hangers, which draw directly upon the ends of the springs. These bear, in the centre of their length, upon the top of the axlebox, so that the jar due to the striking of the wheel upon any inequality in the rail-surface is lessened in violence by passing thus through the spring. An equalizing lever is placed on each side, between the driving-wheel springs, and to this lever one end of each spring is hung, so that the jar brought against one wheel is in part transmitted to the spring of the other wheel, and thus the elasticity of both springs is utilized for the relief of each wheel. On each side of the axleboxes are placed vertical wedges which bear against the jaws of the frame, and by tightening them any looseness due to the wearing of the moving faces may be compensated for. The axlebox has a brass or white-metal lining, which bears upon the axle, and on the top of it is formed an oil-cup for the lubrication of the rubbing surfaces. Underneath the axle is an oil-box filled with a compressed sponge, which retains the oil and presses it constantly against the bearing surface of the axle.

The driving-wheels are bored to a close fit upon the axles, and are forced on by a powerful hydraulic press. They are held from turning on the axle by a square key, which is driven into a recess or key-way cut half in the axle and half in the wheel. The steel crank-pin is forced in the same way into a hole bored in the crank-boss, which is an enlargement of two of the spokes of the wheel. The driving-wheels of American locomotives are invariably made of cast iron, and are encircled with a steel band or tire, which bears upon the rail and has a flange or lip at its inner edge by which it is kept laterally upon the rail. Many methods of holding the tires in place upon the wheel have been employed. In one of these oak blocks are driven with great force into recesses which are left under the tire in the rim of the wheel. In another the tire is turned out true on its inner circumference, and the wheel is turned slightly larger than this inner diameter of the tire. The latter is heated until by its expansion it will slip on to the wheel, and by the tension due to its cooling it is held in place. The forward or truck-wheels are made of cast iron, with a hard tread or bearing surface. They are pressed on to the axles without keys, and are placed under the engine in the truck-frame. Upon this frame is placed a centre-bearing, upon which the weight of the forward part of the engine rests, and around which the frame can rotate slightly in following the curvature of the track over which the engine may be passing, and thus the resistance due to the side-pressure of the flanges against the rails in passing curves is greatly lessened. The direction of the motion of the engine may be changed by the action of the reverse lever, in bringing into gear with the slide-valve, by means of the reversing link, one or the other of the eccentrics upon the driving-axle.

The feed-pump by which the supply of water is forced into the boiler is driven by one of the cross-heads, the pump-plunger being attached directly to it. The pump-valves are made of the hardest brass, and so that they may be easily examined or repaired. An injector is usually fitted for the supply of the boiler when the engine is standing. The water is led to the pump and to the injector by pipes which are connected to the tender by a flexible hose. It is delivered to the boiler through pipes which enter near the front end, and a check-valve is fitted close to the side of the boiler to prevent the return of the heated water to the pump. The tender, which accompanies nearly all American locomotives, is provided with a water-tank enclosing a space for fuel, and the whole, resting upon a timber platform, is placed upon two truck-frames which are fitted with the requisite wheels and axles.

The weight of an engine of this class, without the tender, may be taken at thirty-two tons when filled with water and ready for work. Of this weight, twenty-one tons rest upon the driving-wheels. The cost of operation and maintenance per mile run is about 19 cents, the proportion due to repairs being $3\frac{7}{10}$ cents, to fuel $5\frac{6}{10}$ cents, to stores $\frac{5}{10}$ cent, to miscellaneous $2\frac{5}{10}$ cents, and to attendance of all kinds $6\frac{5}{10}$ cents. It is certain that the secret of the most successful practice in the designing and construction of locomotives has lain in the observance of the most rigid simplicity of detail in every part, and also that the improvements of the future will lie chiefly in the adaptation of new materials, rather than new methods of construction.

Fig. 2.



Road Locomotive.

Road Locomotive.—The engraving shows a well-approved form of engine by Aveling & Porter of Rochester, England. Very little has been done in this country in bringing such engines into actual use, though several excellent designs for them have been put forward. In this engine the boiler is of the common locomotive form. On the top of it, near the front end, the steam-cylinder is placed, and the crank-shaft, fly-wheel, and driving-gear are directly behind it. The driving pinion upon the crank-shaft is connected, with one intermediate shaft, to a heavy gear upon the driving-axle, and thus a high speed of the fly-wheel may be maintained at an ordinary speed of the locomotive, and an ample power developed even with a small steam-cylinder. The driving-wheels, upon which about eight-tenths of the whole weight of the engine rests, have very broad rims, with thin oblique strips riveted upon them, and they thus have a slightly greater hold upon the ground than would be afforded by an entirely smooth surface. The front wheels are pivoted, by a centre-pin in their axle, so as to allow the engine to move in a curved path. This turning of the engine is controlled by side-chains, which are drawn up by a hand-wheel placed near the driver. The wheels are made with an internal wrought-iron rim and arms. A cast-iron external rim or tire is used, and between these two rims, in a closed recess, are placed blocks of rubber, which by their elasticity afford sufficient relief to the machinery from the jarring of rough roads, and which are at the same time protected from injury. The weight of a medium-sized engine of this kind may be taken at about eight tons, and the cost of operation and maintenance at from four to six cents per mile run.

P. Barnes.

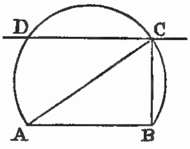
Locoroton'do, town in Southern Italy, in the province of Bari, about 26 miles N. of Taranto. Pop. in 1874, 7189.

Lo'cri, or **Locri Epizephy'rii,** an ancient city of Magna Græcia or Southern Italy, in the subsequent Roman province of Bruttium or Calabria Ultra, now Reggio. It was founded probably as early as 710 B. C. (according to Strabo) as a colony from the Grecian Locris, but whether from the eastern or western country of that name is uncertain. The original settlement was on Cape Zephyrium (Capo di Bruzzano), near the S. E. point of the Calabrian peninsula, whence the name given to distinguish the colony from the mother-country. Ultimately, the settlement was removed 15 miles farther N. Locri was celebrated as the first Greek state to adopt a *written* code of laws, the authorship of which was ascribed to a half-mythical legislator, Zaleucus. The people were said to be skilful and courageous in war, and addicted to poetry, philosophy, and music. The Locrians were long in hostility with Rhegium and Crotona, and in alliance with Syracuse. The younger Dionysius seized upon the citadel at Locri on his expulsion from Syracuse (356 B. C.), and carried on a despotic government until expelled six years later. During the wars of the Romans with Pyrrhus and with the Carthaginians, Locri alternately favored all the contending parties, and consequently suffered by turns from all, especially from the Romans, who were finally victorious, and followed the example of Pyrrhus in plundering the famous temple of Proserpine. From this time Locri sunk into insignificance; its very existence for many centuries is known only by passages in geographical treatises. Destroyed probably by the Saracens, its site had become unknown until the present century, when the remains of the walls of the two famous citadels and the foundations of the temple of Proserpine have been discovered 5 miles from the modern town of Gerace. (See description by the duke de Luynes in *Ann. d. Inst. Arch.*, vol. ii.)

Loc'rians [Λοκροί], a people of ancient Greece, reputed to be descendants of the Leleges, divided into eastern and western tribes. Those on the E. coast, and N. of the Phocian city Daphnus, were called Epicnemidii (named from Mount Cnemis), while those farther S. were Opuntii, so called from Opus, their chief town. On the N. of the Corinthian Gulf dwelt the Ozolæ, a semi-barbarous tribe. The distinction between Epicnemidii and Opuntii is not found, however, in the writings of Homer, Herodotus, Thucydides, and Polybius, and during the flourishing period of Grecian history Opus was regarded as the chief town of the Epicnemidii. Even Strabo, from whom the distinction is principally derived, in one place describes Opus as the metropolis of the Epicnemidii. The origin of the name Ozolæ is uncertain. It is generally derived from a Greek verb which signifies "to smell," but various opinions prevail concerning the object to which the smell has reference—the undressed skins worn by the ancient inhabitants, or the stench arising from a spring at the foot of Mount Tophiassus, or the abundance of asphodel with which the air was scented. The Locri Ozolæ are said to have been a colony from the Opuntian Locrians.

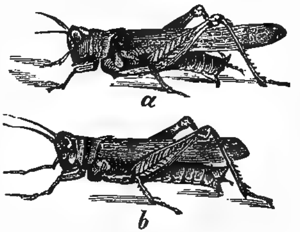
Lo'cus [Lat.]. The locus of a point is the line generated by that point when moving according to a fixed law. Thus, if a point moves in a plane in such manner that the sum of its distances from two fixed points is always equal to a given distance, its locus is an ellipse. The locus of a line is the surface generated by that line when moving according to a fixed law. Thus, if a straight line moves in such a manner as to touch three other straight lines, no two of which are parallel, its locus is a hyperboloid of one nappe. To find the equation of a locus we have only to express the law of motion by one or more indeterminate equations.

The following example illustrates the method of solving geometrical problems by the principles of loci: Let it be required to construct a triangle whose base is equal to a given line, whose area is equal to a given area, and whose vertical angle is equal to a given angle. Draw a line AB equal to the given base; on it, as a chord, construct an arc of a circle capable of containing the given angle; draw a line DC parallel to AB, and at a distance from it equal to the quotient of the given area by half the line AB; and from either point in which this line intersects the arc, as C, draw CA and CB; then will ACB be the required triangle. For, DC is the locus of the vertices of all the triangles whose common base is AB and whose areas are equal to the given area, and the ACB is the locus of the vertices of all the angles whose sides pass through A and B, and which are equal to the given angle; hence, the points of intersection are the vertices required. If DC cuts the arc in two points, there are two solutions; if it is tangent to the arc, there is but one solution; if it does not intersect the arc, and is not tangent to it, the solution is impossible. W. G. Peck.



Lo'cust [Lat. *locusta*]. By this name may be denoted the migratory locust of the Old World (*Œdipoda migratorium*) and the locust of Western North America (*Caloptenus spretus*). The term "locust" is often wrongly applied to the cicada or seventeen-year locust. The transformations of the locust, as in all the grasshoppers, are very slight, the larva differing from the adult chiefly in wanting wings; but in this state even they are said by African travellers to travel great distances. The eggs are large, long, cylindrical, and laid late in the summer in packets of about seventy-five, resembling cocoons, in holes bored in the ground by means of their stout horny ovipositors. The voracity of the locust, and of grasshoppers generally, may be explained by the anatomy of the alimentary canal, which is highly developed, the gizzard being provided with from six to eight rows of horny denticulated plates situated on ridges, the whole number of teeth in some species amounting to 270. The stomach and salivary glands are highly developed, the large jaws further adapting it for its vegetable diet. The air-tubes (tracheæ) dilate into numerous large air-reservoirs, which assist it in taking its long-sustained flights. The ears of the locust are two vesicles situated at the base of the hind-body or abdomen, each supplied by an auditory nerve sent from the third thoracic ganglion. The stridulating noise this and many other grasshoppers make is produced by rubbing the thighs against the wings. The migratory locust of the Old World is widely distributed, being found all over Africa, in Western Asia, and Southern Europe, sometimes occurring in Belgium and England. It is said to travel about sixteen miles a day. It moults five times, at intervals of about six weeks. The locust is eaten and relished by the natives of the country in which it is found as nutritious food.

FIG. 1.



Red-legged Grasshopper, and its long-winged Western variety.

The locust of North America is the widely distributed red-legged "grasshopper" (*Caloptenus femur-rubrum*, Harris, Fig. 1, *b*) with its allied species (*Caloptenus spretus*, Uhler, Fig. 1, *a*), which inhabits the U. S. west of the Mississippi River, though occasionally found in New England. The eastern species does the most damage in Northern New England and Canada. The western species (*spretus*) breeds most abundantly in the elevated portions of Colorado and northward, and migrates to the plains below; it also breeds abundantly in Iowa and Minnesota, and is so voracious as to drive farmers from their lands. The young of the *spretus* are hatched in March and April and early in May in Texas, Colorado, and Kansas, and at once begin their ravages. Late in the season, by the last of June, they acquire wings, becoming fearfully destructive, though most destructive before acquiring their wings. They are more active by night than by day. Late in summer so abundant do they become that an observer in Texas has seen "the whole surface of the earth so broken up by their borings that every inch of ground contained several patches of eggs." A. S. Packard, Jr.

Locust Tree [Lat. *locusta*]. The locust tree is named *Robinia*, in honor of John Robin, herbalist to Henry IV. of France, and of his son Vespasian, who first cultivated the tree in Europe. The beautiful genus received its name from Linnæus, and belongs to the sub-order Papilionaceæ of the order Leguminosæ. The five-toothed calyx is short and slightly two-lipped. The standard is large and rounded, turned back, and scarcely longer than the wings and keel. The stamens are in two bundles—*i. e.* diadelphous. The style is bearded next the free stamen; the pod linear, flat, several-seeded, margined on the seed-bearing edge, and with thin flat valves. Leaves odd-pinnate, with stipels at the base of the leaflets. The flowers are very showy, in pendulous racemes, and in the common locust are exceedingly fragrant. *Robinia Pseud-acacia*, the common locust, is called false acacia from the resemblance it bears to the true acacia. It has prickles at the base of the leaves, which are smooth and rarely retain dust. The roots do not bury themselves deep in the soil, but spread out just beneath the surface, and cause the young tree to grow with extreme rapidity during the first years of its life. When more mature, and the roots have exhausted the nourishment about them, the growth is slower. It has been recommended to be planted on the borders of pastures, as its droppings enrich the soil. Cattle are fond of the sweet leaves. The tree never attains great size in the Eastern States, but reaches its perfection in Kentucky and Tennessee, where it sometimes exceeds four feet in diameter, and grows to a height of eighty feet. When the land where it grows is cleared it produces abundant crops of Indian corn for several years in succession without manuring. It has been suggested that exhausted soil may be restored to fertility by a growth of the locust, its leaves soon becoming converted into mould.

The wood of the locust is close-grained and compact. Its medullary rays are closer and more numerous than in any other tree. The color varies, but the reddish-tinted is the most valued for timber. According to Emerson, there is a black variety in the Western States. The wood is remarkable for its strength and durability, and for its stiffness, hardness, elasticity, and weight. Fence-posts, railway sleepers, and trenails in naval architecture are made of it. It is considered as durable as the live-oak. It is used to some extent in cabinetmaking, but only slightly in housebuilding. For mill-cogs it is very valuable. The celebrated Cobbett in 1823, after a residence of some time in America, returned to England, and by his writings, in which he claimed superlative virtues for this tree, produced a remarkable interest in it. It was soon found that he had much exaggerated the useful properties of the tree. Valuable as the wood is for many economic purposes, graceful as is the aspect and foliage of the tree, and beautiful as are the flowers, the locust is yet so infested by many varieties of insects as to make it objectionable. Where it is grown for timber it is advised to plant it in groves, as then the trees on the margin only seem to be affected. All parts of the tree—leaves, bark, wood, and seeds—are subject to insect ravages, almost threatening its extermination. The branches are easily broken, moreover, by winds. It is easily propagated by the suckers which spring up from the roots, and still more readily by the seed, which is best preserved in the pod. It prefers a rich, loamy soil, and the young plants will often grow from two to three feet in the first season. There are two species of *Robinia* found in cultivation besides the *pseud-acacia*—viz. the *Robinia viscosa* and the *Robinia hispida*. The latter—a mere shrub—is known as the rose acacia, and is distinguished by its rose-colored, inodorous blossoms and hairy stems. It is apt to spread and become troublesome. W. W. BAILEY.

Lodève, town of France, department of Hérault, at the confluence of the Ergue and Soulandres, at the foot of the Cevennes. Pop. in 1881, 10,185.

Lodge (EDMUND), F. S. A., b. in London, England, June 13, 1756; served in the army in his youth, and afterwards devoted himself to antiquarian pursuits, especially genealogy. He became a member of the Heralds' College; was promoted to the office of Lancaster Herald 1793, Norroy King-of-Arms 1822, and Clarencieux King-of-Arms 1838. D. at London Jan. 16, 1839. He published *Illustrations of British History, Biography, and Manners in the Reigns of Henry VIII., Edward VI., Mary, Elizabeth, and James I.* (3 vols., 1791), *Peerage and Baronetage of England*, an annual publication, etc.

Lodge (HENRY CABOT), b. in Boston May 12, 1850, educated in Boston at private school; graduated at Harvard 1871; at Harvard Law School 1875, LL.B.; assistant editor *North American* 1874; resigned 1876; 1876 admitted to bar; elected member of Massachusetts Historical Society; took degree of Ph.D. for essay on *Land Law of Anglo-Saxons*, published by Little & Brown in 1877; published *Life and Letters of Great-Grandfather George Cabot;* was university lecturer on American history 1876–79; resigned 1879; 1878 elected member American Academy Arts and Sciences; 1879 editor *International;* resigned 1881; 1879 delivered Fourth of July oration before city government of Boston; wrote article "Albert Gallatin" for *Encyclopædia Britannica;* elected member of House from 10th Essex district 1880; re-elected to House; district delegate to Chicago June, 1880; 1881 published *Short History of English Colonies;* edited two series of *Popular Tales* and a volume of *Ballads and Lyrics;* elected member of American Antiquarian Society 1882; published *Life* of Alexander Hamilton 1883, and *Life* of Daniel Webster; elected chairman of Republican State committee, and conducted campaign which resulted in defeat of Gen. Butler; 1884 published *Studies in History;* sent as delegate-at-large to Republican convention at Chicago; ran as Republican candidate for Congress in 6th Dist., and was defeated by some 255 votes in a total of 30,000; edited Putnam's edition of *Works of Alexander Hamilton.*

Lodge (THOMAS), b. in Lincolnshire, Eng., about 1555; entered Oxford University in 1573; was a law-student at Lincoln's Inn in 1584; was for some time an actor; was a soldier in the expeditions of Clarke and Cavendish; studied medicine at Avignon, and practised at London, where he d. of the plague in Sept., 1625. He was the author of *Rosalynde; Euphue's Golden Legacie* (1590), a novel which was the basis of Shakspeare's *As You Like It; True Tragedies of Marius and Sylla* (1594), a drama; *A Margarite of America* (1596), a tale; a *Treatise of the Plague* (1603). In connection with Greene he wrote *A Looking-Glass for London and England* (1594).

Lo'di, town of N. Italy, in the province of Milan, in lat. 45° 18' 35'' N., lon. 27° 09' 67'' E. It lies 20 miles S. of Milan, on the right bank of the Adda, which is here crossed by a bridge, the river being navigable for large boats until it reaches the Po. Lodi was the theatre of one of the most daring and brilliant exploits of the French under Bonaparte. On May 10, 1790, Napoleon, after the terrible passage of the long and narrow bridge under the full fire of the Austrian batteries, won the memorable victory which secured him the possession of Lombardy. The streets and piazzas of Lodi are, for an old town, broad, spacious, well paved, and clean, and many of the public buildings are worthy of notice. The cathedral dates from the twelfth century, and other churches contain fine marbles, bronzes, frescoes, and especially wood-carvings of much merit. The educational and charitable institutions of Lodi are numerous, and recent co-operative associations have proved very successful. The trade and industry of the place are remarkable. Its *majolica* has a high reputation; also its silk and linen, but the chief article of the Lodi market is the famous Parmesan cheese, which is made in immense quantities in the neighborhood. Pop. in 1881, 25,804.

Lo'di Vec'chio [anc. *Laus Pompeia*], an old town about 5 miles from Lodi, founded, Pliny says, by the Boii and colonized by the father of Pompey. Its mediæval vicissitudes, together with those of the more modern town, are of much interest. Pop. 3500.

Lodome'ria was the Latin name for a part of Galicia.

Lodz, city of Russian Poland, in the government of Piotrokow, is well built, and has very extensive manufactures of cotton, woollens, and linens. In 1821 it had only 800 inhabitants, but the establishment of cotton manufactures has made it the second town in Poland. Pop. 57,000.

Loess [Ger. *Lösz*, from *Losen*, to "loosen"], arenaceous calcareous clay, yellowish brown in color, found chiefly in the valleys of certain rivers, such as the Rhine, the Danube, and the Missouri. The loess belongs to the category of superficial deposits, being covered only by alluvium, and where in contact with the till or boulder clay, the ground moraine formed by glaciers, it is found to rest upon that, and is thus proved to be of more recent date. Usually the loess shows little signs of stratification; sometimes it is obscurely bedded, but often forms cliffs or walls 30 to 50 feet in height where the material is very nearly homogeneous throughout. Unlike clay, loam, or sand, the loess is remarkably resistant to weathering; exposed cliffs of it seem to be as little affected by rain or frost as many varieties of solid rock; and where faces of loess have been marked with inscriptions, these remain legible for a surprisingly long time when the softness of the material is considered. Another peculiarity of the loess is that it contains many calcareous concretions, usually round, ovoid, or cylindrical, though irregular in diameter and surface. It also contains traces of what seem to be the roots of plants deeply penetrating the mass, apparently from the present surface, and the concretions referred to above have been often formed around such roots. The loess of the Missouri Valley is sometimes called the *bluff-formation*, because, from its power of resisting erosion, it forms vertical faces or "bluffs." These are, however, often only the facings of the rocky cliffs which constitute the walls of the valley formed long ago and filled, in comparatively modern times, with the loess, now but partially removed. The fossils of the loess are usually few in number, and are chiefly land-shells and the bones of land-animals, but occasionally fresh-water mollusks are found in considerable abundance.

The origin of the loess has recently become a subject of earnest discussion among geologists. It was formerly supposed by all to be a river silt, and that is the view advocated by Lyell in his description of the loess of the Rhine, but Baron Richthofen, in the study of the great area occupied by the loess in China, was led to consider the whole formation as an accumulation of wind-borne dust. This view is accepted by many geologists, but there are serious difficulties in its application to the loess deposits of Europe and America. These are:

1st. *The limitation of the loess of Europe to the valleys of the Rhine and Danube.* It is difficult to understand how an æolian deposit should be so restricted, while a fluviatile or lacustrine sediment would necessarily be so. The loess of the Mississippi Valley is not restricted to so narrow limits, and yet it is mostly confined to the Valley of the Missouri and the adjacent country, which would be flooded by its waters if their flow was impeded.

2d. *No such deposit as the loess is now known to be accumulating through the agency of wind.* Nothing of the kind has been observed by the writer in repeated journeys through the arid and windy regions of the interior of our continent, where the conditions would seem to be especially favorable and where dust-storms are common, the material transported by the wind being all washed away by the rain and snow. The absence of stratification in the loess is a feature difficult to reconcile with aqueous deposition, as it would be evidence of a constancy in conditions of sedimentation certainly unusual, though not impossible; Lyell shows, however, that the silt of the Nile is nearly unstratified. The writer adheres to the theory of aqueous deposition for the origin of the European and American loess, because it is more like an accumulation of river silt than any other deposit now forming. The yellow waters of the Missouri are now always loaded with a sediment which in chemical and physical characters is scarcely different from the loess; and if the outlet of the Missouri were obstructed by a dam or by the influx of the waters of the Gulf, it would precipitate a sediment undistinguishable from it unless laminated by variations in the volume of the river. If the sediment carried by the Missouri were distributed through a considerable body of still water into which it flowed, the sediment would be distributed and deposited with a good degree of constancy. We can imagine circumstances in which the amount of sediment transported would be subject to very little variation, and hence the deposit formed at the bottom of the receiving basin would be nearly homogeneous. The rivers which are fed only by rain vary greatly in their volume and the amount of sediment they transport, but the streams which drain glaciers are much less variable in their flow, and the silt they carry is always abundant and almost invariable in character and quantity. The region drained by the Upper Missouri was once occupied by glaciers more extensive than those of Switzerland, and it is certain that its current once carried a larger and more constant burden of silt than now. We have also evidence that a water-basin at one time occupied the country about the mouth of the Missouri and received its flow. Putting these facts together, we have the basis of a theory for the formation of the loess which is not difficult to understand or believe. Similar causes would produce like results in the valleys of the Rhine and the Danube, and we have only to imagine what we know to have been at one time true—that these streams drained a great glaciated area in Central Europe, and their ice-cold and lifeless waters transported a large and constant quantity of sediment, precipitated this near their obstructed mouths—and we have supplied an explanation of the phenomena which is not only possible and probable, but almost inevitable. (See Lyell, *Elements of Geology*, 1838, and *Principles of Geology*, 10th ed., vol. i., 1867; R. Pumpelly, *Geol. Researches, Smithsonian Cont.*, 1866; J. S. Newberry, *Annals N. Y. Lyc. Nat. Hist.*, 1871, and *Geology of Ohio*, vol. ii., 1874; J. E. Tod, *Proc. Amer. Assoc.*, 1878; E. W. Hilgard, *Amer. Jour. Sci.*, 1879; W. J. McGee, *Proc. Amer. Assoc.*, 1878, and *Geol. Mag.*, 1879; R. Ellsworth Call, *Am. Naturalist*, 1882.) J. S. Newberry.

Lofo'den, or **Lofo'ten,** a group of islands situated between lat. 67° 30′ and 69° 30′ N., and stretching along the north-western coast of Norway. The largest are Andöen, Langöen, Hindöen, East Vaagen, West Vaagen, and Flagstadöe. They are high and rocky, presenting wild, rugged, and deeply-indented coasts, and rising in some places of the interior to the height of 4000 feet, at which elevation the snow does not melt during summer. The inhabitants number about 4000, partly of Norwegian, partly of Finnish descent. Along the coasts of the fiords a little barley, oats, and potatoes can be cultivated, but the islands derive their importance from the immensely rich fisheries, which each summer employ nearly 30,000 men, and form a source of national wealth to Norway. Early in spring cod is caught to the number of nearly 20,000,000, a large portion of which is sold fresh, the rest producing about 9000 tons of dried fish, 22,000 barrels of oil, and 6000 barrels of roe. When the cod-fishing is over, at the end of April, the herring-fishing begins and continues the whole summer; also great numbers of lobsters are caught. But this fishing is not without its dangers. The currents around and between the islands are so rapid and tortuous, and subject to such violent changes from ebb and flood, that during spring and fall, when hard weather sets in, these waters often become perfectly unnavigable. Even whales are sometimes dashed to pieces against the rocks of the coasts. (See Maelstrom.)

Lof'tus (William Kennett), b. at Rye, Sussex, England, about 1820; was educated at Cambridge, where he distinguished himself in geology under Prof. Sedgwick; was from 1849 to 1852 a member of a commission for determining the boundary between Turkey and Persia, becoming familiar with the regions on the Tigris and Euphrates, which he explored in 1853–54 under the auspices of the Assyrian Society, making numerous important excavations and discoveries, especially upon the site of Warka, the biblical Erech. He published in 1857 a valuable work, *Travels and Researches in Chaldea and Susiana*, was appointed a member of the geological survey of India, and d. Nov., 1858.

Logan, cap. of Harrison co., Ia. (see map of Iowa, ref. 5–D, for location of county), on Bayes River and the Chicago and North-western R. R., 30 miles from Council Bluffs, has excellent water-power, and limestone and hardwood timber in abundance. Pop. in 1880, 644.

Logan, R. R. centre, cap. of Hocking co., O. (see map of Ohio, ref. 7–F, for location of county), on the Hocking Canal and the Columbus and Hocking Valley R. R., 51 miles from Columbus, has a furnace, flouring-mills, foundry, woollen-factory, furniture manufactory, and a large trade. Pop. in 1870, 1827; in 1880, 2666.

Logan, on R. R., cap. of Cache co., Ut. (see map of Utah, ref. 2–G, for location of county), is a Mormon town. Pop. in 1870, 2757; in 1880, 3396.

Logan, b. about 1720, the son of a Cayuga chief who lived at Shamokin, in Pennsylvania. He bore the name of Tah-gah-jute, but took also the name of James Logan, acting governor of Pennsylvania, his friend. He was a man of fine physical and mental powers, and was always friendly to the whites until 1774, when a party of ruffians murdered his wife and all his children. He then lived near the Ohio River, having removed in 1767. After this for six years Logan and his followers kept the whole West from Detroit to the Holston in terror, and slaughtered great numbers of settlers. A well-known and eloquent speech which Logan sent to the whites by an interpreter a few months after the murder of his family is preserved in Jefferson's *Notes;* but its authenticity, and still more the accuracy of its statements, are open to serious question. Logan attacked a party of friendly Indians at Detroit in 1780 while intoxicated, and was killed in the affray by one of his own relatives. A granite monument was erected to his memory at Fair Hill cemetery, near Auburn, Cayuga co., N. Y.

Logan (Cornelius A.), b. at Baltimore, Md., in 1800, of Irish stock; educated at St. Mary's College, and went several times as supercargo to Europe; was afterwards a journalist in Baltimore and New York; became an actor, and produced several successful plays. His poem, *The Mississippi*, is one of his best-known productions. In 1840 he removed to Cincinnati, O. His daughters, Olive, Eliza (Mrs. Geo. Wood, 1830–72), and Cecilia, were known as actresses.

Logan (George), M. D., grandson of James Logan, b. at Stenton, near Philadelphia, Sept. 9, 1753; studied medicine in Edinburgh; returning to the U. S. in 1779, served in the Pennsylvania legislature for several terms, and was a warm partisan of Jefferson and the Republican party under the administration of John Adams. In 1798, during the imminent peril of war between the U. S. and France, he went to Paris as a volunteer peacemaker, and was denounced for so doing by the Federalists, who procured the passage by Congress of the so-called "Logan act," making it a high misdemeanor for a private citizen to take part in a controversy between the U. S. and a foreign power. Dr. Logan was a member of the U. S. Senate 1801–07; went to England in 1810 in the hope of contributing to preserve peace with that country; was a member of the Philosophical Society and of the board of agriculture, and author of valuable experiments in scientific farming. D. at Stenton Apr. 9, 1821.

Logan (George), M. D., b. at Charleston, S. C., Jan. 4, 1778; studied medicine in Philadelphia under Profs. Caldwell and Hartshorn; for half a century practised his profession in Charleston, where he was hospital surgeon to the navy-yard, and was one of the oldest surgeons on the naval list; was author of a popular work on diseases of children. D. at New Orleans Feb. 13, 1861. Paul F. Eve.

Logan (James), b. at Lurgan, Ireland, Oct. 20, 1674, of Scotch Quaker stock; was well educated, and became a merchant; went in 1699 with Penn to Philadelphia; was long in public life as provincial secretary, chief-justice, etc. of Pennsylvania; was president of the council and acting governor 1736–38; author of *Experimenta de Plantarum Generatione* (Leyden, 1739), a translation of Cicero's *De Senectute* (1744, printed by Franklin), and other works in

Latin and in English prose and verse; was the founder of the Loganian Library. D. at Stenton, near Germantown, Pa., Oct. 31, 1751.

Logan (JOHN), b. near Edinburgh, Scotland, in 1748; studied at the University of Edinburgh; took orders, and became a minister at Leith in 1773. He had formed at the university a friendship with Michael Bruce, a young poet who d. in 1767, and whose poems he edited in 1770, adding some of his own. The *Ode to the Cuckoo* and several hymns contained in this volume having become very popular, Logan claimed them as his own composition, and thus gave rise to a literary controversy which has been warmly maintained ever since, though the balance of evidence seems to support the claims of Bruce. Logan wrote for the stage, delivered lectures on the philosophy of history, and was in 1780 an unsuccessful candidate for the professorship of history at Edinburgh. He lost his ecclesiastical position through alleged intemperance, and devoted himself in London to literature, publishing a volume of poems in 1781, *Runnamede*, a tragedy, in 1783, and several historical treatises. D. at London Dec. 28, 1788. Two posthumous volumes of *Sermons* (1790–91) were so popular as to reach an 8th ed. in 1822.

Logan (JOHN A.), b. in Jackson co., Ill., Feb. 9, 1824; received a limited common-school education, and on the outbreak of the war with Mexico enlisted as a private in the 1st Illinois Vols., of which regiment he became quartermaster with the rank of first lieutenant. Returning at the close of the war, he was elected clerk of the court of his native county in 1849; in 1852 graduated at the Louisville University, and was admitted to the bar, attaining popularity and success in his profession; was elected to the State legislature in 1852, 1853, 1856, and 1857, and was prosecuting attorney 1853–57; was elected to the U. S. Congress in 1858, and again in 1860, resigning his seat to enter the army; in Sept., 1861, was appointed colonel of the 31st Illinois Vols., which he led at the battle of Belmont in November; at Fort Donelson in Feb., 1862, was wounded, and the following month appointed a brigadier-general of volunteers; engaged at Pittsburg Landing in April, and in the West until Nov., 1862, when he was promoted to be major-general; throughout the Vicksburg campaign was in command of a division of the 17th corps, and was distinguished at Port Gibson, Champion Hills, and in the siege and surrender of Vicksburg; in Oct., 1863, was placed in command of the 15th corps, which he led with great credit until the death of McPherson, when he succeeded to the command of the Army of the Tennessee, where, in the language of Gen. Sherman, he "nobly sustained his reputation;" he was, however, shortly after relieved by Gen. O. O. Howard, and returned to the command of his corps, which he led until the fall of Atlanta, when the eventful political crisis, involving the choice of a President, demanded his voice and influence at home, and consequently he did not rejoin his corps until the arrival of Sherman's army at Savannah, after its famous "march to the sea;" when, resuming his command, he retained it through the subsequent march through the Carolinas, and in May, 1865, succeeded Gen. Howard in command of the Army of the Tennessee. Resigned from the army Aug., 1865, and in November following was appointed minister to Mexico, but declined; was subsequently elected to the 40th and 41st Congresses, and in 1870, 1878, and 1885 to the U. S. Senate from his native State. He was nominated for Vice-President of the U. S. by the Republican National Convention at Chicago, Ill., June 6, 1884; wrote *The Great Conspiracy; Its Origin and History* (1885).

G. C. SIMMONS.

Logan (OLIVE). See SYKES (OLIVE LOGAN).

Logan (THOMAS MULDRUP), M. D., b. in Charleston, S. C., Jan. 31, 1808; graduated M. D. in Charleston Medical College, S. C., 1828; was co-editor of a surgical compendium, has contributed largely to medical science, and is a member of several foreign and domestic societies: is the author of *Topography of California*, and contributed largely to the *Transactions* of the American Medical Association, of which he became president.

Logan (Sir WILLIAM EDMOND), LL.D., F. R. S., F. G. S., b. at Montreal, Canada, Apr. 23, 1798; graduated at the University of Edinburgh in 1817, and in 1818 became partner in a mercantile house in London; was 1829–38 manager of a coal-mining and copper-smelting enterprise at Swansea, Wales, and prepared geological maps and sections of that region for the ordnance survey; in 1841 became the head of the geological survey of Canada, from which time he published valuable annual reports and many important scientific papers; represented Canada in the Expositions of 1851 and 1862 at London, and in 1855 at Paris; was made a knight of the Legion of Honor in 1855, a knight bachelor by Queen Victoria 1856, and received several valuable medals and other distinctions. D. in Wales June —, 1875. He was the first to demonstrate that the stratum of under-clay which underlies the coal-beds was the soil in which the coal-vegetation grew. He published many valuable treatises in various scientific periodicals.

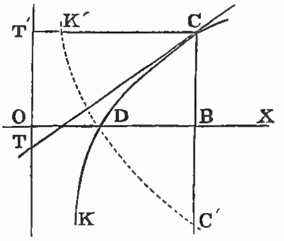
Logan Court-House (or **Arrocoma**), cap. of Logan co., West Va. (see map of West Virginia, ref. 6–B, for location of county), 50 miles S. W. of Charleston. Pop. of dist. in 1870, 1220; in 1880, 1769.

Log and Line, a contrivance for measuring the velocity of a ship at sea. It consists of a wooden float, weighted on one side so that it will float upright, and having a line attached to it in such manner as to bring the flat side of the float so as to offer the greatest resistance to a force tending to drag it through the water. The attached line is about 150 fathoms in length, and when not in use is wound on a light running reel. The line is divided into equal parts, each of which is equal to $\frac{1}{120}$ of a nautical mile, the points of division being marked by *knots*, formed by passing pieces of twine between the strands of the line, and leaving the free ends to project on each side of the line. The first knot is placed at a considerable distance from the *float* or *log*, and is very prominently marked. The part of the line between the log and the first knot is called the stray line; its use is to allow the log to become settled before the count is commenced. To use the log and line, the log is thrown over from the lee quarter of the vessel, and the line is then unwound from the reel as fast as the vessel sails. At the instant the first point of division passes from the reel a half-minute sand-glass is inverted, and when the last sand falls the reel is stopped. The number of equal spaces that have been unwound indicates the number of nautical miles the ship is sailing per hour, inasmuch as a half minute bears the same relation to an hour that one of the divisions of the line does to a nautical mile. The log is thrown from time to time, and the results are recorded in a book called the *logbook*. To secure accurate results, the line should be so prepared as to prevent stretching. To guard against variations of length due to hygrometric changes, the line is usually saturated with oil. If it is found that the line has changed in length, a correction must be applied to the measured rate of the vessel, and the line must be graduated anew. W. G. PECK.

Logania'ceæ [from *Logania*, one of the genera], a natural order of exogenous trees, shrubs, and herbs, mostly tropical, but having a few representatives in the U. S. It is remarkably allied to the Rubiaceæ, Scrophulariaceæ, the Gentianiaceæ, and the Apocynaceæ, and is briefly characterized by its regular gamopetalous flowers, along with opposite leaves and interposed stipules, which adhere to the footstalks or form sheaths. The calyx is 4- or 5-partite, the corolla hypogynous, regular or irregular, 4- or 5- or 10-cleft. The stamens arise from the corolla. The ovary is generally 2-celled; there is one style. The fruit is a capsule, a drupe, or a berry. It contains a large number of poisonous plants. Strychnine, curare, etc. are among its deadly principles. Spigelia and gelsemium, both active poisons and valuable medicines, are our most important native Loganiads.

Logansport, city and R. R. centre, cap. of Cass co., Ind. (see map of Indiana, ref. 4–D, for location of county), at the junction of the Wabash and Eel rivers, is surrounded by a fine agricultural country, with splendid timber and excellent building-stone. The aggregate of its water-power from the rivers above named and the Wabash and Erie Canal, improved and unimproved, is estimated at 500 horsepower, and the manufacturing establishments give employment to over 1000 operatives, and their products amount to above $5,000,000 per annum. It has well-paved streets, fine residences and business houses, an extensive trade in grain, pork, and lumber, is very healthful, and has fine schools and a Universalist college. Pop. in 1870, 8950; in 1880, 11,198.

Logarith'mic Curve, a curve that may be referred to a pair of rectangular axes such that the ordinate of any point shall be equal to the logarithm of its abscissa. When so referred, its equation may be written



$y = \log x$, or $a^y = x$;

in which the symbol *log* denotes a logarithm taken in any system; that is, in a system whose base is a. Thus, in the figure we have $CB = \log OB$. The axis of x is called the axis of numbers, and the axis of y the axis of logarithms. There are as many logarithmic curves as there are systems of logarithms, but they have certain general properties in common, some of which we subjoin.

1st. The curve always cuts the axis of x at a point D, whose distance from the origin is equal to 1.

2d. If the base of the system, a, is greater than 1, the curve takes the position KDC, having the axis of y for an asymptote at the point $(0, -\infty)$; the curve is everywhere concave downward, and as x increases it continually approaches parallelism with the axis of x.

3d. If the base of the system, a, is less than 1, the curve takes the position $K'DC'$, having the axis of y for an asymptote at the point $(0, +\infty)$; the curve is everywhere concave upward, and as x increases it continually approaches parallelism with the axis of x.

4th. If a tangent is drawn to the curve at any point of either class of logarithmic curves, as at C, the subtangent TT', taken on the axis of logarithms, is constant and equal to the modulus of the corresponding system of logarithms.

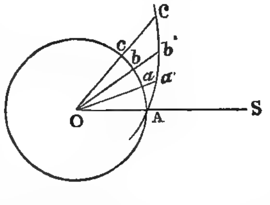
5th. If $a = 1$, the curve reduces to a straight line through D parallel to the axis of y. This line limits and separates the two classes of curves referred to in suppositions 1st and 2d.

6th. If $AB = 2$, the area $ODCT'$ is equal to the entire area between the part DK of the curve, the axis of x, and the axis of y; and furthermore, each is equal to the modulus of the corresponding system of logarithms. W. G. Peck.

Logarith'mic Spiral, a spiral whose equation may be reduced to the form,

$$log\, r = v, \text{ or } r = log^{-1} v;$$

in which the *pole* is at the *eye* of the spiral. It is very closely related to the logarithmic curve, from which it may be constructed as follows: Let O be the eye or pole, OS the initial line, and let a circle be described about O as a centre with a radius $OA = 1$, which call the directing circle. From A lay off on the circumference of the directing circle a distance equal to any ordinate of the logarithmic curve; then from O draw a radius vector through the extremity of this distance, making it equal to the corresponding abscissa; the extremity of the line thus constructed is a point of the curve. If the ordinate is positive, it is to be laid off in the direction from A towards c; if negative, it is to be laid off in the opposite direction. The curve proceeding outward from A has an infinite number of continually diverging spires; proceeding inward from A, it has an infinite number of converging spires. If any number of radii vectores are drawn making equal angles with each other, they will form a continued proportion; thus, if $Aa = ab = bc$, etc., we have



$$OA : Oa' :: Oa' : Ob' :: Ob' : Oc' \ldots \text{etc.}$$

This principle enables us to construct the curve when we know its pole and two points on the same spire. The curve everywhere makes a constant angle with the radius vector, and is therefore closely analogous to the Loxodromic Curve (which see). The involute of the curve is an equal logarithmic spiral. Newton showed (*Principia*, b. i., prop. 9) that if the force of gravity had varied inversely as the cubes of the distances, the planets would have receded from the sun, and that their paths would have been logarithmic spirals. The modulus of the spiral in each case would have depended upon the initial velocity of projection. This curve is sometimes called the *logistic spiral*.

W. G. Peck.

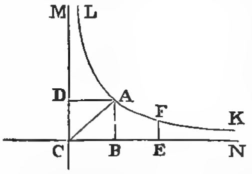
Log'arithms [Gr. λόγος and ἀριθμός]. The logarithm of a number is the exponent of the power to which it is necessary to raise a fixed number to produce the given number. The fixed number is called the *base*. Thus, in the equation $10^3 = 1000$, 3 is the logarithm of 1000, the base being 10. Any positive number except 1 may be taken as a base, and for each base there is a corresponding *system of logarithms*; there is therefore an infinite number of systems of logarithms, but only two of them are in general use—the *Napierian* and the *common* system. The Napierian system, named after its inventor, Baron Napier, is the system whose base is 2.718281828 . . .; the common system is the system whose base is 10. In what follows we shall designate Napierian logarithms by the symbol l, and common logarithms by the symbol *log*.

Uses.—Napierian logarithms are mostly employed in the higher branches of analysis and in scientific investigations. Common logarithms are used in practical computations, where they serve to convert the operations of multiplication and division into the simpler ones of addition and subtraction. In trigonometric computations their use is almost indispensable. Computations by means of logarithms are made in accordance with the following principles: 1st, the logarithm of the product of any number of factors is equal to the sum of the logarithms of the factors; 2d, the logarithm of a quotient is equal to the logarithm of the dividend diminished by that of the divisor; 3d, the logarithm of any power of a quantity is equal to the logarithm of the quantity multiplied by the exponent of the power; and 4th, the logarithm of any root of a quantity is equal to the logarithm of the quantity divided by the index of the root. In applying these principles the logarithms needed are taken from tables called tables of logarithms. The method of forming these tables will be explained hereafter.

General Properties of Logarithms.—In the exponential equation $a^x = n$ we may regard a as the base of any system of logarithms, in which case x will be the logarithm of n taken in that system. The discussion of this equation indicates the following general properties: 1st, the logarithm of 1 in any system is equal to 0; 2d, the logarithm of the base of any system, taken in that system, is 1; 3d, in any system whose base is greater than 1 the logarithms of all numbers greater than 1 are positive, the logarithms of all numbers less than 1 are negative, the logarithm of 0 is $-\infty$, and the logarithm of ∞ is $+\infty$; 4th, in any system whose base is less than 1 the logarithms of all numbers greater than 1 are negative, the logarithms of all numbers less than 1 are positive, the logarithm of 0 is $+\infty$, and the logarithm of ∞ is $-\infty$; 5th, there are no real logarithms of negative numbers in any system. These general properties are used in analytical investigations.

Relations between Different Systems.—Every logarithm is composed of two factors. The first factor is constant for the same system, and depends for its value on the base of that system; the second factor is independent of the base of the system, but is dependent on the particular number in question, and changes with it. The constant factor corresponding to any system is called the *modulus* of that system. The modulus of the Napierian system is 1, that of the common system is .4342945, and that of any system is equal to the reciprocal of the Napierian logarithm of the base of that system. Since the Napierian logarithms of all numbers less than 1 are negative, and of all numbers greater than 1 are positive, it follows that the modulus of a system whose base is less than 1 is negative, and that the modulus of a system whose base is greater than 1 is positive. A modulus may have any value from $-\infty$ to $+\infty$; it is to be observed that the modulus decreases algebraically as the base increases. If we multiply the Napierian logarithm of any number by the modulus of any system, the product is the logarithm of the same number in that system. This principle enables us to find the logarithm of any number in any system when we have a table of Napierian logarithms.

Geometrical Relations.—Napierian logarithms are sometimes called hyperbolic logarithms, on account of their relation to the equilateral hyperbola; there is, however, no good reason for this distinction, inasmuch as the same relation that exists between the logarithms of this system and a particular equilateral hyperbola exists also between those of any system whatever and some other equilateral hyperbola. To explain the nature of this relation, let LAK be one branch of an equilateral hyperbola, whose equation, when referred to its asymptotes, CN and CM, is $xy = m$; let A be the vertex and let F be any point on the curve; and let CB and CE be the abscissas of A and F, the latter being called the *terminal* abscissa. The square described on the co-ordinates of A is equal to m, as may be shown from the equation of the curve. Now, it may be proved by means of the calculus that the area $CDAB$ is to the area $BAFE$ as 1 is to the Napierian logarithm of CE. Denoting the area $BAFE$ by A, and CE by x, we have



$$m : A :: 1 : lx, \; . \; . \; . \quad \therefore A = mlx; \; . \; . \; . \; (1).$$

Hence the area between an equilateral hyperbola and one of its asymptotes, estimated from the ordinate of the vertex up to any other ordinate, is equal to the logarithm of the terminal abscissa taken in a system whose modulus is the square described on the co-ordinates of its vertex. If we take the conjugate of the hyperbola LAK, whose equation is $xy = -m$, equation (1) will become

$$A = -mlx \; . \; . \; . \; (2).$$

The numerical value of m in equations (1) and (2) depends upon the value of CB; by giving suitable values to CB, m may be made to have any value from 0 to $+\infty$; that is, ± mlx may be made to represent the logarithm of x in any system whatever. If we make $CB = 1$, we have $m = 1$, and equation (1) becomes $A = lx$, a result that conforms to the Napierian system. The value of the area A may be expressed by an infinite series in terms of x, and this series may be used as a means of computing a table of logarithms. Such a series was originally employed for this purpose, but its use has been superseded by other and more convenient ones.

Tables of Logarithms.—Tables of logarithms are tables from which we may find the logarithm corresponding to any number, or the number corresponding to any logarithm, within certain limits. Every logarithm consists of two parts—an entire part, called the *characteristic*, and a decimal part, called the *mantissa*. Either of these parts may be 0, and the characteristic may be either positive or negative, but the mantissa is always positive. The characteristic may be found by a very simple rule, and for this reason it is not given in the ordinary tables; the decimal point is also omitted in writing the mantissa. The manner of arranging the tables, as also the manner of using them, will be best learned from the explanations which precede each collection of tables; and to these the reader is referred for all information of that nature. In addition to the logarithms of natural numbers, the tables usually contain the logarithms of the principal circular functions, such as the sine and cosine, the tangent and cotangent, from 0° to 90°. In these tables the inconvenience of negative characteristics is avoided by adding 10 to each logarithm; an allowance is made in the final result for each 10 thus added. The same device is employed in using the logarithms of ordinary decimals.

Logarithms were invented by Baron Napier, who published an account of the same in 1614 in a work bearing the title *De mirifici Logarithmorum Canonis Constructione.* The first table of common logarithms was published by Briggs in 1624 under the title of *Arithmetica Logarithmica.* He calculated the logarithms of all numbers from 1 to 20,000, and also from 90,000 to 100,000, carrying out his figures to 14 decimal places. In 1628, Adrian Vlack supplemented the work of Briggs by publishing a book bearing the same title, *Arithmetica Logarithmica*, in which he supplied the logarithms of the numbers from 20,000 to 90,000, but at the same time he reduced the number of decimal places to 10. Vlack included in his work the logarithms of the sines, tangents, and secants for each minute of arc from 0° to 90°. Five years later the same author published a table of the logarithms of sines and tangents, for every *hundredth* of a degree from 0° to 90°, which had been computed by Briggs. In 1797, Vega published an edition of Vlack's tables, but the work is out of print and the copies are difficult to be found. Probably the best accessible tables are those of Callet. These are carried to 7 places of decimals, and include logarithmic sines, cosines, tangents, and cotangents for every second of arc from 0° to 90°. An American edition of these tables was published in 1830 by Hassler, who was at that time chief of the U. S. Coast Survey. These are probably the best American tables, but unfortunately they are very scarce and difficult to obtain. In addition to these, several collections of tables have been published in Germany, of which the most noted is Hulsse's *Sämmelung Mathematischen Tafeln*, published in Leipsic in 1840. Besides those above mentioned, several six-place tables have been published, which for most purposes of computation are sufficiently accurate. Five-place tables have also been published, which for auxiliary computations are of great utility. To this class we may refer Lalande's five-figure table, which was republished in 1839 by the Society for the Diffusion of Useful Knowledge.

The computation of logarithmic tables is effected by means of rapidly converging series, of which a great number have been deduced. It is to be observed that it is only necessary to compute the logarithms of prime numbers, inasmuch as the logarithms of composite numbers may be found by taking the sum of the logarithms of their prime factors. The following series and its applications are taken from Hackley's *Treatise on Algebra*, p. 274, to which the reader is referred for greater detail. The series referred to is as follows:

$$l(P+1)=lP+2\left\{\frac{1}{2P+1}+\frac{1}{3(2P+1)^3}+\frac{1}{5(2P+1)^5}+\cdots\right\} \quad (1),$$

in which P stands for any whole number, and $P+1$ for the next higher whole number. Making P equal to 1, 2, etc., we have, since $l1 = 0$,

$$l2 = 0 + 2\left\{\frac{1}{3}+\frac{1}{3.3^2}+\frac{1}{5.3^5}+\frac{1}{7.3^7}+\ldots\right\} = 0.6931472$$

$$l3 = l2 + 2\left\{\frac{1}{5}+\frac{1}{3.5^3}+\frac{1}{5.5^5}+\frac{1}{7.5^7}+\ldots\right\} = 1.0986123$$

$$l4 = l2 + l2 = 2 \times l2 \ldots\ldots\ldots\ldots\ldots = 1.3862944,$$

etc. etc. etc. etc.

In the same way we may compute the Napierian logarithms of the natural numbers from 1 to any number whatever. Then, to find the common logarithms of the same numbers, we have simply to multiply each logarithm thus found by the modulus of the common system, .4342945.

General Logarithms.—If we denote the base of the Napierian system by e, we may write the equation

$$e^y = x \quad . \ . \ . \ . \quad (1);$$

in which y is the Napierian logarithm of x. Heretofore we have only considered the real values of y, which correspond to *arithmetical* logarithms. There is, besides these values, an infinite number of imaginary values of y which satisfy equation (1), and which may be called algebraic *logarithms.* The arithmetical and the algebraic logarithms, taken together, constitute what may be termed *general logarithms.* (See De Morgan's *Calculus*, p. 126.)

Antilogarithms.—An antilogarithm is the number corresponding to a given logarithm. Thus, 100 is the antilogarithm of 2 in the common system. Antilogarithms, in the common system, are denoted by the symbol $\log^{-1}$. Thus, $\log^{-1}2 = 100$ is equivalent to the expression, the number whose logarithm is 2 is equal to 100. W. G. PECK.

Log′arithms, Logis′tic [λογιστική]. The logistic logarithm of a number less than 3600 is equal to the common logarithm of 3600 diminished by the common logarithm of that number. Thus, the logistic logarithm of 16*m.* 24*s.*, or 984*s.*, is equal to log 3600 − log 984, or to 0.5633. A table formed in this way for all numbers from 1 to 3600 is called a table of logistic logarithms, and is used in solving proportions in which the terms are *hours* and *minutes, degrees* and *minutes*, or *minutes* and *seconds*, the first term being 1 *hour*, 1 *degree*, or 1 *minute.* The method of using the table may be illustrated by the following example: When the moon's hourly motion is 30′ 12″, what is her motion in 16*m.* 24*s.*? We have the following proportion:

$1h : 16m.\,24s. :: 30'\,12'' : x$; or, $3600 : 16m.\,24s. :: 30'\,12'' : x$;

from which we readily deduce the equation

$$\frac{3600}{x} = \frac{3600}{30'\,12''} \times \frac{3600}{16m.\ 24s.} \quad .$$

Denoting logistic logarithms by the symbol L, we may write the above equation as follows:

$$Lx = L\,30'\,12'' + L\,16m.\ 24s.$$

From the logistic tables we have

$$\begin{array}{ll} L\,30' \quad 12'' & = 0.2981 \\ \underline{L\,16m. \quad 24s.} & \underline{= 0.5633} \\ L\,x & = 0.8614; \ \therefore x = 8'\,15''. \ \textit{Ans.} \end{array}$$

A table of logistic logarithms will be found in Norton's *Astronomy*, p. 111 of tables, with a full explanation of its use on p. 320 of the main work. Logarithms of this kind are sometimes called *proportional logarithms.* Tables of this kind are often extended to 3*h.*, or to 10,800, to correspond with the moon's tabulated changes given in the *American Nautical Almanac*, pp. xiii.–xviii. (See *Am. Naut. Al. for 1875*, pp. 256, 257.) W. G. PECK.

Log′ic [Gr. λόγος, "speech," "reason"] is the science of reasoning. By reasoning in this connection we understand all those mental acts and processes that occur between the observation of facts and the most remote deductions and the broadest generalizations. Among the acts indirectly implied there may be insight, consciousness, imagination, and memory. But the mental acts that are directly in the line of reasoning are analysis, abstraction, synthesis or judgment, generalization, and inference. Hence, all *knowledge* rests on either (1) observation or (2) reasoning. *Belief* is a different affair, and may rest on testimony, or even on a voluntary acceptance of dogmas for convenience' or policy's sake, with little or no regard to their truthfulness. At the time of the observation of an object there is doubtless some insight into its nature; there is an analysis (logical analysis) of its properties, an abstraction and an objectification of its properties, so that we give them and call them by names, as whiteness, solidity, etc. etc. After this affirmation or judgment follows, by which we say, "This paper is white," etc. etc. There is also a grouping of similar objects into classes, genera, and species; hence, general terms or common nouns. There is also inference, so that from two propositions, as A is B and B is C, we infer that A is C. In the first instance we have propositions of four kinds: (1) identical propositions, in which the subject and the predicate denote the same thing, as "Common salt is chloride of sodium;" (2) the subject is an individual term, and the predicate is an adjective, as "This paper is white;" (3) the subject is an individual term, and the predicate a common noun, as "This horse is a quadruped;" and (4) the subject is a common noun, and the predicate is an adjective, as "Horses are fourfooted," the predicate denoting some obvious property of the subject.

For anything beyond this there must be a process of reasoning which may be either (1) demonstration, (2) induction, or (3) deduction. The word *demonstration* is used somewhat vaguely, but for our purposes it denotes that process in which, by analysis of any subject, displaying, as of course the analysis will, its *nature*, we make manifest properties which were not so before. Mathematical reasoning is of this kind. We reason from the nature of a triangle—expressed by its definition—and prove all the properties of a triangle that we know in either our geometry or in our trigonometry. And in all reasoning something of demonstration from the very nature of the thing we are talking about, forms an indispensable element. This reasoning is, however, to a large extent, instinctive, a matter of insight and tact, subject to no special forms, though of course it may be reduced to recognized formulæ, and is, or should be, self-evident alike in the axioms it assumes, in the steps it takes, and the results at which it arrives.

The word *induction* is also used vaguely and variously, but in this connection it must be understood to indicate that process in which, by the bringing in and examination of facts or individual instances, we generalize a proposition up to the point of its greatest comprehension, when it becomes the statement of a universal act, or, as it is more commonly called, a universal law. For successful induction the first step is the collection of facts, either such as occur of themselves or by experimentation producing them at will. Then follow an analysis and a classification of these facts on the basis of some common but important property; the property on which we base our classification may be regarded as *formal*, or as being a cause. Thus, vertebrates are classified in reference to the important fact of a spinal column, the ruminants by reference to the peculiar construction of their stomach, the cat family with reference to their claws. the dog family with reference to the structure of their teeth, etc. etc. All these formal properties are found to be connected with some *modal* property; that is, with something in the history, mode of life, etc. of each of the animals in the class. Thus, all cats are predacious or leap on their prey; all dogs chase theirs down; all ruminants chew the cud, etc.

When objects are thus properly classified, we know that there is a relation—constant and implied in the laws of nature—between the formal property on which as a differentia the classification is based, and the modal property which we affirm as a predicate of all the objects in the class. Thus, when we say that "All Canidæ are carnivorous" and "All ruminants chew the cud," we do but give expression to a law of nature, the knowledge of which has been obtained by induction. The certainty of the law thus obtained depends upon this connection of properties. Without it we may indeed often obtain a wide generalization of facts, as in the case of the electric properties of all the resins. And when a fact is thus obtained, it creates a strong presumption in favor of its universality, and leads to the very confident expectation of some connection as of cause and effect not yet discovered. And when the connection has been discovered, the law is considered as established, and is reckoned as one of the triumphs of science. But until this connection has been discovered, any announcement of the general fact as a universal law of nature would be regarded as premature and liable to modification.

In these ways we demonstrate from a few definitions, and by the aid of a few self-evident axioms, the whole of abstract science, including mathematics, logic, etc., and from the observed facts in nature we establish by induction all the general laws and principles of concrete and practical science. And having established in these ways the general laws or truths, we proceed by *deduction* to establish by means of them many particular facts and subordinate truths, which are, for the most part, as a matter of fact, though by no means necessarily so, such as are not or cannot be readily subjected to the test of observation and experiment. In some cases they can never be so tested, and in others the inference must be made before the test can be applied. Thus, the statesman and the physician are often obliged to reason from general principles and obvious facts to the results of the measures they would adopt before the trial of them, although, of course, in these cases the testing of them by experience is but a result of their reasoning. And it is in this way that, by reasoning from general principles obtained by induction from existing plants and animals to objects and facts discovered in the strata of the earth's crust, we have obtained much the largest part of the science of geology and palæontology. These facts and phenomena are such as cannot now be subjected to observation.

The first proposition enunciating the general principle or most comprehensive truth is called, technically, the major premise; the other, "this measure," etc., is called the minor premise; and the two, together with the inference or conclusion drawn from them, constitute what is called a syllogism. And of these three parts all syllogisms consist. But for the most part we have in practice either (1) an omission of one of the premises, as A is B, therefore A is C, in which case we call the abridged form an enthymeme, or (2) several premises following each other in some regular order, and only one conclusion drawn from them, as A is B, B is C, C is D, therefore A is D; this is called a sorites. In such cases we have, in fact, two or more syllogisms condensed into one formula by the omission of some of the propositions that would have appeared if each of the syllogisms had been stated in full, each with its own premises, and the conclusion to each pair distinctly stated as such in due order. Thus, in the example just given, we have, in fact, (1) B is C, A is B, therefore A is C; (2) C is D, A is C, therefore A is D; that is, the second premise of the sorites becomes the major premise of the first syllogism; the first is the minor premise, and the conclusion is a proposition that did not appear in the sorites at all. Then for the second syllogism the third premise of the sorites is used for major premise, and the conclusion of the first syllogism is used for minor premise, and so on until we come to a syllogism that has for its conclusion the same proposition as the sorites itself. In the case of the enthymeme one premise is omitted for the most part, because it is a part of the common sense or the acknowledged science of mankind, and therefore needs no repetition or explicit statement. It is, however, a part of the syllogism or argument as truly and as really as though it were expressed, since without it no conclusion can be drawn from any proposition which would contain any term that was not contained in the proposition used as a premise itself. Hence, the means by which we can find the suppressed or omitted premise is one of the most important parts of logic in a practical point of view.

Syllogisms are of four different kinds, as they arise from one or another of the four relations which the objects in nature sustain to each other. (1) Individuals in a class, and classes considered as species included in a higher and more comprehending class, considered as a genus. Thus, John, Henry, Thomas, etc. are Englishmen (a species), and Englishmen, Frenchmen, etc. are Indo-Europeans (the genus). Or, again, Indo-Europeans, Shemites, etc. are men, and constitute the genus *Homo*, or man. On this relation is based what are called categorical propositions. They simply assert that an object is or is not in a class, or that a class is or is not in a higher class, as S is P, or S is not P; P are Q, or are not Q, etc. With two categorical propositions for premises we have a categorical syllogism. (2) Every object sustains some relation of quality to others. It is above or below, longer or shorter, harder or softer, whiter or blacker, etc. than some other. Or it may be simply equal to another. From these relations there arise comparative propositions, and with one or more comparative propositions in a syllogism it is called a comparative syllogism, as A is greater than B, B is equal to C, therefore A is greater than C. (3) Most if not all objects in nature are related to some others as cause and to others as effect. An effect is always proof of the existence of a cause, and is some indication of its character and attributes. So, too, every cause is a means of judging of the nature of the effect it will produce. A good work of any kind is proof of a good workman, and the goodness of the workman is to some extent a guaranty for the goodness of his work. But in logic we call every argument a cause also. It is a logical cause, or cause of belief, and conviction. Hence, when one premise is so connected with a conclusion that if that premise is assented to the conclusion will be accepted as true or proven, we often state the two, the premise and the conclusion, as what is called a conditional or hypothetical proposition, as, "If A is B, C is D;" "If the workman is skilful, his work will be good." This mode of stating the major premise constitutes what we call a conditional syllogism. (4) In the fourth place, every object in nature is a part of some collective or physical whole. An atom of hydrogen is a part of a molecule or particle of water; a leaf is part of a book; a paragraph is part of a chapter; a word is part of a sentence; a letter is part of a word; the nose is part of the face; the hand is a part of the body; each citizen is part of the state; the earth is part of the solar system, and each star is part of "the heavens." Hence, we can and do reason to some extent both from the nature of the parts to that of the whole, and conversely from the nature of the whole to that of the parts. For example, we reason from the letters in a word to the sound and meaning of the word itself, and likewise from the nature of a word to the letters, and we are thus able to detect false spelling if a word should happen to be spelled wrong. Now, it so happens that what is included in any whole must be in some one of the parts into which it is divisible, and also that whatever is in one part cannot be in another when the division is what is called a complete division. But in what is called a "cross" division we sometimes have one individual in more than one part. Suppose we divide literary men into poets, philosophers, historians, and one man, as Southey, be both a poet and a philosopher or historian. From this relation of objects there arises what are called disjunctive propositions, as, "Either A is B or C is D;" which implies that if the first (A is B) is not true, the second (C is D) is. When one premise, which is always the major premise, is disjunctive, the syllogism itself is called disjunctive.

Of comparative syllogisms we need say no more in this place, because most of them are so simple in their construction that their validity or their fallacy is obvious at sight, and the others are so complicated that we could not discuss them intelligibly in this place. Most treatises on logic do not even so much as mention them. The fullest discussion that is known to us is to be found in Dr. Wilson's *Text of Logic*, published at Ithaca, N. Y., 1872. In the case of conditional syllogisms it is to be noted, in the first place, that they imply another premise, and are therefore virtually enthymemes stated hypothetically. Thus, "If A is B, A is C," implies a proposition called the sequence—namely, "B is C." But in the second place it should be noted that if we affirm the antecedent we prove the consequent, and *vice versâ* if we deny the consequent we disprove the antecedent. Thus,

If A is B, C is D.

A is B, C is not D,
Therefore C is D. Therefore A is not B.

Any other mode of completing the syllogism would be fallacious. This will be obvious from a simple example: "If John has a fever he is sick. John has a fever, therefore he is sick;" "John is not sick, therefore he has not a fever." This is right. But if we say, "John has not a fever, therefore he is not sick," or if we say, "He is sick, therefore he has a fever," it would be manifestly wrong.

In a disjunctive syllogism it is always safe to deny one of the parts or propositions as a means of proving the other, as "A is either B or C; A is not B, therefore A is C; or A is not C, therefore A is B." Polypes are either plants or animals: they are not plants, therefore they are animals. But the other method of completion, offering one proposition to disprove the other, is not always valid. Thus, "Coleridge is either a poet or a philosopher; he is a philosopher, therefore he is not a poet." In this case poets and philosophers are not what are called co-ordinate parts or species, for a man may be both a poet and a philosopher at the same time.

But both conditional and disjunctive syllogisms may be regarded for logical purposes as categorical syllogisms stated as enthymemes (though comparative syllogisms cannot be so stated). In the case of the conditional syllogisms the enthymeme has one affirmative premise, as "A is B," and an affirmative conclusion, "A is C;" that is, "If A is B, A is C." But the disjunctive syllogism has (apparently) a negative premise, A is not B, with an affirmative conclusion, therefore A is C; that is, "Either A is B or A is C;" or again, "If A is not B, A is C." Here the premise is apparently negative, while the conclusion is affirmative. But we shall have to consider this again in order to explain the apparent violation of a fundamental law in relation to the formulæ of inference.

It is manifest, therefore, that the utmost importance attaches to the nature and construction of categorical syllogisms, to the consideration of which we shall now proceed. Categorical propositions may differ in *quality*, and be either affirmative or negative, as A is B or A is not B. Again, they may differ in *quantity*, and be either general or partial, or particular as they are sometimes called, as "All A are B" or "Some A are B." Combining the two, we have four varieties of propositions, called universal affirmative, "All S are P;" universal negative, "No S are P;" partial affirmative, "Some S are P;" and partial negative, "Some S are not P." These four kinds of propositions have been called, for the sake of convenience, by the four vowels A, E, I, and O. Now, it is manifest that with A for major premise we may have either A, E, I, or O for minor, and thus four pairs of premises, A A, A E, A I, and A O, and with each pair we can have either A, E, I, or O for a conclusion; and thus sixteen syllogisms differing from each other in what is called the mood of the syllogism. And in like manner we may have sixteen with either E, I, or O for major premise, making in all sixty-four moods. Thus, for an example of A A A, we have, "All S are M, all M are P; therefore all S are P;" of E E E, "No S are M, no M are P; therefore no S are P." The former is at once seen to be valid, and the latter is about as obviously invalid or fallacious, actually proving nothing.

In the above example I have used S to denote the subject of the conclusion, which is therefore called the minor term, and is found only in the minor premise. I have used P for the predicate of the conclusion. It is therefore called the major term, and is found only in the major premise. M stands for what is called the middle term. It is found in both premises, but not in the conclusion. It may, however, occupy either of four positions in the premises, as (1) subject of the major premise and predicate of the minor; (2) predicate in both; (3) subject in both; or (4) the inverse of the first, predicate of the major premise, and subject of the minor. These varieties of position constitute what is called the figure of the syllogism. And as each of these positions of the middle term may be found in either of the sixty-four moods, we may have 256 different categorical syllogisms.

But most of these 256 syllogisms are invalid—not only worthless, but actually delusive. Hence, the discovery of some rules and practical tests of validity is of the utmost importance. Fallacies may be of two kinds—either (1) in form or (2) in diction. A fallacy is said to be in form when it is obvious on the mere inspection of the form of the syllogism, without considering or knowing the meaning of the propositions, or of its terms even; as, "M are not P, S are M; therefore S are P." But when there is no fallacy in form, there may be one in diction, which renders the reasoning worthless. This can be discovered and exposed only by a consideration of the meaning of the several propositions considered separately. Thus, "Light comes from the sun, feathers are light; therefore feathers come from the sun." In this case the form is faultless, but the diction is fallacious. The word "light" is ambiguous, and means one thing in one premise and something else in the other.

Besides these two classes of what are called logical fallacies there are one or two others, called extra-logical fallacies, of which we shall say a word in conclusion. Considering the limits to which we are confined in this article, it will be better to suggest the tests of fallacy, leaving the reader to take all syllogisms to be valid that do not offend against one or another of the rules that are given. And first we shall speak of fallacies in form:

(1) There may be no more than three real terms. There may be any number of words, for nouns will often have several adjectives and modifying clauses. But for the purposes of logic a noun with all its adjectives may be considered as one word. As an example of the "fallacy of many terms," as it is called, we have the following: "My hand touches the pen, the pen touches the paper; therefore my hand touches the paper." Here, as we see on a careful analysis, we have four terms, four different things really spoken of: (1) my hand, (2) that which "touches the pen," (3) "the pen," and (4) that which "touches the paper;" and the syllogism *implies*, though it does not state, that whatever touches the pen is the pen, which is of course absurd. It will sometimes happen, however, that what is thus implied is not only not absurd, but is in fact quite true. In that case the apparent fallacy is only an abridged form of the sorites, of which we shall say more below.

(2) If both premises are negative, there can be no conclusion. Thus, "S are not M, M are not P." After these premises we can have no conclusion. "Horses are not men, men are not birds." It is true that horses are not birds, but if we say "Horses are not men, and men are not quadrupeds," we can have no conclusion, although we know otherwise that horses are quadrupeds. It will sometimes happen, however, that there is an appearance of two negative premises when one or both of them is really affirmative. Thus, "No one who has not enough can be called rich, but no miser has enough; therefore no miser can be called rich." Here two of the negatives virtually correct each other, making for the middle term "person not having enough," and the inference is as valid as though the middle term were positive, "persons having enough," or "No S is M" (which is equivalent to "S is not M"). "Whatever is not M is P" (equivalent to "All not M is P"), "therefore S is P."

(3) It is found to be necessary that the middle term should be used once at least, as either the subject of a universal proposition or the predicate of a negative one. The failure to fulfil this condition constitutes what is called an undistributed middle. It would be impossible within the limits to which I am here restricted either to demonstrate this law *a priori* or to prove it by an examination in detail of all the cases in which an undistributed middle may occur. One or two illustrations, therefore, must suffice. Thus, "Horses are animals, foxes are animals; therefore horses are foxes." But horses and foxes are co-ordinate species of animals, and therefore cannot be predicated of each other. Even this fact, however, is not proved by the premises, for we may have "Dogs are animals, spaniels are animals."

Spaniels are a species or variety of dogs, so that in this case the major and the minor terms are subordinate rather than co-ordinate, and may be predicated of each other affirmatively.

(4) Neither the minor nor the major term may be used in the conclusion as subject of a universal proposition, or as predicate of a negative one, unless it had been used in one or the other of these ways in the premises. The violation of this condition constitutes what is called "illicit process," and the fallacy is called illicit of the minor when the minor term is used in violation of this law. But when the major term is so used, the fallacy is called illicit of the major. Here, again, the demonstration of the law would require more space than can be spared to it. As an example of illicit process of the minor term we may have the following: "Horses are quadrupeds, and horses are useful animals; therefore *all* quadrupeds are useful animals." It would be legitimate to say either "Some quadrupeds are useful animals," or "*Some* useful animals are quadrupeds." Then, for an example of illicit of the major, we have, "Negroes have black skins, the Arabs are not negroes; therefore the Arabs have not black skins." Here the negative term "black skins" is predicate of a negative conclusion, whereas it was not used as either subject of a universal or as predicate of a negative premise. It was predicate of an affirmative proposition in the major premise.

There are several other convenient rules known to the expert logician, but they are too abstruse and technical to admit of being given here. Besides this, they accomplish nothing that is not equally well accomplished by the application of one or another of these four. There are, however, two that may be given that are of great practical value, though resulting from the application of the preceding four: (1) After two partial premises there can be no conclusion, for it is found that in all such cases a conclusion would involve either an undistributed middle or an illicit process. (2) After one partial premise there can be no universal conclusion, for the same reason as that just given in regard to any conclusion after two partial propositions. (3) It is also found that after one negative premise there can be no affirmative conclusion. We have seen that after two negative premises there can be no conclusion whatever. But if one of the premises be negative, any affirmative conclusion involves a violation of the fundamental conditions of validity.

It is seldom the case, however, that both of the premises of any syllogism are expressly stated. In some cases one of them is so well known, and so universally assented to, that it would appear like a piece of mere pedantic formality to repeat it. At other times the real major premise, though really assumed, has not been so distinctly thought out and considered as to admit of express statement. For this and for other reasons it becomes very important to know how to find and put into explicit statement the assumed premise. This can always be done by means of the principles and rules already laid down. But for the purpose now before us another set of rules is more immediately applicable. Of course we have in the enthymeme the conclusion and one premise. We have therefore all the terms that can be used, and the problem is to find the other and assumed premise, such in character as that it will complete the syllogism without violating any of the rules above laid down. The four rules are as follows: (1) If the conclusion be universal affirmative, both premises must be affirmative, and the minor and the middle term must be distributed. (2) If the conclusion be partial affirmative, both premises must be affirmative, and only the middle term need be distributed. (3) If the conclusion be partial negative, one premise must be negative, and the middle and the major term must be distributed. (4) If the conclusion be universal negative, one premise must be negative, and all three of the terms must be distributed.

But it is necessary to pass to the consideration of fallacies in diction. Logic assumes that the words in any argument, like the letters in an algebraic equation, shall denote each one and the same thing throughout the argument or solution, and that language for the most part shall be used literally, each word describing its object or event as it is, and that no proposition shall have, either expressly stated or necessarily implied, two propositions in one, one of which may be true, while the other is false. Thus, if I say, "A man has ceased to be a liar," I *imply* that he has been a liar, and I *assert* that he is not one now. But of course either of these assertions may be true, while the other is false, and they may therefore be both true at the same time. Subject to these conditions, all the fallacies in diction may be referred to four classes. (1) *Ambiguous Middle.*—In this one term (usually the middle term) is used to denote one thing in one proposition and something else in another. Thus, in the example already cited, "*Light* comes from the sun, feathers are *light*," here both premises may be true separately if we shall take the word *light* to mean different things in each of them, but not otherwise. (2) *Variation.*—This may be in quantity, condition, etc. Thus, "Money will buy whatever is for sale; a ten-cent piece is money," etc. Here the word "money" is not used ambiguously; it means the same thing in each premise, but it is used with reference to different quantities in each premise, and the premises will be assented to only as we so understand the words. (3) *Division and Composition.*—This fallacy consists in using a word (usually the middle term) as a collective term in one place and as a general in the other. Some words are always collective when used in the singular form, as family, army, church, state, congress, etc. etc. But many words may be either general or collective, according to the nature of the proposition in which they are used. Thus, "The Romans conquered Carthage." The word "Romans" is used as general, but here it must be collective, as no *one* Roman performed the act here ascribed to them. But in the proposition, "The Romans spoke Latin," "Romans" must be general, because the act is one which each Roman did individually and for himself. If, now, we should say after the first, "Cicero was a Roman, therefore he conquered Carthage," our fallacy would be one of division. But if the word is first used as general, and then as collective, the fallacy takes the form which is called composition. (4) *Substance and Accidents.*—A property may be accidental in one premise, and yet used so as to make it essential in the other or in the conclusion. Or it may be affirmed with regard to some property, mode, or accident in a premise, and then affirmed in reference to its substance in the conclusion, and *vice versâ.* This constitutes what is called the fallacy of substance and accidents. Thus, the example usually given is, "We eat what we buy in the market; we buy raw meat in the market; therefore we eat raw meat," or eat our meat raw. We buy our meat not because it is raw, but rather because it is meat; the "rawness" is merely accidental to the act of purchasing and to the premise, but in the conclusion it is so placed as to make it untrue, and is thus essential to its meaning. This is called the fallacy of accidents. But if we should say of a certain man, in reference to his pecuniary responsibility, "He is good," and should thus infer by means of a major premise that he is a good "man," we should have the fallacy in the other form, applying what is said in reference to some accidental mode, property, or attribute to the substance itself. This is called the fallacy *a dicto secundum quid ad dictum simpliciter*. Of all the fallacies in diction, those belonging to this class are the most subtle and difficult of detection and exposure.

It will often happen, indeed, that an argument may contain fallacies both in form and in diction. And it will often happen in practice, also, that one is in doubt to which of the classes or kinds of fallacies he should refer a formula. It is, however, of but very little consequence, so far as refutation is concerned, to which class he refers it, since they are all alike, and equally fatal to any validity in the conclusion.

But it is time to say a few words of the extra-logical fallacies in conclusion. These are rather faults in rhetoric than fallacies in logic. Extra-logical fallacies are of two kinds—fallacies in matter and fallacies in method. Whoever undertakes to prove any proposition that is not assented to by those to whom he addresses his argument, necessarily assumes what is called the *onus probandi*, or the burden of proof. He has to consider the state of mind and of heart or will—that is, the intelligence, the knowledge, the prejudices, and feelings—of those whom he would address. And while arguments may be considered as conclusive in themselves—that is, that they will satisfy any one who understands and appreciates them—yet it is often found that the arguments that are really the best for those who can understand them fail entirely of effect on those to whom they are addressed. But in order to success anywhere consideration must be taken with regard to both the matter of the argument and the method of presenting it.

In regard to the matter, there are several forms of fallacy that are to be noted. The first is what is called *non vera pro vera*—the using a premise that is untrue as though it were true. And this applies as well to those propositions that are implied, and can be formed only in the ways of completing imperfect formulæ already spoken of, as to those that are expressly stated as premises. Of course when a premise that is false is used as a real premise the argument fails to prove anything, and will be so regarded by all persons that know its falsity. Then, again, we have what is called *non causa pro causa*, which consists in using as a premise a proposition which, though true enough, is not a premise to the conclusion. For example, it is true enough that it is raining at the present moment, but that fact could not be used as proof of a proposition in Euclid or of the guilt of Mary queen of Scots. A proposition occurring in the course of an argument is always irrelevant, or *non causa*, when it cannot be connected with the rest as one in a series that make a sorites by having one of its terms in common with the preceding proposition and the other common to it and the succeeding proposition. Thus, if we have "A is B, B is C, C is D, ∴ A is D," the propositions follow in logical order, and are logically connected. But if amongst them there should occur "C is H or M is P," we could not connect such a proposition with the other premises, and although true it would be no premise to A is D.

The fallacies in method may also be of several kinds. First, we have what is called a begging of the question, or *petitio principii.* As a general rule, one of the premises is so evidently true that it may be assumed without proof and without remark, while all effort at proof should be directed to the other. But if an orator assumes as true or as conceded that which his auditors expect or desire to have proved, they accuse him of begging the question; that is, of assuming the very thing they want to have proved before they will assent to his proposition. Logically, both premises should be proved, but rhetoric requires that we should spare ourselves the labor and the audience the annoyance of listening to proof of what nobody doubts. In some cases this begging of the question takes the form of reasoning in a circle—*curriculum nefas.* Suppose we have three propositions, 1, 2, and 3, and we use 1 and 2 as premises to prove 3, and then use 1 and 3 to prove 2, or 2 and 3 to prove 1, we are in such a case reasoning in a circle; that is, we first deduce a conclusion from premises, and then use that conclusion as a premise to prove one or the other of its premises—that is, its own premises.

The other recognized form of fallacy in method is called mistaking the issue, or *ignoratio elenchi.* One first mistakes the real proposition that is to be proved, and then, seeking proof for his supposed conclusion, does not find the proof that is required for the real conclusion which should be established; and he is said to be ignorant of the proof or to have mistaken the proof, because he had first mistaken the proposition to be proved. A case is cited from Greek history: The Athenians were deliberating whether to put Mitylenians to death. One orator had tried to show that it was *justice* to do so. Another replied that that was not the proposition to be proved; it did not answer the question, for the question really was whether it was *expedient* to do so: nobody doubted the justice of the measure.

The textbooks on logic are so numerous that it would be impossible to enumerate them. The most popular and the best known of all is that of Whately. I should also mention that of Prof. Bowen of Harvard University as deserving of special consideration, from the fact that it presents Sir William Hamilton's theory of syllogisms, together with the Aristotelian. Thompson's *Outlines of the Laws of Thought* is a book in extensive use and has many admirable qualities. Prof. Wilson's book, already referred to, professes to give a more ample view of both the valid syllogisms and the fallacies than has hitherto been given, and in the third part, or "Practical Application," he has attempted a classification of the methods of argumentation with reference to the kinds of propositions one may have occasion to prove. W. D. WILSON.

Log'os [Gr. λόγος, which means "reason" and "word," *ratio* and *oratio*, both being intimately connected] has a peculiar significance in Philo, St. John, and the early Greek Fathers, and is an important term in the doctrine of Christ.

(1) Philo, a Jewish philosopher of Alexandria, who endeavored to harmonize the Mosaic religion with Platonism (d. about 40), derived his Logos view from the Solomonic and later Jewish doctrine of the personified *Wisdom* and *Word* of God, and combined it with the Platonic idea of *Nous.* The Logos is to him the embodiment of all divine powers and ideas (the ἄγγελοι of the Old Testament, the δυνάμεις and ἰδέαι of Plato). He distinguished between the Logos inherent in God (λόγος ἐνδιάθετος), corresponding to reason in man, and the Logos emanating from God (λόγος προφορικός), corresponding to the spoken word which reveals the thought. The former contains the ideal world (the κόσμος νοητός); the latter is the first-begotten Son of God, the image of God, the Creator and Preserver, the Giver of life and light, the Mediator between God and the world, also the Messiah (though only in an ideal sense—as a theophany, not as a concrete historical person). Philo wavers between a personal and impersonal conception of the Logos, but leans more to the impersonal conception. He has no room for an incarnation of the Logos and his real union with humanity. Nevertheless, his view has a striking resemblance to the Logos-doctrine of John, and preceded it as a shadow precedes the substance. It was a prophetic dream of the coming reality. It prepared the minds of many for the reception of the truth, but misled others into Gnostic errors. *Literature.*—Gfrörer, *Philo und die Alexandrinische Theosophie* (1831); Dähne, *Jüdisch-Alexandrinische Religionsphilosophie* (1834); Grossmann, *Quæstiones Philon.* (1841); Keferstein, *Philo's Lehre von dem Göttlichen Mittelwesen* (1846); Langen, *Das Judenthum zur Zeit Christi* (1867); and especially Emil Schürer, *Lehrbuch der Neu-Testamentlichen Zeitgeschichte* (1874, pp. 648 *seq.*).

(2) St. John uses Logos (translated *Word*) four times as a designation of the divine, pre-existent person of Christ, through whom the world was made, and who became incarnate for our salvation (John i. 1, 14; 1 John i. 1; v. 7 (spurious); Rev. xix. 13). Philo may possibly have suggested the use of the term (although there is no evidence that John read a single line of Philo), but the idea was derived from the teaching of Christ, and from the Old Testament, which makes a distinction between the hidden and the revealed being of God, which personifies the Wisdom of God and the Word of God, and ascribes the creation of the world to the Logos (Ps. xxxii. 6, Sept.). There is an inherent propriety in this usage in the Greek language, where Logos is masculine and has the double meaning of thought and speech. Christ as to his divine nature bears the same relation to God as the word bears to the idea. The word gives shape and form to the idea, and it reveals the word to others. The word is thought expressed (λόγος προφορικός), thought is the inward word (λόγος ἐνδιάθετος). We cannot speak without the faculty of reason, nor think without words, whether uttered or not. The Christ-Logos is the Revealer and Interpreter of the hidden being of God, the utterance, the reflection, the visible image of God, and the organ of all his manifestations to the world (John i. 18; comp. Matt. xi. 27). The Logos was one in essence or nature with God (θεὸς ἦν, John i. 1), yet personally distinct from him, and in closest communion with him (πρὸς τὸν θεόν, John i. 1, 18). In the fulness of time he assumed human nature, and wrought out in it the salvation of the race which was created through him (i. 14). *Literature.*—See the commentaries of Lücke, De Wette, Olshausen, Hengstenberg, Meyer, Godet, Lange (Schaff's ed.), and Alford on the Prologue of John's Gospel; also M. Stuart, *Examination of John i. 1–18*, in *Bibliotheca Sacra* for 1850 (pp. 281–327); Röhricht, *Zur Johanneischen Logoslehre*, in the *Theol. Studien und Kritiken* for 1868 (pp. 299–315); and H. P. Liddon, *Bampton Lectures on the Divinity of Christ* (London, 1867, lect. v., pp. 310–411). On the ecclesiastical development of the Johannean Logos-doctrine by Justin Martyr, Origen, etc., see especially Dorner, *History of Christology.* PHILIP SCHAFF.

Logroñ'o, province of Spain, situated between Alava, Navarre, Aragon, and Soria, belongs to the basin of the Ebro, and produces an abundance of corn, wine, fruits, and vegetables; it is also very rich in ores and mineral springs. That part of the province which stretches along the southern bank of the Ebro is an undulating plain, very fertile, especially in its western parts—the so-called La Rioja—which produce excellent wine and oil. The southern parts of the province, however, are very much broken up by offshoots of the sierras which separate the basin of the Ebro from that of the Duero, and which in Pico Santa Ivés rises 7380 feet. The mineral wealth of the province is completely undeveloped, and the manufacturing industry is inconsiderable. Area, 1945 square miles. Pop. 174,425.

Logroño, a town of Spain, cap. of the province of the same name, on the Ebro, is a well-built town, with several good educational and literary institutions, and a brisk trade in wine, olive oil, and fruits. The surrounding plain produces the celebrated Rioja wine. Pop. 13,393.

Log'wood [named from being imported in *logs*], the *Hæmatoxylon Campechianum*, a middle-sized leguminous tree of Mexico and Central America, naturalized to some extent in the West Indies. It prefers wet land. It is the most important dyewood known. Its yellow sap-wood is hewn away, and the red heart-wood is exported in great quantities. It makes many shades from black to red and lilac, according to the mordant employed. The "extract" or inspissated juice is largely prepared in its native countries, and is exported. In medicine, logwood is a mild astringent, from the presence of tannic acid. For use in the arts logwood is usually supplied in the form of chips, powder, or solid extract. Occasionally a fluid extract is prepared, and recently a preparation called *hæmatin* has appeared in Lyons, which is probably an impure hæmatoxylin extracted from the wood by ether.

Composition.—Logwood contains a peculiar principle, *hæmatoxylin*, a volatile oil, fatty bodies, resinous bodies, tannin or a body nearly allied to it, acetates, oxalates, chlorides, sulphates, and phosphates of potassium, sodium, magnesium, calcium, aluminum, iron, and manganese, with some silica. *Hæmatoxylin*, $C_{16}H_{14}O_6$, discovered by Chevreul in 1811, is the characteristic principle of logwood; though it is not itself a dye, it readily yields by oxidation (loss of hydrogen) the real logwood dye, which is hæmatein. Hæmatoxylin is obtained either in white needles containing $3H_2O$, or in pale-yellow crystals containing but one molecule of water of crystallization. It is slightly soluble in cold, very soluble in hot, water, soluble in alcohol and ether. Acids have little effect upon it; alkalies, especially ammonia, in the presence of oxygen, produce a purplish-red color, owing to the formation of hæmatein, the real logwood dye. Chromic and vanadic acids produce a deep bluish-black ink with it. Nitric acid converts it into oxalic acid; fusing with caustic potash changes it to pyrogallol, $C_6H_6O_3$. Stannous chloride produces a rose-red precipitate, copper sulphate a greenish-gray precipitate, the latter changing rapidly to dark blue. Alum changes the color to bright red without making a precipitate. Hæmatoxylin is a delicate reagent for alkalies, especially ammonia; it is used as an indicator in volumetric analysis, and for preparing test-paper. *Hæmatein*, $C_{16}H_{12}O_6$, is the result of the action of the air on hæmatoxylin in the presence of bases, and exists, in combination with metallic oxides, in all fabrics dyed with logwood or its preparations. It is easily prepared by exposing to the air an ammoniacal solution of hæmatoxylin and drying the resulting precipitate at 130° C. It forms colored lakes with metallic bases; blue or violet with alumina, copper, and tin; black with iron and chromium.

Dyeing with logwood is accomplished with the decoction of the wood or with the extract. It was introduced into England in the time of Elizabeth, but, as the colors then obtained were very fugitive, its use was prohibited under severe penalties. The use of indigo was forbidden at the same time, as it interfered with the use of the native woad. A century later the restrictions on these most useful dyes were removed. It is used for reddish, violet, blue, and black shades, but chiefly for black.

Logwood Blues and Violets.—Cotton is dyed blue by mordanting first in chloride of tin, then in sulphate of copper, and finally dyeing in decoction of logwood. Wool is dyed blue by first mordanting in a boiling solution of alum, chloride of tin, and cream of tartar, then dyeing in decoction of logwood. Silk to be dyed violet is first scoured, alumed, and washed, then turned in the cold decoction of logwood, to which Brazil-wood is often added to modify the shade.

Logwood blacks are the most important shades produced by this dye-wood. Cotton is dyed black by boiling in a decoction of logwood, to which a little quercitron is added to give a brownish shade to the black; it is then immersed in milk of lime, then in a cold solution of ferrous sulphate (copperas). It is then returned to the original logwood decoction, to which some soda-ash has been added in the mean time. It is taken out, some copperas is added to the decoction, and it is again submitted to the bath. Wool is dyed black by first boiling it in a solution of copperas, blue vitriol, and argol, then immersing in the logwood decoction. Silk, after being freed from gum by boiling with Marseilles soap, is mordanted with acetate of iron, washed, placed in a solution of quercitron and alum, and finished in a decoction of logwood, to which a little soap is added.

The *iron blacks* do not resist the action of acids, which withdraw the iron, leaving the hæmatein as a red spot; to obviate this defect, potassic bichromate, in combination with cupric sulphate (blue vitriol), is substituted. The resulting black, which is a compound of hæmatein with the oxides of chromium and copper, withstands both acids and alkalies better than the iron compound. Cotton is first boiled in the logwood decoction, with or without quercitron, then placed in the solution of bichromate and blue vitriol. After adding some soda-ash to the original logwood decoction, the cotton is again placed in it; finally, copperas is added to this bath, and the cotton is once more submitted to its action. Wool is first boiled in a solution of bichromate, blue vitriol, argol, and sulphuric acid, and then submitted to the action of the logwood.

Printing logwood blacks is based on the same principles as the dyeing. For cotton a mixture is prepared of logwood extract with acetate and nitrate of iron and acetate of alumina, properly thickened with gum tragacanth. This is printed on the cotton, and by exposure to damp, warm air the alumina and oxide of iron are fixed in combination with the hæmatein. For wool a mixture is made of logwood extract, indigo carmine, sal-ammoniac, and starch; these are boiled together. When the mixture has cooled to about 122° F., nitrate and chloride of iron are added. When cold, oxalic acid and bichromate of potassa are added. This mixture is printed on the wool and fixed by drying and steaming.

Logwood Inks. See article INK.

Literature. See article CALICO-PRINTING and articles in the *Journ. London Chem. Soc.*, 1881, ii. 611; 1882, i. 368; 1883, ii. 349. C. F. CHANDLER.

Lohardaga, or **Lohardugga**, a district of the lieutenant-governorship of Bengal, India, extends between lat. 22° 20′ and 24° 39′ N., and comprises an area of 12,044 square miles, with 1,237,123 inhabitants. The central and southern portion of the district is an elevated table-land with undulating surface, and the slopes between the ridges are cut into terraces covered with rice. The northern and western portion is a tangled mass of insulated peaks, presenting nowhere a level area of any extent. The principal rivers are the North and South Koel. Though only 91 persons of the whole population were returned as Europeans, the Christians are more numerous in Lohardaga than in any other Bengalese district. At the last census there were 741,952 Hindus, 58,211 Mohammedans, and 12,781 Christians. The two missions are the German Lutheran and the Church of England, which harmoniously and successfully work side by side. The principal town is Ranchi, on the Koel, with 12,500 inhabitants.

Lö′her, von (FRANZ), b. Oct. 15, 1818, at Paderborn, Westphalia; studied law, history, natural science, and art at Halle, Munich, Freiburg, and Berlin; made extensive travels in Europe, Canada, and the U. S. (1846–47); took an active part in the political movements in Germany in 1848; founded the *Westphalische Zeitung*; was imprisoned by the Prussian government for political agitation, but shortly after acquitted by the court; became assessor at the court of appeal in Paderborn in 1849, professor at the University of Göttingen in 1853, and was called to Munich in 1855 as secretary of the academy and professor at the university. His writings are partly juridical—*Das System des Preussischen Landrechts* (1852); partly historical—*Fürsten und Städte zur zeit der Hohenstaufen* (1846), *Geschichte der Deutschen in America* (1848), and *Jakobæa von Baiern* (1861); partly sketches of travel—*Land und Leute in der Alten und Neuen Welt* (3 vols., 1857–58) and *Neapel und Sicilien* (2 vols., 1864).

Loigny′, Battle of, Dec. 2, 1870. The grand duke of Mecklenburg, commander of the right wing of the army of Prince Frederick Charles, stood opposed to Gen. Chanzy, who commanded the left wing of the French army of the Loire. Between these two parties a contest took place at Loigny. On the morning of Dec. 2 the grand duke concentrated his troops on the line of Tanon-Baigneaux, and was about attacking the French when the latter, consisting of the 16th corps in the first line, the 17th in the second, and parts of the 15th as reserve, assumed the offensive at 9.30 A. M. The Germans had the 1st Bavarian corps and the 4th cavalry division on their right wing, the 17th infantry division in the centre, and the 22d infantry division with the 2d and 6th cavalry divisions on their left wing. The village of Loigny stood midway between the two lines of battle. The French attacked first the Bavarians, defeated them, and occupied Loigny. The grand duke then sent the 4th cavalry division to aid them, and ordered the 17th infantry division under Gen. von Treskow to wheel inward. The 17th infantry division threw itself with such force on the flank of the French that they had to abandon Loigny, which they were not able to retake, in spite of repeated attacks. The 17th infantry division occupied Loigny, and, pushing forward in connection with the 4th cavalry division, forced the French back to Terminiers and Gommiers. At noon two French divisions of the 15th corps, stationed at Artenay, moved northward through Poupry against the left wing of the grand duke, but they were met by the 22d infantry division and driven back through Poupry to Artenay. The Germans lost in this battle 3000 men killed and wounded; the French nearly twice as many, besides 3000 prisoners and 7 guns. AUGUST NIEMANN.

Loir [anc. *Lidericus*], a river of France, rises in the hills of Orleannais and joins the Sarthe, an affluent of the Loire, 5 miles N. of Angers, after a course of about 150 miles, of which the lower half is navigable.

Loire, a department of France, comprising the old province of Forez and portions of Beaujolais and Lyonnais, including part of the basin of the upper Loire and spurs of the Cevennes and Forez mountains. Area, 1805 square miles. Pop. 599,836. Iron is mined, marble, granite, porphyry, and flint are quarried, and there are extensive manufactures of silk, iron, steel, and flint glass, and rich coal-beds in the vicinity of St. Etienne, where, in 1881, 3,454,612 tons of coal were raised. Cap. Montbrison.

Loire [anc. *Liger*], the largest river of France, rises in the Cevennes and flows in a north-western and western direction through the centre of France to the Bay of Biscay, receiving from the right the Loir, and from the left the Allier, Cher, Indre, and Vienne rivers. It is navigable 450 miles from its mouth, and is lined with high embankments, and a lateral canal completed in 1838 along its lower course, as it is liable to rise considerably, occasioning destructive inundations. In the volume of its water there is almost the irregularity of a mountain-torrent. During the droughts of summer it shrinks into thin and feeble threads winding their way between the sandbanks of the channel, and for about six months of the year navigation is practically impossible. At other times, and often very suddenly, tremendous floods pour down and submerge large tracts of land. A rainfall of from 3 to 4 inches over the whole river-basin is sufficient to put 35,320,000,000 cubic feet of water into the channel. When, however, the rain is general over the whole basin, the floods of the different tributaries reach the main stream at different times, and no harm is done; but when, from some reason or other, two or more of them arrive at the same time, inundations of the most serious character result. Attempts at controlling the river were made at a very early date. At the close of the Middle Ages the bed was enclosed by dykes, from 10 to 13 feet high, between Orléans and Angers, and in 1783 a double line of dykes, 23 feet high, was completed from Bec d'Allier downward. Of late various experiments have been made in order to improve the navigation of the lower part of the river, though not with the results anticipated. Its fertile basin is called "the garden of France," of which it comprises one-fourth the area. In several wars carried on within the boundaries of France it formed an important strategical element; *e. g.* in the wars against the English invasion in the fifteenth century, in the wars of 1814, and in the war of 1870–71 against the Germans. In the latter instance the Loire formed the boundary between the territory occupied by the Germans and those parts of France which remained unharmed by the invaders. It put a check to the German operations, though a few minor expeditions penetrated farther S., and it formed the basis for the French operations during the closing period of the war. It obtains this importance partly from the surface-formation of Central France, partly from the road and railway systems which divide France into two different fields of operation, a northern and a southern. The river itself is so broad that its passages become very important military positions. August Niemann.

Loire-Inférieure, department of France, situated on both sides of the mouth of the Loire. Area, 2595 square miles. Pop. 625,625. The surface is low, containing extensive lagoons, but the soil is generally fertile. Wine and wheat are produced. Fine horses, good sheep, and many bees are reared. Salt, preserved meats, pickles, and sugar are exported. Cap. Nantes.

Loiret', department of France, situated between the Seine and the Loire, and consisting of a low, sandy, and unproductive tract on both sides of the Loire, and a more elevated and fertile plain called the plateau of Orleans. Area, 2551 square miles. Pop. 368,526. The principal products are grain, wine, hemp, saffron, timber, and apples. Much more wheat and oats are raised than necessary for home consumption. Sheep and cattle, both of good breeds, poultry and bees, are reared. Cap. Orleans.

Loir-et-Cher, department of France, situated on both sides of the Loire, and traversed by several of its affluents, which form extensive lagoons. Area, 2389 square miles. Pop. 275,713. The surface is low and level, but the soil is generally fertile. Wheat, hemp, and vines are extensively cultivated; sheep, horses (the Perche breed is celebrated both for strength and for lightness), poultry, and bees are reared, and some woollens, cottons, leather, and glass are manufactured. Cap. Blois.

Lo'ja, an inland city of Ecuador, cap. of a province of the same name, 250 miles S. of Quito, near the Peruvian frontier, is situated in a fertile valley 7000 feet above the sea, regularly and neatly built, with several public buildings, churches, and high schools. In the immediate vicinity are mines of gold, quicksilver, and coal and quarries of beautifully-veined marble. The chief article of commerce is the cinchona or quinine bark, which was first found in this district. Pop. about 10,000.

Loja, or **Loxa,** town of Spain, province of Granada, on the Genil River, situated on the slope of a hill crowned by a magnificent Moorish castle, and in the Moorish wars considered the key to Granada. There are considerable Roman remains and manufactures of woollens, silks, paper, and leather. Pop. 18,249.

Lo'keren, town of Belgium, province of East Flanders, on the Darme, is a handsome and well-built town, with numerous schools and many benevolent institutions, and has important manufactures of linen goods, damasks, and laces. Pop. 17,400.

Lokman', an Arabian fabulist of very early times, concerning whose real epoch and life the traditions are conflicting and untrustworthy. His fables were published at Leyden by Erpenius in 1615, with a Latin translation, and they have since been one of the commonest textbooks for learning the Arabic language—a distinction they by no means merit either on the score of elegance or of originality, as most of them may be traced through the Syriac to a Greek original. Among modern editions those of Caussin de Perceval (Paris, 1818), Helot (Paris, 1847), and Dernburg (Berlin, 1850) may be mentioned.

Loligin'idæ [from *Loligo*, the chief genus], a family of dibranchiate cephalopods of the sub-order Sepiophora, with the eyes covered by skin; the internal shell horny and lanceolate; the body oblong, and with a more or less pointed latero-terminal fin; the mantle with three internal cartilages, one dorsal and two ventral; the siphuncle attached to the head by a double superior medial band; the head free from the front of the mantle; and the teeth of the radula are in seven regular longitudinal rows, the median and inner lateral teeth being broad and fringed, and the outer long and fang-like. To it belong the most common "squids" of the eastern American coast. Three species have been recognized as inhabitants of the New England and New York seas—viz. *Loligo Pealii*, *L. punctata*, and *L. pallida*. Among other genera are *Gonatus*, an Arctic or Greenland type, and *Teuthis*, a European and East Indian genus. The gigantic cuttle-fishes of the North Atlantic (*Architeuthis*) are nearly allied, but differ greatly in the teeth of the radula. Theodore Gill.

Lol'lards [probably from Ger. *lallen*, "to sing in a murmuring strain," and *hard*, an affix signifying "to sing the praises of God or funeral dirges and the like," and probably connected with our "lullaby"], a term of reproach applied at first to a half-monastic sect which originated in 1300 at Antwerp. The sect was designed to furnish ministrants for the care of the sick. In 1374 and 1377 its members were placed under the protection of Gregory XI. In 1472, Pope Sixtus IV. recognized them as a religious order. Their proper designation was *Cellites* or *Alexians*. A few Alexian houses still exist in Europe. But the name was afterward especially applied to the English and Scottish followers of Wycliffe, who were sorely persecuted during the reigns of Henry IV. and Henry V. in England, and in the same and somewhat later times in Scotland, where they were called "Lollards of Kyle." The chief centre of Wycliffe's teaching was the University of Oxford, and after the condemnation of his doctrine of the sacraments, in 1382, Archbishop Courtenay proceeded to silence the Wycliffite teachers in the university. There was a strong party in the university which tried to resist the archbishop's interference, but he was supported by the crown, and in the space of five months he succeeded in reducing to silence the Lollard party in Oxford and in securing the orthodoxy of the university. But during his lifetime Wycliffe used to send out itinerant preachers, who met with considerable acceptance among the people; and in that field the contest threatened to become both more violent and more protracted. Nevertheless, in the course of time the most famous of those itinerant preachers were compelled to recant or were driven into exile—a result which was largely due to a reaction against novelties which was produced by the peasants' rising under Wat Tyler, in 1381. From its very beginning the Lollard movement wore, indeed, a political aspect which it never lost, and which weakened its religious significance in no small degree. It was an opposition not only to the doctrinal system of the Church of Rome, but also to her organization, such as was that planned and partially carried through by Hildebrand and his successors. (See Stubbs, *Constitutional History of England*, Oxford, 1875–80, vols. ii. and iii.)

Lombard' (Peter), [*Petrus Lombardus*], b. of humble parentage near Navara in Lombardy early in the twelfth century; studied theology at Bologna and Rheims, and in Paris under Abelard, and was appointed in 1159 bishop of Paris, where he d. July 20, 1160. He was one of the founders of the scholastic theology of the Middle Ages. His principal work, *Sententiarum Libri IV.*, from which he received the title of *Magister Sententiarum*, is a collection of passages from the Fathers, with accompanying commentaries, bearing on the various doctrines of Christianity. It was first printed in Venice (1477); an edition was published in Paris (1841). Until the Reformation it was the most common handbook used in all theological schools.

Lombard Architecture. When Christianity became the religion of the Roman empire, Roman architecture came to an end. It had excelled in the construction of temples, theatres, circuses, baths, palaces, basilicas, triumphal arches, etc., but for buildings of these descriptions there was no further use, for it was not only the Roman empire which broke into pieces; it was the Roman civilization which crumbled into dust, and the new life which Christianity came to plant among the ruins of ancient paganism had other needs, which it now became the task of architecture to supply. The character of this earliest Christian architecture is singularly mixed. There are new wants to satisfy, but there is as yet no new model to follow. There is a new spirit in demand, but there is as yet no new principle in construction. The first Christian architects took the old Roman buildings, blotted out such features as reminded too plainly of paganism, and changed or modified the architectural arrangement only so much as was necessary in order to make the building answer the new purposes. Even when they had to erect entirely new buildings they borrowed the fundamental plan and the constructive principle from the old ones, and thus the Roman basilica became the model of the Christian church. Soon, however, the new spirit began to remodel all the details of the old construction and shape them after its own image, and by degrees it turned from the details to the fundamental forms, which at last it succeeded in rebuilding on an entirely new principle of construction and with an entirely new æsthetic character; thus producing an entirely new style of architecture. But it took several centuries to transform the Roman basilica into the Gothic cathedral. The transformation began in the fifth century, and was not accomplished until the twelfth; and this period of the history of architecture is generally called the Romanesque, to indicate the peculiarly mixed character of Roman forms and Christian spirit which it exhibits throughout.

As the Christian religion was truly universal in its spirit, it was capable of becoming truly national in its life; and thus we see the Romanesque architecture, though it everywhere arose from the same type and strove after the same ideal, develop differently in Italy, Spain, France, England, Germany, and Scandinavia under the influence of a variously developed national spirit. Nowhere, however, is this phenomenon more interesting to observe than in Italy. Here, when Rome had perished, there was no more nationality; all the nations came and sat down around the corpse of the one great nation. Italy, which had once been the centre whence all influences radiated over the world, had now become a focus into which all the influences of the world were gathered back. It exhibits four distinct groups of Romanesque architecture. In Central Italy the classic type was kept purest. In Rome, the churches of S. Martino in Monti, S. Giovanni in Laterano, and S. Maria in Aracœli, all from the ninth century, and those of S. Crisogono and S. Maria in Trastevere, from the twelfth century; in Pisa, the cathedral (1063), the baptisterium (1153), and the belfry (1174); in Lucca, the churches of S. Michele and S. Frediano; in Florence, the baptisterium and the church of S. Miniato, both from the twelfth century,—show a decided adherence to the classical taste, both in their plans, which are simple and clear, and in their ornaments, which are elaborate, delicate, of the finest materials, and of antique design. In Venice, which maintained extensive and brisk commercial relations not only with the Byzantine empire, but with the whole Levant, a strong Oriental influence is visible in the church of S. Marco as it rises like a wonder from the sea, with its mighty arches resting on long rows of columns, and lifting an immense profusion of cupolas and spires, the whole covered with a most gorgeous ornamentation. In Sicily and Lower Italy, which alternately belonged to the Byzantine empire, the Moors, and the Norsemen, the cathedrals of Palermo, Salerno, Amalfi, Monreale, Ravello, etc. show a combination of the old basilica plan with the Byzantine dome and ornamentation, the Arabic horseshoe arch, and the belfry or front tower, which was a feature of Northern taste.

The most interesting group of Romanesque architecture in Italy is the Lombard, not so much on account of the grandeur and magnificence of its monuments, as on account of the superiority of their construction; they come nearest to the Gothic style. To this group belong the cathedral of Modena, commenced in 1099, but not finished until 1184; the churches of S. Zeno in Verona, S. Michele in Pavia, and S. Ambrogio in Milan, all from the eleventh century; the cathedral of Novara from the eleventh, and the cathedral of Parma from the twelfth century. Earlier examples of this style of architecture are found in Switzerland, but there they are generally on a small scale. The most prominent feature of the Lombard style is the general introduction and artistic development of the vault. The old basilica was generally open. On its transformation into a Christian church it had generally been covered with a flat wooden roof. As this roof was liable to catch fire, and many buildings had been destroyed or injured in this way, it had in some cases been replaced by a tunnel vault of masonry. But the tunnel vault never became generally used, and it exercised no influence either on the æsthetic character or on the technical construction of the building. As it pressed with equal weight on every point of the side-wall, which it touched, it simply demanded that the whole wall should be built stronger. Not so with the cross-vaulting employed by the Lombards. It pressed only on those four points of the wall on which the ends of the cross-arches rested, and it demanded only that these four points should be supported. This occasioned the application of buttresses, which later on in the Gothic style became so conspicuous a part of the construction and of the compound pier. The side-walls which enclosed the nave rested on columns, which separated the nave from the aisles. When now the cross-vaulting was suspended over the nave, those points of the side-walls on which the ends of the cross-arches rested had to be strengthened, and thus the column which stood immediately under such a point was replaced by a whole bundle of columns, of which each had its own capital and its own pedestal—a compound pier which was carried up through the wall till it reached the point which ought to be supported, and showed on the wall as wall-shafts and wall-arches. The spaces of the wall between these piers needed no particular strength; on the contrary, they could conveniently be broken through by triforiums between the vaultings and the roof of the aisles, and by windows; and thus the dead, bare walls of the basilica type became vividly diversified, and began to show signs of that living organization which is the charm of the Gothic cathedral. A beautiful example of the manner in which the Lombards attempted to diversify the wall-masses give the arcades or arched string-courses, which generally are carried along the upper part of the apse, and sometimes along the whole side elevation of the building.

Another characteristic feature of the Lombard architecture is the tower. In the Gothic architecture the towers became the most prominent part of the front façade. In the Lombard architecture they are still insulated pieces of decoration, sometimes placed before the main entrance of the nave, sometimes only loosely and inorganically connected with the building. But their mere presence announces a Northern influence. The tower was a Gotho-Germanic invention. Still more striking is the manifestation of this spirit in the ornamentation of the details. The classical designs are almost wholly given up and replaced by either fantastic or realistic devices, such as please the Gotho-Germanic taste. The materials employed by the Lombards are generally brick, sometimes coated with marble, but whether they used this material from economy or because it is more pliable and allows of a richer and more complicated construction than marble, cannot be decided. CLEMENS PETERSEN.

Lombardi'ni (ELIA), b. Oct. 11, 1794; graduated at the University of Pavia, and devoted himself to the study of fluviatile hydrology; in 1847 was appointed director-general of the public works in Lombardy, and held that position for nine years; in 1860 was nominated senator of the kingdom, and is still living. Among his numerous and highly important professional writings, most of which have appeared in scientific journals, we may mention—*Cenni Idrografici; Memoria sull' Importanza degli studii sulla Statistica dei Fiumi; Memoria sui cangiamenti nell' idraulica Condizione del Po; Sulle Inondazioni avvenute nella Francia; Dell' origine e del progresso della Scienza Idraulica in Italia; Saggio Idrologico sul Nilo; Studii sul grande estuario Adriatico;* several essays on the hydrology of the Po and the Tiber, and the very valuable *Guida allo Studio dell' Idrologia fluviale e dell' Idraulica pratica,* published separately in 1870.

Lom'bards, a family of the Suevic or Suabian branch of the great Teutonic race. The word *Lombard,* though derived by Vassius from *langepart,* or *barte,* a long hatchet (*e. g.* halbert), probably comes, as Paulus Diaconus, himself a Lombard, asserts, from nearly the same words, signifying a "long beard." They are first mentioned 5 A. D. In 17, led by Marbodius, they joined the Cherusci, and established Italicus as king. In 548 they appear as Arian Christians led by Andouin. Under his son Alboin the Lombards became a wealthy and powerful race, ruling Pannonia. Having conquered the Gepidæ and killed their king with his own hands, Alboin married his daughter Rosamond. At a great feast the Lombard king gave to his chiefs Italian fruits and wines, and so inflamed their imaginations with an account of the southern country that ere long his entire nation, with their women and children, appeared in Northern Italy. They were accompanied by 20,000 Saxons, a race as fierce as themselves. Their appearance caused a general panic, and it was by the immense number of fugitives who took refuge in the swamps and on the islands of Venice that this city was chiefly founded. The principal cities of Northern Italy were soon conquered by the energetic Lombards, who to great skill in war added administrative capacity and adaptability to law and culture. Pavia was taken by them after three years' siege (A. D. 568), Alboin was proclaimed king of Italy in Milan, and the Lombard kingdom was founded.

Their great victories were due to the numbers of other Northern tribes who joined them during their struggles, for, like the Normans, they were, though a ruling race, never a large one. Ravenna under its exarch remained Greek, but the remainder of the country was divided into duchies. Alboin at the height of his power, while intoxicated at a grand orgy, compelled his wife to drink wine from her father's skull. She revenged herself by inducing two soldiers to murder him during his sleep. He was succeeded by Cleph (573), who during his short reign of eighteen months greatly extended his dominion. For ten years the Lombards under thirty dukes ravaged the greater part of Italy, when they chose Antheric for king. Under this truly great leader the Lombard empire was greatly extended, though during his reign Chilperic, king of the Franks, seized Milan. Freed from these invaders, Antheric (584) organized a powerful federal kingdom. After his death (591) his widow, Theodelinda, married Agilulf. Under his rule the Lombards became orthodox Catholics. Adaloald, who succeeded him (615), was deposed by the dukes, or peers, who elected Ariovald of Turin, his brother-in-law. Rotharis (636) crushed the turbulent aristocracy, which threatened the stability of the empire, extended his dominions, and became famous by the compilation of the great code of Lombard laws, nearly 400 in number. "Augmented and continued by different kings until Didier or Desiderius (756–774), these laws not only survived the ruin of the Lombard kingdom, but became the basis of the revival of the study of jurisprudence in the Middle Ages, especially in Germany." From the reign of Rotharis the royal succession presents the usual scenes of murder, debauchery, intrigue, and dethronements common to all governments of the time under weak monarchs, until the accession of the great Luitprand (712). He united the kingdom by subduing the refractory aristocracy, and would have united Italy but for the intrigues of the Church of Rome, which then, as at all subsequent periods, opposed the union of Italy. Aided by Popes Gregory II. and III., the Lombards were successively attacked by Pepin and Charlemagne. Ratchis, who succeeded Luitprand (744), was so far influenced by the pope as to become a monk. Astolofo, his brother, who became king in 749, endeavored to carry out the old Lombard ideas, but was checked by Pepin. Desiderius or Didier, his successor, had for coregent Ratchis, who was taken from the cloister. Getting rid of Ratchis, Desiderius ruled alone. His daughter, Hermengilda, married Charlemagne, but as soon as the latter was on the throne he divorced his wife and sent her back to her father. For revenge, Desiderius supported the claims of the children of Carloman, Charlemagne's brother, and marched upon Rome, which had supported the outrage committed by Charlemagne, leaving his throne in charge of his son, Adelchis. Charlemagne invaded Italy (773) and conquered Adelchis, who fled to Constantinople. Desiderius, who was made prisoner, ended his days as a monk in the monastery of Corbia. In 776 the Lombard government of dukes was replaced by that of the Franks, and in 803, by treaty between Nicephorus, the emperor of the East, and Charlemagne, all of Lombardy, with the greater part of Italy, was transferred to the former. Thus perished the Lombard rule after a duration of 206 years. The Lombard laws and architecture, art and culture, were of a high order, and no race of the Transition or Romanesque period developed greater energy or originality, or exercised a greater influence upon the Teutonic races of Europe.

The name *Lombards* also was given during the Middle Ages to a vast number of shrewd and intelligent Italians, principally from Lombardy, who abounded in London and Paris during the twelfth century. They were principally brokers, bankers, and usurers, who advanced money on all kinds of securities. Lombard street in London derived its name from them, and there is in Paris another, once entirely occupied by Lombards, which bears the same designation. That of London still is, what the Lombard street of Paris was, the great financial centre of the country. Both in France and England the Lombards were regarded, though in less degree, like the Jews, as a despised race, and were accordingly oppressed by the sovereigns of those countries. CHARLES G. LELAND.

Lom'bardy, a territory of Northern Italy, extending from the Alps to the Po, and from Lago Maggiore and the Ticino, which separate it from Piedmont, to Lago di Garda and the Mincio, which separate it from Venetia. It consists of an alpine region to the N. covered with picturesque mountain-ranges and containing beautiful valleys, and a large and exceedingly fertile plain to the S., extending along the Po, and watered by the Ticino, Lambro, Adda, Oglio, and Mincio. This plain, with its rich soil and mild climate, is not only one of the most fertile, but also one of the best cultivated and most prosperous parts of the kingdom of Italy. Large crops of wheat, maize, rice, and millet are raised. Melons, oranges, figs, citrons, peaches, olives, and mulberry trees are extensively cultivated; also vines, though the wine produced is of inferior quality. The principal industry is dairy-farming, which annually produces about 50,000,000 pounds of excellent cheese. The principal manufacture is silk, which is produced in large quantities and of excellent quality; the annual value of this single product is estimated at $15,000,000. The hilly region is rich in beautiful marbles. The territory, comprising an area of 9085 square miles, with a population of 3,460,824, does not form a political unit at present, but is divided into the provinces of Bergamo, Brescia, Como, Cremona, Milan, Pavia, and Sondrio. It received its name from the LOMBARDS (which see), who in 569 conquered Northern and Central Italy and established an independent kingdom, which flourished till 774, at which time it was incorporated with the Carlovingian empire. By the treaty of Verdun in 843, Lombardy, together with a long but narrow strip of country situated between France and Germany, and inhabited by Frankish tribes, was formed into a kingdom under a ruler of the Carlovingian house, and it remained a Frankish possession till the death of Charles the Fat, in 888. After this time several independent duchies arose in the eastern portion of the old Lombardian dominions, and in 961 the western and central parts, Lombardy proper, fell under the feudal authority of the German empire. In the beginning of the eleventh century it succeeded in separating itself from Germany, and a number of small republics, generally consisting of one city only, with a dependent territory, were formed. This period of its history, which lasted to the middle of the sixteenth century, is perhaps the most interesting and prosperous. Twice united into powerful leagues, the Lombard cities defeated Frederic Barbarossa in 1176 and Frederic II. in 1225; and after the dissolution of the league Milan still remained a power which commanded some respect under the sway of the VISCONTIS and SFORZAS (which see). In 1540, Spain subdued the North Italian republics, and held the country to 1706, when it fell to Austria. During the wars between France and Austria at the end of the eighteenth and the beginning of the nineteenth centuries, Lombardy successively belonged to the Cisalpine republic, the Italian republic, and the kingdom of Italy, but in 1815 it was restored to Austria, which ceded it to the king of Sardinia in 1859 by the treaty of Villafranca.

Lombok', one of the group of the Sunda Islands, in the Malay Archipelago, situated between Bali and Sumbawa, and belonging to the Netherlands. Its area is estimated at 1850 square miles; its population at 250,000, all Mohammedans. Its coasts are mountainous, containing several active volcanoes; the interior is a low and fertile plain, in which rice and cotton are extensively cultivated, as cotton on the hillsides. The capital is Mataram; the seaport Ampanam, much frequented to obtain provisions.

Lom'briz [Sp., "intestinal worm"], an epizootic disease destroying multitudes of young sheep in Texas and Mexico. The sheep has in its stomach and flesh multitudes of long, reddish, hair-like worms. It is best prevented by liberal feeding and good care for the breeding ewes and the young lambs, since well-fed sheep throw off the parasites early. The administration of salt water, or of salt, sulphur, and copperas in equal parts, in a few small doses, will, it is asserted, destroy the worms without harming the sheep.

Loménie, de (LOUIS LÉONARD), b. in 1818 at St. Yrieix, department of Haute-Vienne, France; studied at Avignon; began in 1840 in Paris the publication of the *Galerie des Contemporains illustres, par un Homme du Rien* (10 vols., finished in 1847), which attracted much attention; was appointed professor in French literature at the Collége de France in 1845, and at the École Polytechnique in 1864. Another series of biographies, *Hommes de '89*, has not been finished. In 1855 he published *Beaumarchais et son Temps* (2 vols.), rich in original researches, and republished in the U. S. D. Apr. 2, 1878.

Lo'mond, Loch, the largest lake of Scotland, 21 miles long, comprising an area of 40 square miles, and situated between the counties of Stirling, Perth, and Dumbarton. It receives the Endrick, Luss, and Fruin, and sends its waters through the Leven to the Frith of Clyde. It is studded with islands and surrounded by grand and beautiful scenery.

Lom'za, town of Russia, in the government of the same name, on the Narev, a tributary of the Vistula, is 80 miles N. E. of Warsaw. It has a college, a gymnasium, and was formerly one of the most important towns of Poland, but was destroyed by the Swedes, and never recovered. In 1795 it became subject to Prussia; in 1807, to Russia. Pop. 15,000.

Lona'to, town of Northern Italy, in the province of Brescia. This town, of Roman origin, after being again and again desolated by war and pestilence during the Middle Ages, has been in modern times the scene of two great battles between the French and Austrians—one in 1706, and the other in 1796—in both of which the French were victorious. Pop. within the municipal limits, 6462.

London, the metropolis of Great Britain, is situated on both sides of the Thames, 60 miles from its mouth, in lat. 51° 30′ 48″ N., lon. 0° 5′ 48″ W. (the dome of St. Paul's cathedral). Its size is somewhat indefinite. The postal district covers an area of 250 square miles. The police district extends still farther, covering an area of 687 square miles, and including (in 1881) a population of 4,764,312. On the other hand, the parliamentary London is much narrower. It consists of ten boroughs, of which the city of London, although the smallest (having 50,526 inhabitants in 1881), is represented by four members, on account of its commercial and financial importance, while each of the other nine, although larger, is represented only by two: Chelsea, 366,506; Finsbury, 524,480; Greenwich, 200,651; Hackney, 417,191; Lambeth, 498,967; Marylebone, 498,311; Southwark, 221,866; Tower Hamlets, 438,910; Westminster, 228,932. But together these ten boroughs represent a population of only about 3,452,350, and the remainder of the inhabitants of the city belong to non-metropolitan electoral districts. Generally, however, the size of the city is determined by the area under the operation of the Metropolis Local Government act, which is also adopted by the registrar-general for the census. According to this definition, London covers an area of 122 square miles, forming parts of the counties of Middlesex, Surrey, and Kent, with 3,832,441 inhabitants in 1881. Of this population, about one-third was born outside of the limits of the city. There were about double as many natives of Ireland (250,000) as of Scotland (120,000), and about five times as many natives of the counties of England and Wales (1,000,000) as foreigners (200,000). The foreigners consisted of 155,000 Europeans (60,000 Germans, 30,000 Frenchmen, 15,000 Dutchmen, 12,000 Poles, 7500 Italians, 5000 Swiss) and 45,000 Asiatics, Africans, and Americans. The number of Jews amounts to about 40,000. The special foreign district of London is that of Soho, but many foreigners also live in the neighborhood of Ratcliff Highway, the present St. George street. The lower class of the Jews inhabit the neighborhood of Houndsditch and Aldgate; the Italian street-musicians and vendors of ices, the neighborhood of Hatton Garden.

In its course through the city the width of the Thames varies from 700 to 1200 feet. It is spanned by a great number of magnificent bridges, of which the most remarkable are London Bridge, 900 feet long, of stone, daily crossed by 25,000 vehicles; Waterloo Bridge, 1240 feet long, consisting of nine elliptical arches; Westminster Bridge, 1200 feet long, consisting of seven iron arches resting on stone piers, etc. Several tunnels under the river connect the two banks. The Thames Tunnel, two miles below London Bridge, was opened Mar. 25, 1843, and consists of two arched passages, 1200 feet long, 14 feet wide, and 16½ feet high, separated by a brick wall 4 feet thick. In 1865 the tunnel was bought by the East London Railway Company to connect the railways N. of the Thames with those on the southern side, and July 19, 1869, it was closed as a public footway. The Thames Subway, carried 25 feet below the bed of the river, was opened in the beginning of 1870, and two others have since been constructed. At London Bridge the Thames has sufficient water to admit vessels of 800 tons, and between this point and Bigsby's Hole, 6½ miles farther down, opposite Blackwall, extends the port of London, with its twenty-eight magnificent wet docks. The most remarkable of these are the East India, West India, St. Katharine's, and London docks, with the famous wine-vaults; and on the other side the Surrey and Commercial docks, mostly for the timber and corn trades. In 1881 the port was entered by 10,765 vessels, of 5,810,043 tons, and cleared by 8081 vessels, of 4,478,960 tons, all engaged in the foreign and colonial trade; while of vessels engaged in the coasting trade, 36,112, of 4,239,663 tons, entered, and 10,470, of 1,453,715 tons, cleared the port; 2709 vessels, of 1,118,579 tons, were registered as belonging to the port—namely, 1637 sailing vessels, of 506,865 tons, and 1072 steam vessels, of 611,714 tons. London has, so to speak, monopolized the trade with the East Indies and China, and is the emporium for tea, coffee, sugar, spices, indigo, and, indeed, for all kinds of Eastern produce and manufacture. The trade with France is also chiefly concentrated in London, which receives from that country, besides the special French manufactures, large quantities of butter, eggs, vegetables, fruit, poultry, and grain. The greater part of the Baltic trade, furthermore, is carried on by way of London, which imports corn, cattle, and provisions of various kinds from Denmark, timber and fish from Norway, tallow, hemp, linseed, and wool from Russia, etc. In the Mediterranean trade, however, London has found a great rival in Liverpool, though it still imports large quantities of olive oil, wine, fruit, madder, etc. from Turkey, Greece, Italy, and Spain; while the circumstance that the staple manufacture of Lancashire is cotton has directed most of the trade with the U. S. through Liverpool. The total value of the trade of London amounted in 1880 to £194,043,836—namely, exports, £52,600,929; imports, £141,442,907. The principal items of importation were tea, 206,816,609 pounds; coffee, 1,357,397 pounds; cocoa, 20,750,014 pounds; wool, 358,776,758 pounds; wheat, 12,808,355 quarters; wine, 10,682,179 gallons; live animals: oxen, 122,992; sheep and lambs, 679,522; tobacco, 26,645,681 pounds; eggs, 909,406 gt. hund.

The manufacturing industry of London is of less importance than its commerce. The principal branch is brewing. In 1880 there were 110 common brewers, who used 9,955,177 bushels of malt and exported 236,206 barrels of beer. The breweries are now supplied with water by wells sunk below the chalk to the greensand. Silk-weaving, which was introduced by French refugees after the revocation of the Edict of Nantes and flourished for a long time at Spitalsfield, has during the last fifty years gradually succumbed under the rivalry of Lancashire. The shipbuilding yards are located at the Isle of Dogs, but it is principally yachts which are built. In 1881 their number amounted to 64, but the tonnage to only 2723. Of more importance are the engineering works at Lambeth and Millwall, the potteries and glass-works at Lambeth, Whitefriars, and Southwark, and the chemical works on the Lea. The manufacturing activity of the city is chiefly carried on in the districts S. of the river; that of carriages, however, is concentrated at Long Acre. The cabinetmakers have their shops principally in the neighborhood of Shoreditch, Tottenham Court road, and Hampstead road. The wholesale book-trade is to a large extent concentrated in Paternoster Row. The Jews carry on their trade in second-hand clothing at Houndsditch, especially on Sunday mornings, at which time also birds and fancy-animal fairs are held in Church street, Bethnel Green, and St. Andrews street. The newspaper offices are principally gathered in Fleet street. The commerce and regular business are carried on in that part of the city which is distinctively called the *City* of London, situated on the northern bank of the river, and forming the centre of the whole hive; it has its own police, and is said to be entered every morning by 700,000 persons who leave it again in the evening.

The principal thoroughfares run from E. to W., parallel with the river. The western part is the seat of most of the public institutions and the residence of the wealthy and aristocratic classes. A prominent feature in the prospect of the city are the Thames embankments or river-quays. The Victoria embankment, on the northern side, runs from Westminster Bridge to Blackfriars' Bridge, and forms a magnificent public way, 100 feet broad, from the houses of Parliament to St. Paul's cathedral; it was opened in 1870. The Albert embankment, on the southern side, runs from Westminster Bridge to Lambeth Palace, the town-residence of the archbishop of Canterbury. The Chelsea embankment begins at Chelsea Hospital, and presents an excellent roadway 70 feet wide, and lined on the land-side with numerous pleasure-grounds. Of the squares, of which a great number is scattered all over the city, and of which many are planted with beautiful trees and are well cultivated, the largest are Eaton, 1637 by 371 feet; Cadogan, 1450 by 370; Bryanston, 814 by 198; and Montagu Square, 820 by 156; the most fashionable are Belgrave, Grosvenor, St. James's, Hanover, Cavendish, and Trafalgar Squares, with the Nelson Column, the statues of Havelock and Napier, and fine fountains; the most crowded, because situated in the eastern quarters and mostly surrounded by lodging-houses, are Great Ormond, Queen, Brunswick, and Mecklenburg Squares. Soho Square, near Oxford street, one of the gayest points of the city in the days of the prince regent, but afterwards somewhat deserted, has of late been embellished by a beautiful garden. Of the public parks, the most prominent is Hyde Park, comprising an area of about 400 acres between Green Park and Kensington Gardens, and containing a fine sheet of water, the Serpentine, an excellent drive, Rotten Row (*route du roi*), from Apsley House to Kensington Gardens, and the splendid Albert monument, erected on the site of the Crystal Palace of 1851. Remarkable among the other parks are the Regent's Park, comprising 450 acres, and containing a zoological and botanical garden; St. James's (59 acres), extending between St. James's Palace, Buckingham Palace, and the Wellington Barracks; Green Park (60 acres), between Hyde Park and Piccadilly, from which it is entered through a triumphal arch surmounted by an equestrian statue of Wellington; Victoria Park (300 acres), in the north-eastern part of the city; Kensington Gardens, a beautiful piece of ground separated from Hyde Park by the Serpentine; the Kew Botanical Gardens, situated 5 miles from Hyde Park, on the road to Richmond, and comprising 170 acres, etc.

The citadel of London, the Tower, is perhaps the most interesting and most widely known of its public buildings. It is situated at the eastern extremity of the city, and consists of a bewildering mass of towers, forts, batteries, ramparts, barracks, and storehouses, covering an area of 900 feet by 800. The oldest part of the building is the White Tower, constructed by William the Conqueror, and almost unchanged in the interior, though externally remodelled by Wren. Other remarkable points of the construction are the Bloody Tower, in which the sons of Edward IV. were murdered; Beauchamp Tower, in which Anne Boleyn and Jane Grey were detained; the Bell Tower, in which the constable resides; the galleries of the Horse Armory and Queen Elizabeth Armory, containing fine collections of arms; the Jewel Room, in which the regalia of the English crown is kept, etc. As a fortress the Tower is not of great consequence, but it contains vast stores of war-materials. Of the royal palaces, none is very remarkable; they are more distinguished for vastness of dimensions than for elegance of architecture. Buckingham Palace was begun by George IV. and finished by William IV. It forms an immense quadrangle, contains a fine collection of pictures, a magnificent ball-room, capable of receiving 2000 persons, a splendid staircase of white marble, etc.; but it is only used on great occasions. The queen resides, when in town, in Kensington Palace, and holds her drawing-rooms in St. James's. Marlborough House, in Pall Mall, was built by Wren for the duke of Marlborough, and bought in 1817 by the Crown; it is now the residence of the prince of Wales. The new Westminster Palace, or the houses of Parliament, stands on the left bank of the Thames, between the river and Westminster Abbey, on the site of the old palace, which was destroyed by fire in 1834. It is a vast construction, covering an area of 8 acres, containing 2 miles of corridors, 100 staircases, and 1100 apartments, among which are the House of Lords, 100 feet by 45, the House of Commons, 60 feet by 45, and the famous Westminster Hall, 290 feet long, 110 high, and 68 wide, in which the highest law courts of England are held. It is built in Gothic style, very elaborate in its details, and rich, even gorgeous, in its interior decoration.

Next to the Tower in historical interest, and far superior to it in architectural respects, is Westminster Abbey. The oldest parts of the present building, the choir and the transepts, were erected in the thirteenth century by Henry III., the nave and the aisles in the fourteenth and fifteenth centuries by the abbots, the western front and the great window by Richard III., the famous chapel at the eastern extremity by Henry VII., who also completed the interior, and the upper part of the western towers by Wren. The present structure is 511 feet long, 203 across the transepts, 79 across the nave and aisles; the height of the nave is 102 feet; of the towers, 225. From the time of Edward the Confessor the kings of England have been crowned here, and most of them, after Henry VII., lie buried or have their monuments here. An interesting spot of the building is called "Poets' Corner," in the eastern aisle of the southern transept, in which the most illustrious men of English science, literature, and art are buried or have their monuments. The cathedral of the see of London is the church of St. Paul, built by Wren between 1675 and 1710. It is 500 feet long, 180 wide, 222 high; the height of the dome is 365 feet, the diameter 145. It is the fifth largest church in Europe. The oldest church of London is St. Bartholomew the Great, West Smithfield, built in 1102 and restored 1865–67. In all, the city contains about 1500 places of worship—600 belonging to the Established Church, 400 to the Wesleyan and other Methodists, 300 to the Baptists, 150 to the Congregationalists, 100 to the Roman Catholics, about 25 to the English and other Presbyterians, 20 synagogues, etc. The British and Foreign Bible Society of London distributes annually 4,000,000 Bibles in 200 languages. London has a large number of hospitals and over 1000 charitable institutions, with an annual income of about £5,000,000, half of which is disbursed for food and clothing alone. By the Elementary Education act of 1870 the city was divided into ten school districts, represented in the central school board by 49 members. This board is authorized to provide new schools and compel the attendance of children between five and twelve years of age. The school funds are raised from parents, public taxes, and local funds. Before the enactment of this law, in the year 1869–70 there were within the space of a square mile in the eastern part of the city 40,000 children, of whom 30,000 received no instruction. The schools for the middle class have been sufficient in number and good for a long period back, and those for higher or special educations, commercial, industrial, artistic, military, etc., are excellent. First among all educational institutions of London stands the British Museum (which see), but the city has besides about 50 large libraries accessible to the public, excellent collections illustrative of industry and art in the Kensington Museum, the National Gallery of Paintings of all schools in Trafalgar Square, and a great number of private collections. The number of theatres amounts to about 40, but since the age of Shakspeare the English stage has never occupied a prominent position. With respect to music, although England has produced no great composer, nowhere can better music be heard than in London, and musical institutions and associations are very numerous.

The municipal government of London presents a very striking example of decentralization. Fifty years ago the metropolis was governed partly by the City of London and partly by the vestries of the outlying parishes, to which two elements of government had to be added the justices of peace, the various local commissioners for paving, lighting, and cleaning the streets, the burial boards, the commissioners for public baths, for libraries, for public schools, for the police, for the poor, etc. It was vividly felt, however, that twenty or thirty independent governments do not govern a city so very well, and fifteen years ago the Metropolitan Board of Works was created to take charge of such improvements as plainly could not be done on the parochial plan. The board did not work well, and in 1884 a plan was laid before Parliament erecting London into a county by itself.

London (*Londinium, Augusta Trinobantum*) first appears in history as a Roman station in the reign of Claudius; under Constantine the Great it was fortified. After the departure of the Roman troops it became the capital of the East Saxon kingdom, and in the ninth century, under Egbert, the capital of the united Saxon kingdoms. William the Conqueror granted it a charter, which was renewed and enlarged by Henry I. in 1100. From this time, and up to our days, the city has always been most intimately connected with the history of the country. There is hardly any great event or any great character in the English history and literature of which some trace cannot be found in London. The kings were often very jealous of its privileges and power, and favored Westminster, where they resided, and which at that time was a separate city. Even Elizabeth, although she contributed much to the prosperity of London by suppressing the privileges of the Hanseatic League, feared that it would grow too big. In the latter part of the seventeenth century it suffered severely—first, by the plague in 1665, which cost the lives of 65,000, while the total population was only about 200,000; and the following year by a great conflagration, which destroyed about five-sixths of the whole city. It soon recovered, however, and made immense progress, especially in this century; between 1801 and 1881 its population increased from 958,863 to 3,832,431. It is now one of the great centres of modern civilization, and more especially the centre of the commerce of the world; every enterprise of any great magnitude looks to it for capital. And as a place of elegance, comfort, and safety it stands in the foremost rank among cities, its police, fire departments, means of conveyance and communication, relief and sanitary institutions, etc., being models in their respective lines. Clemens Petersen.

London, city and port of entry, capital of Middlesex co., Ont., Canada, on the river Thames, and on the Great Western Railway, 61 miles E. of Sarnia, is the N. terminus of the London and Port Stanley Railway and the S. terminus of a branch of the Grand Trunk. It is surrounded by a very fertile and well-timbered district, has 5 banks, a board of trade, and 17 churches, is the seat of a Roman Catholic bishop and of the Anglican bishop of Huron, has numerous benevolent societies, a convent, a well-regulated school, fire and police departments, and is the seat of Hellmuth College, Hellmuth Ladies' College, and of Huron College, all flourishing institutions. There are 2 literary and several religious societies, 3 monthly, 5 weekly, 1 tri-weekly, and 2 daily newspapers, an orphan asylum, a hospital, and an insane hospital. London is well laid out, and is lighted by gas; has a large number of machine-shops, breweries, oil-refineries, foundries, and other manufacturing establishments. The public buildings, bridges, streets, squares, markets, etc. are for the most part named after those of London in the mother-country. Many of the public buildings are architecturally very fine. Pop. of the city in 1871, 15,826; in 1881, 19,763.

London, on R. R., cap. of Laurel co., Ky. (see map of Kentucky, ref. 4–I, for location of county). Pop. in 1870, 165; in 1880, 215.

London, R. R. junction, cap. of Madison co., O. (see map of Ohio, ref. 5–E, for location of county), 25 miles W. of Columbus. Stock sales have been held here monthly for many years. Pop. in 1870, 2066; in 1880, 3067.

London Clay, a series of argillaceous strata, in places from 500 to 600 feet in thickness, forming the most important member of the Lower Eocene of England and the northern extremity of France, and underlying the city of London. The remains of mammals (*Hyracotherium*, *Lophiodon*, *Coryphodon*), of birds (*Halcyornis*, *Lithornis*, and some others), of a sea-snake (*Palæophis*), and of marine turtles and at least eighty species of fish, have been found in these beds, which also abound in shells (upwards of 250 species have been recorded), and have also yielded a great variety of plant remains (palm fruits, etc.) of tropical or sub-tropical aspect. The fauna and flora thus indicate to us that these strata were deposits in a delta or in a limited sea receiving waters flowing from a torrid region of the earth.

Lon′donderry, county of Ireland, in the province of Ulster, bordering on the Atlantic. Area, 810 square miles. The surface is mostly hilly and rugged, with fertile tracts along the rivers Bann, Foyle, Faughan, Roe, and Mayola, with their numerous affluents. Oats, barley, potatoes, and flax are the common crops; linen is the principal manufacture. Pop. 164,991. From 1857 to 1881 the number of emigrants amounted to 73,725. A great part of the ground is held by the inhabitants by lease under the Irish Society and the twelve London companies.

Londonderry, city of Ireland, capital of the county of Londonderry, on the Foyle, which is crossed by an iron bridge 1200 feet long, is built on a hill, on whose top stands the cathedral of Derry, and was formerly fortified, has many breweries and distilleries, and considerable manufactures of linen and ropes. The salmon fisheries of Lough Foyle are very productive. Pop. 28,947.

Londonderry (Charles William **Stewart Vane**), third marquis of, b. at Dublin, Ireland, May 18, 1778; served on the Continent both as a soldier and a diplomatist during the wars of the French Revolution; aided in suppressing the Irish rebellion of 1798; accompanied Abercrombie to Egypt in 1801, in which year he entered Parliament; became colonel, aide-de-camp to the king, and under-secretary for the war department in 1803; distinguished himself at the head of a brigade of hussars under Sir John Moore in Spain (1808–09); was adjutant-general to Sir Arthur Wellesley (1809–13), distinguishing himself at Talavera and other battles, for which he received the thanks of Parliament and the order of the Bath; went as ambassador to Berlin in 1813, to Austria in 1814, and was a member of the Congress of Vienna in 1815; was made privy councillor, lieutenant-general, and Baron Stewart in 1814; assumed the surname of Vane in 1819 on his marriage with the heiress of that title; succeeded his half-brother Robert as marquis of Londonderry in 1822; was made Earl Vane and Viscount Seaham in 1823, general in 1837, colonel of lifeguards in 1843, knight of the Garter in 1852. D. in London Mar. 6, 1854. Under his original name of Stewart he was author of a *History of the Peninsular War* (1808–13), and as marquis of Londonderry he edited the *Correspondence* of his brother, Lord Castlereagh (1850). In developing the vast estates of his wife in Durham he constructed at his own expense the harbor of Seaham.

Londonderry, second marquis of. See Castlereagh, Earl of.

London Pride (*Saxifraga umbrosa*), a perennial evergreen plant, a native of Southern Europe, frequently found in England and in Ireland, where it is called St. Patrick's cabbage, from its thick cluster of leaves. The stem grows a foot high, and bears small pink flowers with darker spots. Being unaffected by smoke, it grows well in the English cities, especially in London, whence its name.

London, University of, originally incorporated in 1825, was reorganized in 1836, the former university taking the name of University College, and a new university then received a charter, which has been amended in 1837, 1850, and 1858. The university proper consists of a senate and a board of examiners. It does not instruct, but examines, confers degrees, certificates, and prizes, and sends one member to Parliament. There are several colleges and schools in various parts of the kingdom affiliated with the university. Those at London are University College, King's College, and New College. If the London University is less distinguished for the eminence of its graduates in classical learning and pure mathematics than the old English universities, it is certain that in the natural and physical sciences and the professions of law and medicine its diplomas are not less valued than those of either Oxford or Cambridge.

Long, in music. See Large.

Long (Gen. Armistead L.), b. in Virginia in 1826; graduated at West Point in 1850; entered the artillery as brevet second lieutenant; in June, 1861, after serving four months on the staff of Gen. Sumner, he resigned to follow the fortunes of his native State; became brig.-gen., and was killed at the battle of Peach Tree Creek, July 20, 1864.

Long (Crawford W.), M. D. See Appendix.

Long (Gen. Eli), b. in Woodford co., Ky., June 16, 1837; graduated at Frankfort (Ky.) Military School in 1855, and in 1856 was appointed a second lieutenant of cavalry in the U. S. army; prior to 1861 he served with his regiment, mainly against hostile Indians; on May 24, 1861, he attained the rank of captain. Throughout the civil war he was actively engaged in the West, at Perryville, Murfreesboro', Chickamauga, and in the Atlanta campaign, as colonel of the 4th Ohio cavalry since Feb., 1863, but in command of a brigade most of the time prior to his appointment as brigadier-general in Aug., 1864. In Apr., 1865, he led his division of cavalry in the charge upon the intrenchments which resulted in the capture of Selma, Ala., being himself severely wounded in the head; for these services he was brevetted brigadier- and major-general. Retired as major-general in 1867; brigadier-general 1875.

Long (George), b. at Poulton, Lancashire, England, in 1800; educated at Macclesfield School and at Trinity College, Cambridge, where he was elected to the Craven scholarship at the same time with Macaulay; graduated in 1822 as first chancellor's medallist, and obtained a fellowship. Two years later (1824) he was appointed professor of ancient languages in the University of Virginia, then being organized by the care of Thomas Jefferson, and, along with Prof. T. H. Key and other English scholars, spent two years at Charlottesville, Va. Returning to England in 1826, he was professor of Greek in London University until 1831, when he devoted himself to the literary enterprises of the Society for the Diffusion of Useful Knowledge, editing for that association the *Quarterly Journal of Education* (1831–35), the *Biographical Dictionary* (1842–44), and the *Penny Cyclopædia* (1833–46). He was called to the bar at the Inner Temple in 1837, became professor of Latin at University College, London (1842–46), lecturer on jurisprudence and civil law at the Middle Temple (1846–49), and professor of classical literature in the Proprietary College at Brighton from 1849 to 1871, receiving in 1873 a royal pension of £100. He was general editor of a *Bibliotheca Classica;* published an analysis of *Herodotus* and a *Classical Atlas*, and a valuable edition of Cæsar's *Gallic War* and of *Sallust*. He translated *Select Lives from Plutarch*, *The Thoughts of the Emperor Marcus Aurelius*, contributed largely to Dr. Smith's *Classical Dictionaries*, wrote geographical treatises on England and Wales and on America, *History of France*, and *The Decline of the Roman Republic;* translator of *Epictetus* (1877). D. Aug. 10, 1879.

Long (John D.), LL.D., b. in Buckfield, Me., Oct., 1838; graduated at Harvard College in 1857: principal of Westford Academy, Mass., for 2 years; studied law, was admitted to the bar in 1861; practised law in Buckfield and in Boston; was elected to Mass. House of Representatives in 1875, and was its Speaker for 3 years: lieut.-gov. of Mass. in 1879, and gov. of Mass. 1880–83. Elected M. C. 1882; re-elected 1884. Author of a poetical translation of Virgil's *Æneid*.

Long (Stephen Harriman), b. in Hopkinton, N. H., Dec. 30, 1784; graduated at Dartmouth College 1809; was teaching school at Germantown, Pa., in 1814, where he met Gen. Swift, then chief of engineers, who procured his appointment in the army as second lieutenant of engineers Dec., 1814, and in the spring of 1815 Long was placed on duty at the Military Academy as assistant professor of mathematics. In Apr., 1816, he was appointed topographical engineer, with the brevet rank of major, and was brevetted lieutenant-colonel in 1826; on the organization of the topographical engineers as a separate corps in 1838 he became major of that body, and in 1861 chief of topographical engineers, with the rank of colonel. For nearly half a century Col. Long was actively engaged in the service of his country, and with the early engineering works of his time his name is known in connection. His exploration of the Illinois and Arkansas rivers in a flatboat or canoe as early as 1816 was considered quite a feat in its day, and led to his subsequent expedition to the Rocky Mountains, which extended over a period of nearly five years, and embraced the country between the Mississippi River and the Rocky Mountains, one of the loftiest peaks of which great chain received and still bears his name. An account of this expedition was published in 1823 by E. James, and in 1824 W. H. Keating published in two volumes the history of Long's exploration of the sources of the Mississippi, both works being largely from notes of Col. Long. When the great undertaking of the Baltimore and Ohio R. R. was commenced, Col. Long was placed at the head of the board of engineers having in charge the surveys and construction of this road; he was one of the earliest and most efficient in introducing in a practical manner great improvements in the construction of timber bridges for railroad purposes; and it was while acting in his capacity of chief engineer that he devised and patented the bridge now known by his name. (See BRIDGE.) Besides these important works, he was engaged in the survey and construction of numerous railroads in different sections of the country and in a great variety of professional duty. In the improvement of Western rivers and harbors he had a long experience, and devised valuable plans for the removal of obstructions. After serving on a board for the improvement of the lower Mississippi, he was in 1856 placed in charge of that work, and under his supervision the contracts for deepening the mouths of this river were conducted prior to the civil war. Shortly after the merging of his corps into the U. S. corps of engineers Col. Long was retired (June, 1863) from active service, but continued charged with important duties until his death, which occurred at Alton, Ill., Sept. 4, 1864.

G. C. SIMMONS.

Longa'cre (JAMES BARTON), b. in Delaware co., Pa., Aug. 11, 1794; served an apprenticeship with the eminent engraver Murray at Philadelphia, and from 1819 was engaged for many years in illustrating American works. With James Herring he prepared the *National Portrait Gallery of Distinguished Americans* (4 vols., 1834–39), a valuable work, in which many portraits are from drawings by Longacre. In 1844 he became engraver to the U. S. mint, and retained that position until his death at Philadelphia Jan. 1, 1869. He designed the modern gold coinage of the U. S., and superintended for the government of Chili the remodelling of the entire coinage of that country.

Long Branch, R. R. centre, Monmouth co., N. J. (see map of New Jersey, ref. 4–E, for location of county), 11 miles S. of Sandy Hook and 30 miles S. of New York, one of the principal watering-places of the U. S., is situated on the Atlantic coast, and takes its name from a brook which forms a branch of South Shrewsbury River, and was formerly a fishery of the Indians, who held the lands until about the middle of the eighteenth century. Long Branch proper is the "village," 1 mile from the sea, but the corporate limits embrace also the suburban villages of Branchport, Branchburg, Atlanticville, and the "Shore," all lying within a radius of two miles. Communication with New York both by steamer and by rail is easy, a direct railroad having been opened to the public in July, 1875. The *Shore*, where are situated the hotels, boarding-houses, and cottages, has a beach which may vie with the most celebrated in the world, having an open sea-front of more than 5 miles of high commanding bluff, without the intervention of inner bays. Branchport is the nearest landing-place for schooners upon the South Shrewsbury River. Atlanticville on the Shore turnpike is the principal head-quarters of fishermen, and East Long Branch is on the street which connects the Shore with the village. There are post-offices both at East Long Branch and at the village. There are several manufactories. The drives are very fine. The summer population sometimes exceeds 30,000. Pop. of Long Branch in 1885, 5140; of Long Branch v. in 1880, 3833.

Longet' (FRANÇOIS ACHILLE), b. in 1811 at St. Germain-en-Laye, department of Seine-et-Oise, France; studied medicine, and especially physiology; gained twice the Montyon prize of physiology at the Academy of Sciences; was professor of physiology in the faculty of medicine at Paris; member of the Academy of Medicine, and consulting physician to Napoleon III., and d. at Bourdeaux in 1871. His principal works are *Traité d'Anatomie et de Physiologie du Système nerveux* (1842) and *Traité complet de Physiologie* (1850–59), besides a great number of original researches concerning the effects on the nervous system of electricity, of the inhalation of ether, etc., and concerning the general excitability of the nerves and irritability of the muscles.

Longev'ity [Lat. *longævitas*], a subject which has raised a number of curious questions, to which, however, science has not yet been able to give more than preliminary or approximative answers. Most people have a vague impression that plants live longer than animals, and animals longer than men; and although this notion breaks down even on the most cursory survey of the actual state of affairs, it is, nevertheless, not altogether a delusion, as there certainly are plants which are still young and vigorous at an age at which even the most longevous animals must die; and the same relation reappears when men and animals are compared. Although the life of many species of plants lasts only one or two years, the age which certain species of trees attain, such as the baobab, the chestnut, the cypress, the yew, the oak, the palm, etc., is almost fabulous. With many species of trees it is easy to compute the age of an individual with tolerable certainty. Thus, the spruce sets a new system of branches every year, and even when all the lower branches wither away from want of air and light, strongly-marked scars remain on the bark; but the longevity of the spruce is not very great. The age of several kinds of palm trees is indicated by rings visible externally on the rind, each ring denoting the growth of one year; and by counting these rings from the base to the top of the stem the age of certain Brazilian cocoanut-palms has been computed to between 600 and 700 years. The Arabs generally ascribe a longevity of 200 or 300 years to the date-palm, but on what they base this supposition is not known. A horizontal cut of an oak trunk shows a series of often very strongly-marked concentric circles, each of which, like the rings on the rind of the palm tree, denotes one year's growth; by counting these circles the age of an individual oak is found. In England many oaks have been felled whose trunks showed between 300 and 400 such circles, and by comparing the diameters of these trunks with that of a living oak, an estimate is obtained of the age of the latter. Thus, Wallace's oak at Ellersley, near Paisley, Scotland, is believed to be more than 700 years old. The celebrated eight olive trees on the Mount of Olives at Jerusalem are known from authentic documents to have existed when the Seljook Turks conquered the city in 1099; and similar historical testimonies can be produced concerning the age of many other trees. At Ankerwyke House, near Staines, Middlesex, England, stands a yew which dates from before the meeting of the barons at Runnymede in 1215, and the yews at Fountain Abbey, Yorkshire, England, were old trees when the abbey was built in 1132. But the age of the *Sequoia gigantea* in the Mariposa grove of California, 90 feet in circumference and more than 300 feet high, ranges certainly farther back; and farther still ranges that of the sweet chestnut trees on Mount Etna, Sicily, of which one measures 160 feet in circumference; of the Oriental plane near Constantinople, 150 feet in circumference, etc. Adanson computed the age of certain baobab trees in Africa at more than 5000 years; De Candolle, that of the deciduous cypress at Chapultepec, Mexico, still higher; and Humboldt calls the *Dracæna draco* at Orotava in Teneriffe one of the oldest inhabitants of the earth.

In the animal kingdom we know that the longevity of insects is very small, ranging from a few hours to a few weeks, but that of reptiles is considerable. The toad lives about fifteen years, and a tortoise which was placed in the garden of the palace of Lambeth, London, in 1633, perished by accident in 1753. Several species of fishes may attain a high age. Buffon says of the carps in the pond of the count de Maurepas at Pontchartrain that they are proved to be more than 150 years old, and Gesner tells of a pike which was caught in a lake near Heilbronn, Suabia, in 1497, and which, according to a brass ring attached to it, had been placed in the lake in 1230. Common river-trout have lived confined in wells between 30 and 50 years. Of birds, the gallinaceous families live only between 12 and 15 years; the goose is more longevous, and the swan is known to have lived more than a century. Fontenelle tells us that the grand duchess de la Rovère d'Urbino, when she came to Florence in 1633 to marry the grand duke Ferdinand, brought with her a paroquet which she called the oldest member of her family, and which consequently must have been over twenty years old; it afterward lived in Florence for nearly a century. In Northern Germany and Denmark the peasants mark on the gable, below the year in which the house was erected, the year in which the stork built its nest on the ridge, and a record is kept of the annual arrivals of the bird. In many cases these records exceed one century; and as a nest is never taken possession of by a foreign stork unless it has been vacant for two or three years, and after the performance of certain very curious ceremonies by the new occupants, it may be considered as well proved that it is the same couple of storks which has lived in the nest during this period. Birds of prey are believed to be still older, though there are no proofs of their longevity. The experiment of the old woman who bought a raven to see whether it was true that it could live 1000 years led to no result. Of mammals, the age of the domesticated animals is well known; the camel lives 40 years, the horse 30, the ox 20, the dog 12, the cat 10, the sheep 9, the rabbit 8, the guinea-pig 7, etc. The age of a horse can at any time be determined with tolerable certainty from the appearance of its teeth; that of the ox from the rings on its horns, counting the smooth part for three years and each of the rings around the base for one. The horse gets its foal or milk teeth about 15 days after birth, and at the age of 2½ years the middle pair of these milk-teeth drops, and is replaced by a pair of permanent nippers; at 3½ years the next pair, one of each side, changes; and at 4½ years the last pair. After this time the age can still be determined for several years by the degree in which the circular hollow pit in the centre of each tooth has become effaced by the wearing down of the tooth. Later on, the age is determined by the shape of the tushes or canine teeth. But of non-domesticated animals our knowledge is small and vague, with the exception of a very few cases. In the deer kind the age may be computed from the horns, the number of the antlers, the size of the palms, and the thickness of the burrs. The common stag gets its pricket in its second year; its fork, a pricket with one antler, in its third year, etc. Generally, it seems to be a rule among mammals that their longevity increases with their size. But the age of the elephant, rhinoceros, hippopotamus, etc. is not known. Aristotle says that the elephant lives 200 years, the East Indians say 300; one elephant, whose age was not known when it was captured, lived 130 years in captivity. The age of the whale is computed by the laminæ of whalebone in its jaws; if this computation is correct, it attains at least 400 years. It seems, however, as if among mammals the relation between their longevity and their time of gestation is more constant than that between their longevity and their size.

With respect to the longevity of man, this term must not be confounded with that of the average duration of life. The former refers to the question, How long can the human organism last when, undisturbed by any merely temporary, local, or individual influences, it is allowed to run through its natural course and exhaust its inherent vitality without any merely incidental break or jar? The latter, on the contrary, refers to the question, How long does the human organism actually last under certain given influences of profession, climate, diet, etc.? or, Why do people live longer as agriculturists than as dry-polishers, longer in the valleys of Norway than in the plains of the Wolga, longer in France than in the U. S., etc.? The Bible puts down as the natural term for human life "threescore and ten," and history seems during its whole course to have confirmed this term. When a man dies at 50, he is and always was said to have died early, and when a man lives to 90, he is and always was said to have lived long. The Bible tells us that the patriarchs before the Deluge all lived from six to eight centuries, but the expressions are open to some doubt with respect to their true meaning. But when the Bible tells us that Abraham was 175 years old when he died, Isaac 180, Jacob 147, and Joseph 110, such exceptional prolongations of human life still occur. Cases of longevity exceeding one century are frequently recorded. Two of the highest are Peter Czartan, a Hungarian peasant, 185 years old—b. in 1539, d. in 1724; and Thomas Parr, a native of Shropshire, England, who died of an accident when 152 years old. Charles I. wished to see him; he went to the court, was feasted, ate too much, took a fit of indigestion, and died; but Harvey, who dissected him, declared that but for this accident he could have lived on for many years. These instances of exceptional longevity are not so rare as commonly believed. Thus, from the census taken during the reign of the emperor Vespasian, Pliny enumerates no less than 54 persons who had reached the age of 100 years; 14, 110; 20, 125; 40, 130; 40, 135; and 30, 140; and all these instances are taken exclusively from the region between the Apennines and the Po. They have given rise to some very curious speculations. While the average duration of life everywhere has sunk far below the natural term, and philanthropists, educational and hygienic boards, and governments in general are active to repress the most obvious causes of this alarming state, certain philosophers have directed their attention to the question whether it is possible to prolong the natural term itself, and move the barrier from seventy to one hundred. Haller and Buffon declared that they saw in the nature of the human organism no reason why it should be the rule for man to die at seventy, and not at one hundred. As yet, however, these speculations have not extended beyond good intentions. (See *Art of Prolonging Life*, by Hufeland; *The Human Species*, by De Quatrefages; *An Account of Persons remarkable for their Health and Longevity, by a Physician*, London, 1829; and *Human Longevity; its Facts and its Fictions*, by William J. Thoms, 1873.)

The following table, constructed by Dr. Farr, F. R. S., from the census enumerations and the registered deaths in England and Wales, shows the number out of every million persons born who remain alive at the end of every year; also the number of deaths. If the returns made to the registrar-general respecting the real ages of persons deceased may be depended upon, it shows that a much larger number than is generally supposed reach the age of one hundred years and upward:

Age.	Number alive at commencement of year.	Deaths each year.	Age.	Number alive at commencement of year.	Deaths each year.	Age.	Number alive at commencement of year.	Deaths each year.
0	1,000,000	149,493	37	558,859	6,678	73	191,956	15,469
1	850,507	53,680	38	552,181	6,756	74	176,487	15,363
2	796,827	28,238	39	545,425	6,841	75	161,124	15,136
3	768,589	18,456	40	538,584	6,931	76	145,988	14,789
4	750,133	13,315	41	531,653	7,027	77	131,199	14,319
5	736,818	9,899	42	524,626	7,127	78	116,880	13,726
6	726,919	7,768	43	517,499	7,236	79	103,154	13,021
7	719,151	6,559	44	510,263	7,348	80	90,133	12,214
8	712,592	5,458	45	502,915	7,467	81	77,919	11,320
9	707,134	4,625	46	495,448	7,592	82	66,599	10,358
10	702,509	4,028	47	487,856	7,722	83	56,241	9,352
11	698,481	3,637	48	480,134	7,857	84	46,889	8,324
12	694,844	3,431	49	472,277	7,997	85	38,565	7,300
13	691,413	3,382	50	464,280	8,141	86	31,265	6,298
14	688,031	3,468	51	456,139	8,414	87	24,967	5,346
15	684,563	3,669	52	447,725	8,590	88	19,621	4,459
16	680,894	3,957	53	439,135	8,761	89	15,162	3,653
17	676,937	4,317	54	430,374	9,259	90	11,509	2,933
18	672,620	4,720	55	421,115	9,583	91	8,576	2,310
19	667,900	5,150	56	411,532	9,909	92	6,266	1,781
20	662,750	5,583	57	401,623	10,245	93	4,485	1,343
21	657,167	5,668	58	391,378	10,593	94	3,142	989
22	651,499	5,748	59	380,785	10,958	95	2,153	713
23	645,751	5,820	60	369,827	11,338	96	1,440	500
24	639,931	5,886	61	358,489	11,737	97	940	342
25	634,045	5,950	62	346,752	12,149	98	598	228
26	628,095	6,009	63	334,603	12,572	99	370	147
27	622,086	6,065	64	322,031	13,002	100	223	92
28	616,021	6,121	65	309,029	13,430	101	131	57
29	609,900	6,176	66	295,599	13,846	102	74	33
30	603,724	6,231	67	281,753	14,244	103	41	19
31	597,493	6,287	68	267,509	14,607	104	22	10
32	591,206	6,343	69	252,902	14,925	105	12	6
33	584,863	6,404	70	237,977	15,184	106	6	3
34	578,459	6,466	71	222,793	15,369	107	3	2
35	571,993	6,533	72	207,424	15,468	108	1	1
36	565,460	6,601						

Long'fellow (Henry Wadsworth), LL.D., D.C.L., son of Stephen, b. at Portland, Me., Feb. 27, 1807; entered Bowdoin College at fourteen, and graduated in 1825 in a class which included Nathaniel Hawthorne, George B. Cheever, John S. C. Abbott, and several other persons afterwards known in literature. During his college days he distinguished himself in modern languages, and wrote several short poems, published chiefly in the *United States Literary Gazette* at Boston; one of these was the well-known *Hymn of the Moravian Nuns*. After graduation he entered the law-office of his father, but in the following year accepted the professorship of modern languages at Bowdoin, with the privilege of spending three years in Europe in preparation for that post. After studying in France, Spain, Italy, and Germany, he entered upon his professorship in 1829, and began to publish the results of his careful researches into European languages and literature, both mediæval and modern. His first volume was a small *Essay on the Moral and Devotional Poetry of Spain* (1833), which included translations of the *Coplas de Manrique* and of several sonnets of Lope de Vega. A volume of prose sketches of travel appeared in 1835 under the title *Outre Mer, a Pilgrimage beyond the Sea*, and numerous essays and critiques on literary topics were contributed to the *North American Review*. In 1835 he was elected to the chair of modern languages and literature at Harvard University, as successor to George Ticknor, and spent a year in European travel and study, especially in Denmark, Sweden, and Switzerland, cultivating a knowledge of early Scandinavian literature. Entering upon his professorship in 1836, he soon became a resident in the historic Cragie House (Washington's head-quarters), which he afterward purchased and made his home. In 1839 he published *Hyperion, a Romance*, and *Voices of the Night*, his first volume of original verse, comprising the selected productions of nearly twenty years; it procured him immediate recognition as a poet, and the *Psalm of Life* took rank as a popular favorite. *Ballads and Other Poems* and a small volume of *Poems on Slavery* appeared in 1842; *The Spanish Student*, a drama in three acts, in 1843; *The Belfry of Bruges* in 1846; *Evangeline, a Tale of Acadie*, in 1847, the latter being a spirited introduction of hexameter verse, and generally considered as Longfellow's masterpiece. In 1845 he published a large volume of *The Poets and Poetry of Europe;* in 1849 *Kavanagh, a Tale* (in idyllic prose); in 1850 *The Seaside and the Fireside;* in 1851 *The Golden Legend;* in 1855 *The Song of Hiawatha;* in 1858 *The Courtship of Miles Standish;* in 1863 *Tales of a Wayside Inn;* in 1866 *Flower de Luce;* in 1867–70 a masterly poetical translation of *Dante;* in 1869 *New England Tragedies;* in 1871 *The Divine Tragedy;* in 1872 *Three Books of Song;* in 1874 *The Hanging of the Crane;* and in 1875 *Morituri Salutamus*, a poem read at the fiftieth anniversary of his class at Bowdoin College. Prof. Longfellow resigned his chair at Harvard in 1854, but continued to reside at Cambridge; he travelled in Europe in 1841–42 and 1868–69, on which latter occasion he received the degree of D. C. L. from the University of Oxford, and in 1874 received a large complimentary vote for the lord rectorship of the University of Edinburgh. Some of his poetical works have been translated into many languages; complete editions have enjoyed wide circulation, not only in the U. S., but in an equal degree in England, where their popularity rivals that of the best modern English poetry. D. Mar. 24, 1882. The earliest American ancestor of the family was William Longfellow, who was b. in Hants, England, in 1651, and who in early youth settled in Newbury, Mass. (See the biographical sketch of the poet by Francis H. Underwood, 1882.)

Porter C. Bliss.

Longfellow (Samuel), b. at Portland, Me., June 18, 1819, brother of H. W. Longfellow; graduated at Harvard College 1839, and Divinity School 1846; was first settled in Fall River in 1848; in 1853 became pastor of the Second Unitarian church in Brooklyn, N. Y.; resigned his pulpit in 1860, and went abroad. For years past his residence has been in Cambridge, Mass. Mr. Longfellow still preaches, though he has no parish, and writes, but his publications are not numerous, his health not permitting severe professional labor. In 1846, in association with Rev. Samuel Johnson, he compiled *A Book of Hymns*, which was afterwards revised and called *Hymns of the Spirit;* and in 1859 he published a book of *Hymns and Tunes for Congregational Use*, and a small volume for the vesper service which he instituted. Mr. Longfellow is a poet, and has written many hymns which have a place in other collections than his own. His best essays were printed in the *Radical*, 1866–71. O. B. Frothingham.

Longfellow (Stephen), LL.D., b. at Gorham, Me., June 23, 1775; graduated at Harvard College 1798; studied law; was admitted to the bar 1801; practised successfully at Portland, Me.; was a delegate to the Hartford convention 1814, a member of Congress 1823–25, and became president of the Maine Historical Society 1834. D. at Portland Aug. 2, 1849.

Long'ford, county of Ireland, in the province of Leinster, bounded by the counties of Leitrim, Westmeath, and Roscommon. Area, 420 square miles, with a level or slightly hilly surface, and a fertile soil suited both for tillage and grazing. Some linens and coarse woollens are manufactured. The inhabitants numbered 61,009 in 1881.

Lon'ghi (Giuseppe), b. at Monza. Lombardy, Oct. 13, 1766; studied the art of engraving, partly in Milan and partly in Rome; was appointed professor of the school of engraving in Milan in 1797, and d. there Jan. 2, 1831, celebrated as one of the greatest engravers who ever lived. His most famous works are the *Vision of Ezekiel* and *Sposalizio*, after Raphael; *Magdalena*, after Correggio; *Galatea*, after Albano; and the portraits of Napoleon, Washington, and Dandolo of Venice.

Longi'nus (Dionysius Cassius), b. about 213 A. D., probably at Athens; made extensive travels; studied at Alexandria under Plotinus and Ammonius Saccas, and taught philosophy, rhetoric, and grammar in Athens, acquiring great celebrity. The last part of his life he spent at Palmyra, at the court of Zenobia, whose political adviser he was, as well as her teacher in Greek literature. It was partly on his instigation that the queen undertook the famous war against the Romans, and after her defeat Longinus was put to death, in 273 A. D., by the command of Aurelian. Of his numerous writings only fragments are extant, with the exception of his treatise *On the Sublime*, of which the larger part has come down to us, though in a somewhat mutilated condition. The first printed edition was given by Robortello (Bâle, 1554), and it has been often republished; the latest editions are those by Egger (Paris, 1837), Bake (Oxford, 1849), Spengel (Leipsic (1853), and Otto Jahn (1867). It was translated into French by Boileau in 1694, into German by Schlosser in 1781, and into English by William Smith in 1739. It is remarkable, both on account of the subtlety and acuteness of its single remarks and its noble and elevated taste; it has also exercised considerable influence on modern criticism and æsthetics in France, England, and Germany.

Longipen'nes [Lat. *longa*, "long," and *penna*, wing"], a group (sometimes called an order) of Natatores or swimming-birds, including the gulls, terns, albatrosses, and petrels. They are remarkable for their long and often very narrow wings and their great powers of flight. They are also good swimmers, are usually pelagic, but as a rule do not dive under water.

Long Island, the extreme south-eastern portion of the territory of the State of New York, is bounded on the N. by Long Island Sound, E. and S. by the Atlantic Ocean, W. and N. W. by the Narrows, New York Bay, and the estuary called the East River, which connects that bay, through the strait called Hell Gate, with Long Island Sound. The U. S. Coast Survey maps define its situation as between the parallels of 40° 34′ and 41° 10′ N. lat., and its longitude as from 71° 51′ to 74° 02′ W. from Greenwich. The distance from the Narrows (lat. 40° 37′ N., lon. 74° 02′ W.) to Montauk (lat. 41° 04′ N., lon. 71° 51′ W.), which forms its greatest length, is $118\frac{1}{2}$ statute miles. The general distance of this line is N. $74\frac{3}{4}$° E., or S. $74\frac{3}{4}$° W., true on the middle meridian.* In shape it strikingly resembles a fish, with its head immediately opposite New York City. In breadth it gradually increases from the Narrows for about 40 miles, reaching its greatest width of 23 statute miles. It then decreases, its least width of 12 statute miles being near the head of Peconic Bay. Its eastern part has a deep indentation, formed by this bay, of about 22 miles in length. Gardiner's, Fisher's, and Plumb islands belong to its political divisions.

Geology, Soil, Climate.† — The geological structure of Long Island is simple, it being composed chiefly of glacial drift. Underneath the drift there probably exists a deep deposit of clay of Tertiary or Cretaceous age, or perhaps of both. The outcrop of the clay occurs at many points along the N. side of the island through upwards of 50 miles, and in many sections is worked with profit. These beds must be distinguished from others of value which occur in depressions upon the surface, but are of recent formation. The bed-rock of the island is probably the same as is visible along the Connecticut shore, but is seen on the Long Island side only at and near Hell Gate. There it is a dark micaceous gneiss. The drift is composed of pebbles and boulders in a matrix of fine material. The boulders are of the same rock found on the mainland northward from where they lie, and the matrix is the same, only finely broken. The boulders are all more or less worn on their surfaces; none have sharp angles or edges; many are covered with glacial scratches; some of them are of immense size, one near Manhasset being 54 feet long, 40 feet wide, and 16 feet high above the surface of the ground. On the S. side of Long Island the drift deposit has been exposed to the action of the ocean, consequently it has been ground to sand, and the fine portions, as of clay, washed out. The sands and gravels thus formed occur in layers, and extend from the foot of the hills in a gentle uniform slope to the present sea-margin, which slope continues from 60 to 75 miles seaward. The process of disintegration is now going on along the shore of Montauk. The central ridge of hills, which extends nearly the length of the island, is of unmodified drift, and the beautiful undulating country northward to the Sound is of the same material, with local deposits of sand and gravel. A peculiarity of the drift is the many bowl-shaped depressions which occur upon the surface. On Montauk and elsewhere many are filled to their brim with clear water; Ronkonkoma and Success ponds are of this kind.

The soil of much of the S. side of the island is sandy, but is easily cultivated; portions, like that of the great Hempstead Plains, are covered with a thick accumulation of organic matter, and are very fertile. The soil of the unmodified drift is loam, rich, productive, retentive of moisture, and of vegetable nutrition.

The climate of Long Island will appear from the following table, covering a period of twenty-four years:

	East Hampton.	Flatbush.	Jamaica.
Mean annual temperature	48.74°	51.62°	49.87°
Highest "	95°	96°	100°
Lowest "	—8°	—4°	—7°
Rainfall, mean	38.60 in.	42.74 in.	39.07 in.
Average date of earliest frost, Oct. 23.			
Mean of clear days each year	246		
" cloudy " " "	119		

The Great South Bay and other bays extend along its southern border within the outer beach, being about 90 miles long by from 2 to 5 wide, supplied by inlets from the sea, and navigable by small craft. These bays are of vast service to the island in their large supplies of scale and shell fish and seaweed for manures. An act exists to connect and improve these bays by a canal. The N. side of the island is penetrated by a series of fiord valleys, eight in number, and having their source at the central hills. These fiord valleys afford excellent harborage for coasting vessels, in some instances being 40 feet deep. Fine sporting is to be had at the proper seasons, as numerous varieties of wildfowl and some deer yet inhabit the forests and thickets of Suffolk county. The Sound is a superb expanse of water, affording fine prospects from the cliffs of the N. side, and bearing upon its bosom at all times an immense fleet of shipping. Its channel is suited to vessels of the largest draught, and when cleared of the rocky obstructions at Hell Gate by the operations so far successfully executed by Gen. Newton (see HELL GATE, EXCAVATIONS AT) will afford the safest entrance and widest harborage for the commerce of New York. Fifteen lighthouses and thirty lifeboat-stations guard property and life on the sea and Sound.

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* Memoranda of C. A. Schott, Esq., of the Coast Survey.

† From data furnished by Elias Lewis, Jr.

The island is as well timbered as at the time of its discovery, notwithstanding the large clearings of settlers and the ravages of desolating fires from the sparks of the locomotives. The unmodified drift has forests of oak, hickory, and chestnut, and the sandy tracts bear pines of several species.

When first settled by the whites, the island had a great variety of wild animals now extinct, such as the black bear, wolf, wildcat, beaver, opossum, gray fox, and probably the moose and elk. Deer are even now not uncommon in Suffolk county. Of birds, Long Island is the *habitat* or resting-place of about 320 species; the fishes common to its coast number about 190 species. A range of hills runs through the island. Of these, Hempstead Harbor Hill, at Roslyn, is the highest, being 384 feet above the sea; West Hills in Suffolk, 384 feet; elevation at Wheatley, 335 feet; at Reuland's, near Coram, 340 feet; Fort Pond at Montauk is 194 feet. On the S. side, Coney Island, Rockaway, Quogue, Southampton, and Easthampton are popular watering-places, much frequented in the heats of summer. Steamboats ply to all navigable points.

Large tracts of land, held for two centuries past in their wild state, have recently been thrown open to improvement. A portion of the Hempstead Plains, comprising about 12,000 acres, was sold in 1869 to the late Alexander T. Stewart, who founded thereon a city called Garden City, with a fine hotel and a large number of residences. There also since 1877 have been erected a splendid cathedral, an episcopal residence, a school for boys and another for girls—the gift of Mrs. Stewart as memorials of her deceased husband—which, together with the other institutions to be established on the cathedral foundation, form the official estate of the Protestant Episcopal Diocese of Long Island, created in 1869, with the Rt. Rev. Dr. Abram N. Littlejohn as its first bishop. These plains, described (1670) by Denton as having "neither stick nor stone, and which groweth very fine grass that makes exceeding good hay, and is very good pasture for sheep and other cattle," form an elevated tableland about 16 miles long and 4 miles broad, embracing some 60,000 acres, bounded N. by the range of hills which traverse the island from W. to E. and extending, with a descent of about 20 feet to the mile, to the southern shore of the island. From W. to E. the surface is gently undulating, in long swells looking S., and each presenting three drainage surfaces—viz. toward the W., S., and E. The surface soil is a dark loam from 15 inches to 2 feet deep, growing a grass which is identical with the Kentucky "blue-grass," and which "never runs out." The turf upon the plains is so thick and strong as to require a team of three horses and a strong plough to turn a furrow through it. Under this layer of dark loam is a layer of yellow loam of about equal thickness, in many places a clay loam or clay, and under these, generally at a depth of 2½ or 3 feet, is the firm, compact gravel and sand that everywhere forms the main body of the island, and which perfectly filters the inexhaustible flow of the pure, sweet water which is everywhere found at a depth of 20 to 30 feet under its surface. Yet, through some strange misapprehension, Hempstead Plain (as well as another and still more extensive tract eastward of the plains, and reaching to the head of Peconic Bay) was until forty years ago considered as perfectly unsusceptible of remunerative cultivation. Within that time, however, largely owing to the persistent efforts of Dr. Edgar F. Peck, and, more recently, to the extensive and systematic experimentation upon the Stewart estate at Garden City, the unjust odium of sterility has been lifted from these so-called "barrens" of Long Island. Through this the Central R. R. passes to Hempstead and Babylon. The common lands of Huntington and others embraced in the Nicolls patent in Suffolk county have been opened. Upon these are founded the villages of Brentwood, Lakeland, Holbrook, and Breslau.

Counties, Towns, and Population.—Long Island is divided into three counties—Kings, Queens, and Suffolk. Its entire area is 927,900 acres—viz. Kings, 48,800 acres; Queens, 253,100; Suffolk, 626,000. Its growth of population for the past century, including its present population, is shown in the following tables:

	1790.	1810.	1830.	1850.	1870.	1880.
Kings co...	4,495	8,303	20,535	138,882	419,921	599,495
Queens co..	16,014	19,336	22,460	36,833	73,803	90,574
Suffolk co..	16,440	21,113	26,780	36,922	46,924	53,888
Total......	36,949	48,752	69,775	212,837	540,648	743,957

County.	Population in 1880.	County.	Population in 1880.	County.	Population in 1880.
KINGS..........................	599,495	Long Island City	17,129	Islip..........................	3,939
Cities and Towns:		Newtown	9,804	Riverhead..................	732
Brooklyn......	566,663*	North Hempstead......	7,560	Shelter Island............	2,249
Flatbush...........	7,634	Oyster Bay.................	11,923	Smith Town................	
Flatlands.....	3,127	Foreign pop. of the co.	22,001	Southampton, incl. pt.	6,352
Gravesend..................	3,674			of Sag Harbor v.§.....	1,464
New Lots....................	13,655	SUFFOLK.......................	53,888	Sag Harbor v. (pt. of)..	
New Utrecht..............	4,742	*Towns:*		Southold, incl. Green-	7,267
Foreign pop. of the co.	188,312	Babylon†............	4,739	port v......................	2,370
		Brookhaven	11,544	Greenport village.......	
QUEENS.........................	90,574	East Hampton, incl.		Sag Harbor village (in	
Cities and Towns:		pt. of Sag Harbor v.	2,515	East Hampton and	1,996
Flushing...........	15,906	Sag Harbor v. (pt. of)	532	Southampton)‖.......	5,601
Hempstead	18,164	Huntington‡..	8,098	Foreign pop of the co.	
Jamaica	10,088		6,453		

Principal Cities and Villages.—Aside from Brooklyn, the capital of Kings co., the only other considerable villages in Kings co. are East New York in the town of New Lots, and Flatbush in the town of Flatbush. In Queens co., Long Island City, Flushing, College Point, Jamaica, Hempstead, Garden City, Woodside, and Whitestone are the principal cities and villages. In Suffolk co. there are no cities; the principal villages are Huntington, Greenport, Sag Harbor, Bridghampton, Riverhead, Babylon, Bay Shore, Sayville, and Northport.

Railroads.—There have been on Long Island within the past fifty years 212 railroads chartered and organized, of which, including reorganizations and consolidations, there are now running but 25, doing business on fifty routes. These, all having one or both termini in Kings co., but some extending into Queens and Suffolk, transported, in 1881, 92,826,786 passengers, over an aggregate of 673.68 miles. The principal of these roads is the Long Island R. R., opened in 1834, which, with its 324 miles (including branches and leased lines), is a central artery through the island from Brooklyn at the W. to Montauk Point at the E., and supplying by its branches the towns of the N. and S. shores. The railroads of Long Island in 1881 represented a capital stock, taken up and paid for, of $20,576,250 and a funded debt of $12,224,985.25. The wonderful recent development of Coney Island as a summer pleasure resort has led to the establishment of six roads having their termini at that beach, together with a marine, an elevated, and a short local road on the island itself, all of which are taxed to their fullest capacity during the summer season. There are in Brooklyn thirty or more horse railroads, and others projected for rapid transit, and in several of the towns of Kings and Queens cos. there are also street railways.

Agriculture.—The county towns of Kings and nearly the whole of Queens co. are virtually market-gardens to the cities of New York and Brooklyn. Kings, with a total of 10,287 acres, has 406 farms, valued at $4,872,855, yielding annual products of the value of $1,211,000, and with but 320 acres unimproved. Queens' total acreage is 166,211: farms, 2966; value, $22,064,532; farm products, $3,999,402, and 35,969 unimproved acres. Suffolk has 308,897 acres, of which 152,674 are unimproved, and 3379 farms, valued at $17,079,652, and products $2,198,079. In respect to market produce sold, Queens sales amount to $1,315,934; Kings, $842,617; Suffolk, $118,293. Suffolk leads in all crops, except rye, buckwheat, potatoes, and milk, in all of which Queens co. exceeds her; Queens, with 15,000 acres of pasture, has nearly double the milk furnished by Suffolk, although the latter has 50,000 acres of pasture land. Potatoes form the staple crop of the island: Kings, 772,246 bushels; Queens, 1,013,345 bushels; Suffolk, 493,078. Queens co. is also intimately connected, from very early times, with the history of the American turf. A race-course was established on Salisbury Plains (near present Hyde Park station) in 1665 by Gov. Nichols. This course, named the "Newmarket," was carefully fostered by the British colonial governors and gentry, and was maintained until 1821, when horse-racing was transferred to the "Union course," on the western borders of the town of Jamaica. In 1825 a trotting-course was formed at Centreville, a mile S. E. of the Union course. There was another famous mile race-course around Beaver Pond, in Jamaica, established 1757, besides others, of inferior note, but well patronized. The celebrated "Fashion course," at Newtown, opened 1854, was broken up by a railway in 1861, and the racing interests of New York and Queens and Kings cos. have since then been mostly transferred to the present courses, near Coney Island.

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* Acc. to U. S. census. A careful computation made in Lain's *Brooklyn Directory* (June, 1884) gave the pop. of Brooklyn as 704,610.

† In 1872, from part of Huntington.

‡ In 1872, part to Babylon.

§ In 1870, including all Sag Harbor.

‖ In 1870 reported as entirely in Southampton.

This county is also remarkable for the number of its fruit-, flower-, and tree-nurseries, and few can compare with it in the universal use of fine shade-trees, evergreens, flowering shrubs, beautiful parks, and gardens. Especially is this the case at Flushing, where the peculiar adaptation of its soil and climate to the propagation of trees and plants attracted the attention of Mr. William Prince as early as 1737. His gardens had, at the time of the beginning of the Revolutionary war, so increased in value and importance that in 1777 they were placed under military protection by Gen. Howe during the British occupation of the town. Scarcely less important or less widely known are the nurseries established by Samuel Parsons in 1838 (now Parsons & Sons), those of John Henderson, opened in 1867, and others. The agricultural society of this county, established in 1819, has had a most active and successful career of usefulness up to the present time.

Suffolk is the principal and most profitable hay-growing district, while Brooklyn uses nearly the entire crop. Queens and Suffolk raise a large amount of poultry and eggs, apples, grapes, etc., and furnish a goodly quantity of dressed meat (lamb and swine) to the cities. In fact, the agricultural interests of Long Island are now upon the threshold of an immense and rapid development.

Manufactures.—Kings co. has a larger annual manufacture-product than any *State* in the Union except New York, Pennsylvania, Massachusetts, Illinois, and Ohio. Brooklyn alone ranks (from best attainable data, 1883) as the third manufacturing city in the Union. The latest revision of the U. S. census of 1880 gives Kings co. 5281 manufacturing establishments, with capital of $62,719,399; 48,898 employés; $32,867,176 wages paid; $130,108,417 value of material used; annual product, $179,188,685. A recent careful revision of the omissions, inaccuracies, and inconsistencies of the census, however, gives the following—probably much more reliable—data: 5404 establishments; $79,721,149 capital; 53,226 employés; $23,407,866 wages; material, $147,287,654; amount produced, $203,553,781. The principal manufactures are sugar-refining, petroleum and illuminating oils, breweries and distilleries, foundry and machine products, steel works, saws and files, tin, sheet iron and galvanized iron wares, builders', mechanics', agricultural, and other hardware and implements, silver-plating, paints and varnishes, ropes, cordage, and twine, paper-hangings, furniture, upholstery, hats, drugs and chemicals, fertilizers, porcelain and pottery, watches and clocks, clothing, lumber, carriages, marble and stone work, etc. Queens co. has 168 establishments, employing $7,189,275 capital; value of products, $8,511,028. These products are starch, varnish and paints, tin, copper, and sheet iron, rubber and elastic goods, drugs, chemicals, marble and stone work, pianos, liquors, ink, etc. Suffolk co. has 203 establishments, with capital of $1,449,437; value of products, $1,760,710, mostly in brick and tile, fertilizers, shipbuilding, flour and feed, etc. Shipbuilding, foreign and coastwise commerce, and whale-fishery from a very early period engaged a large part of the inhabitants of this county as seamen, captains, etc., and occupied a large share of their surplus capital. Whale-fishery was a favorite pursuit of Suffolk's hardy sons, but it reached its height some forty years ago, since which it has rapidly declined, as, also, has shipbuilding, though in a lesser degree. The fertilizers manufactured in this county are from the "menhaden," a fish which largely abounds on this coast, and which was formerly used directly on the soil. These fish are now taken for the oil, which is expressed from them in factories established along the coast, the residue being then made into fertilizing agents. The oyster-fisheries are perhaps the most important of Suffolk industries. In addition to the natural beds which abound in many of the bays, the producing area has been largely increased by cultivation. Within a few years the demand for exportation to Europe has enhanced the price and given an impetus to the trade, and the home demand for clams, scallops, etc. gives further scope to enterprise and thrift.

History.—It has an Indian, Dutch, and English history. Its Dutch name was "Lange Eylandt," converted into Long Island by the English, who in 1693 by law changed it to the "island of Nassau," which latter name never came into popular use. Its Indian names were Paumanacke, Sewanhacky, Wamponomon, and Matouwacks, the last term applied to the region of Montauk. After the Dutch discovery in 1609, James I. in 1620 granted to the Plymouth Company all the land between 40° and 48° N. lat., extending through from the Atlantic to the Pacific. This includes Long Island and the adjacent islands. By request of Charles I., the Plymouth Company granted a patent to Alexander, Earl Stirling, of the island and the adjacent islands, and appointed James Farret his attorney to sell, mortgage, or lease the lands. The earl died in 1640. His son and heir in 1640 surrendered the patent to the duke of York. Actual settlements began at the E. and W. nearly at the same time—at Gowanus (Brooklyn), Kings co., in 1636; Gardiner's Island, Southhold, and Southampton in 1640; Hempstead in Queens in 1643. The island was occupied by about fifteen tribes or settlements of Indians, and was a great manufactory of wampum from the abundance of the quahog or hard-shell clam. All of these have passed away, except some 200 Shinnecocks, a mixed breed of blacks and Indians in Southampton, and a few families of Montauks (who yet claim to elect a king) on the Indian reservation at Montauk. While there is proof that the island was coasted and the bay of New York visited by the Florentine navigator Verrezzano in 1524, and that some of his sailors penetrated to its interior (see J. C. Brevoort's *Verrezzano*, p. 41), Coney Island, part of its shore and sandy beach, is more clearly indicated as the first point at which a boat's crew from Hendrick Hudson's yacht, Half-Moon, went ashore on his memorable voyage in 1609, which opened the region to settlements. These began in 1611, when New Amsterdam was made a trading-post by the Dutch. They extended over upon the opposite shore of Long Island as soon as the settlers felt justified in quitting the fort at the Battery, which protected them from Indian forays. The first land-grant on Long Island was by purchase from the Indians by Jaques Bentyn and Adrianse Bennet in 1636 of a tract of 930 acres in the S. part of the present city of Brooklyn, along Gowanus Cove to the New Utrecht line. The first house known to have been erected on Long Island was that of Adrianse Bennet upon this tract, probably just after its purchase, as in 1643 it was burnt by the Indians in the war of that time. In 1637, George Jansen de Rapalje made a purchase also from the Indians, at the Wallabout, of a tract of 325 acres, which he did not, however, occupy till 1654. The statements of his earlier residence, and that his daughter Sarah was the first female child born upon Long Island, have been proven incorrect by modern research, as she was born at New Orange (Albany) prior to her removal to New Amsterdam, and thence to Brooklyn. The first male child born in the New Netherlands was Jean Vigne, born at New Amsterdam 1614. The first female child born in Suffolk co. was Elizabeth, daughter of Lyon Gardiner, on Gardiner's Island, Sept. 14, 1641.

This island, being the natural outwork and gateway against invasion, bore the brunt of the first strategic or pitched battle of the Revolution, the battle of Brooklyn or Long Island. (See Stiles's *Brooklyn*.) This battle was fought on the 26th, 27th, and 28th Aug., 1776, with 17,000 British and Hessians against 6000 Americans, and resulted in the defeat of the Americans. Washington, however, saved the army by his masterly retreat in boats to New York, in the face of the enemy, screened by a thick fog. The island suffered greatly by incursions from the main land, by British vessels, and the occupation by troops till the peace. In the war of 1812 a series of defences, substantially on the same lines of those of the Revolutionary period, was erected in Kings co., and manned by volunteers, in anticipation of another British attack upon New York City. In the recent civil war the three counties sent their full quotas and took an active and patriotic part. A. J. SPOONER.

REVISED BY HENRY R. STILES.

Long Island, or **Outer Hebrides,** a name given to a group of the Hebrides, Scotland, embracing Lewis, Harris, North and South Uist, Benbecula, Barra, and a number of small islands, all of which are supposed to have been formerly united. Length, about 130 miles.

Long Island, an island of Suffolk co., Mass., in the harbor of Boston. Pop. not in census of 1880.

Long Island City, city and R. R. centre, cap. of Queens co., N. Y. (see map of New York, ref. 8–C, for location of county), on the East River, opposite the central part of New York City, Blackwell's Island lying between, has numerous manufactures, was formerly a part of Newtown, but was incorporated in 1870, and now comprises Hunter's Point, Ravenswood, Astoria, Blissville, and Dutch Kills. The city is separated from Brooklyn by Newtown Creek, is about 5 miles long from N. to S. and 3 miles wide from E. to W., has waterworks, a county court-house, and a river-frontage of about 10 miles. Hunter's Point, in the S. W. part, has extensive petroleum warehouses and refineries, also chemical works, etc. Pianos, carriages, carpets, etc. are made in the Astoria district. Pop. in 1870, 3867; in 1880, 17,129.

Long Island Sound, an arm of the Atlantic Ocean between Long Island and the State of Connecticut, 115 miles long and generally 20 or 25 miles wide. A chain of small islands extends N. E. from Long Island across the Sound to the S. W. of Rhode Island. The Sound is an important thoroughfare for steamers and coasting vessels, and when the channel of the East River at Hell Gate shall have been sufficiently improved, the largest ships will be able to reach New York harbor with ease and safety through the Sound. It has important fisheries.

Lon'gitude, Terrestrial [Lat. *longitudo,* "length"]. The longitude of a point on the earth is the angle between the meridian plane through that point and the meridian plane through some other point, taken for the origin of longitudes. This angle is measured by the part of the equator intercepted by the meridians, and may be expressed in angular measure or in time, as we suppose the equator divided into 360° or into 24 hours. The origin oftenest used by English-speaking peoples is the Greenwich Observatory. Any plane through the earth's polar axis cuts out of the celestial vault (supposed spherical and very distant) an hour-circle. If it passes through a point on the earth's surface, it is the meridian plane of that point, and cuts the earth's surface and the celestial vault in the terrestrial and celestial meridians. The latter, moving with the earth's rotation, sweeps from W. to E. over the heavens every twenty-four hours. The angle included at any instant between the plane of the meridian at a place and the plane of an hour-circle through any point of the heavens is the hour-angle of that point. If the point be the vernal equinox, its hour-angle expressed in time at any place at a given instant is the local sidereal time; while if the point were one called the mean sun (which starts from the vernal equinox with the true sun, and moves in the equator with his mean motion), its hour-angle is the local mean solar time.

From these definitions it follows that at any instant the difference of local times at two places is their difference of longitudes, since each difference is the angle between the meridian planes of the two places. The problem of terrestrial longitudes is then to find at any instant of absolute time the difference of the local times of two places. It requires, first, the determination of the local time at each place: second, the comparison of those local times at some instant.

There are many methods of determining local time, but as they will be considered elsewhere, only the one which is theoretically simplest will be given here. As already indicated, it is 0*h.* 0*m.* 0*s.* sidereal time when the vernal equinox crosses the meridian, and a clock so adjusted as to work 0*h.* 0*m.* 0*s.* at that instant, and to count twenty-four hours between two such crossings, is a sidereal clock. Such a clock will at any instant give the hour-angle of the vernal equinox. Now, the angle between an hour-circle through any point in the heavens, and the hour-circle through the vernal equinox counted eastward from the equinox, is called the right ascension of the point. Hence, if the sidereal clock is perfectly correct, when a star crosses the meridian the clock-time will be its right ascension, since the latter is then equal to the hour-angle of the vernal equinox. The *Nautical Almanac* gives for every tenth day in the year the right ascensions of a number of stars. If the instant by the sidereal clock at which one of these stars crosses the meridian be noted, the difference between that time and the star's tabular right ascension is the error of the clock.

The ordinary method of determining the time a star crosses the meridian is by a transit instrument. This is a telescope so mounted that its line of sight is perpendicular to an axis about which it turns. That axis has supports which can be so adjusted that it is perpendicular to the plane of the meridian; then the line of sight, marked in the telescope by spider lines, will move very nearly in the plane of the meridian. Its small deviations from that plane can be measured and allowed for. Hence, an observer looking through the transit instrument can determine the precise clock-time a star crosses his meridian, and the error of his clock; and by adding the clock-error to the clock-time he has the local sidereal time. The precision of these time determinations is astonishing; the probable error in a time determination from one star with a good instrument should be but about a tenth of a second, and when several stars are observed it should be but a few hundredths of a second.

One of the many methods of determining local time having been briefly sketched, the problem proper of terrestrial longitudes may be next considered. As already stated, it is to determine at the same instant of absolute time the difference of local times at two places.

A. If observers at different places note by their clocks the occurrence of some instantaneous phenomenon visible at the same instant to both, the difference of the clock-times corrected for clock-errors is the difference of longitude. (*a*) Thus, two observers many miles apart may determine with precision by star transits the errors of their timepieces, and then observe repeatedly at night the instant some powder is flashed on a hill visible to both. From many flashes the difference of longitude can be obtained with great accuracy. In the work of the U. S. Lake Survey flashes made with a pound of powder have been observed for longitude at a distance of 100 miles. (*b*) When in a lunar eclipse the moon passes into the earth's conical shadow, and again emerges, the phenomena are seen at the same time by all persons to whom they are visible. Unfortunately, it is difficult to fix the instant when the moon enters or leaves the shadow, as the earth's shadow is not sharply defined on the moon, and the errors in estimating the time may amount to a minute. The eclipses of Jupiter's satellites are seen by all observers at the same instant, and that of the first, which has a rapid motion, is best fitted for precise observation. But, as in the case of the moon, though to a less degree, the gradual disappearance of the satellite makes it difficult to observe the time of disappearance with precision. That time varies with the power of the telescope used. The Washington times of immersion and emersion are given in the *American Nautical Almanac.* Shooting stars have also been proposed as signals to be observed for difference of longitude.

B. There are several methods of determining differences of longitude, depending on the fact that the moon has a relatively rapid motion among the stars. If observers at two points determine some co-ordinate of the moon's position as seen from the centre of the earth, and also their local times, the change in this co-ordinate in passing from one meridian to the other is determined; and from this change and the known rate of change the time required for so much change can be computed. This time is the difference of longitude. It may be said here that while two observers are constantly spoken of, in practice one observer, supposed to be stationed at a fixed observatory, is replaced by a nautical almanac, giving the results he should obtain in all cases save those in which the highest accuracy is required. (*a*) If at two places observers note the sidereal time of the moon's transit, thus determining the moon's right ascension at those transits, then from the difference of the right ascensions and the moon's known rate of change in right ascension the time required for so much change, which is the difference of longitude, can at once be found. To avoid trusting the clock for several hours, it is usual to observe the transits also of several well-determined stars near the moon, deducing the moon's right ascension from theirs by applying the differences of times of transit to the right ascensions of the stars. This is the method of *lunar culminations.* The moon's average change of right ascension is about one second of time in twenty-seven seconds, so that an error of 0.1*s.* in its observed right ascension would give 2.7*s.* error in the resulting longitude. Prof. Peirce estimates the limit of accuracy of this method, no matter how great the number of observations, at (1*s.*) one second of time. Instead of determining the moon's right ascension by meridian transits, it may be obtained from transits across a near vertical circle, or by observing its altitude or azimuth. (*b*) Another method depends on the moon's whole motion, instead of on that in right ascension alone. The *Nautical Almanac* gives for every three hours Greenwich time the distance of the moon from several fixed stars, some of the planets, or the sun as seen from the earth's centre. If an observer at any point measures one of these angular distances with a sextant, and also the altitudes of the two bodies, he can compute their distance at the moment of observation as seen from the centre of the earth. Should this corrected distance agree with one in the *Nautical Almanac,* the corresponding time in the *Almanac* is the Greenwich time of his observation, and the difference of that time from his local time is the longitude. Should his observed distance fall between two tabular distances, he can find the corresponding Greenwich time by interpolation. This is the method of *lunar distances.*

C. If at any place on the earth whose position is approximately known the phases of a solar eclipse be observed, the corresponding time at a known meridian can be computed, thus giving the difference of longitude. The same is true of occultations of stars by the moon. The data for both are given in the *Nautical Almanac*. Occultations of Jupiter's satellites by the planet, their transits across his disk, and the transits of their shadows are similar phenomena, and may be used in determining longitudes.

D. Another method of determining differences of longitude is that by transportation of chronometers. The error of a chronometer is the amount by which it is fast or slow of true time, and its rate is the amount it gains or loses in twenty-four hours. A perfect timekeeper is one whose rate is constant. If a perfect timekeeper were compared with the true time at Greenwich, and then taken to any other part of the world, from its error and rate at Greenwich before starting the true Greenwich time at any instant could be computed, and its difference from the local time of the traveller's position would be the difference of longitude. So important is this method to sailors that the English Parliament gave $100,000 to Harrison, who first made chronometers with a tolerably steady rate. But as no rate is perfectly constant, and as a travelling rate usually differs from the rate when at rest, when the greatest accuracy is required the chronometer is carried back to the starting-point, so that its travelling rate becomes known. By using many chronometers and making many trips accuracy can be obtained if the distance is not too great. Struve found the difference of longitude of Pulkova and Altona to be 1*h*. 21*m*. 32.52*s*., with a probable error of only 0.04*s*. by seventeen trips of 81 chronometers. Bond determined (1849) the difference of longitude of Liverpool and Cambridge, Mass., from 175 chronometers, and again (1855) from 52. The results differed by 1.23*s*. An idea of the accuracy of timepieces may be obtained from the following: Of 42 chronometers submitted to the six months' trial before purchase at Greenwich in 1871, on taking the average of the daily rates for each week it was found that for the best 5 chronometers out of the 42, the greatest difference of the average rates was for any consecutive weeks 0.7*s*., and for any weeks whatever in the six months, 1.7*s*. In 1870 for the best 5 out of 35 these quantities were 0.9*s*. and 1.9*s*. The rate of the Kessel's clock of the Washington Observatory from Aug. 24, 1871, to Dec. 27, 1871, varied between 0.22*s*. losing and 0.39*s*. gaining.

E. Of all methods of determining differences of longitude, that by telegraphic signals, especially over long lines, is the most precise. The following is the simplest form of the method. Every one understands that a telegraph operator by pressing on a key can make a click on an instrument at a distant station. If the local time of pressing on the key at the first station and of the click at the second station (supposed to be produced instantly) be observed, the difference of those local times is the difference of longitude. It takes a few thousandths of a second for the signal to travel to a distant station, and a few thousandths of a second to make the click, so that if the second station is W. of the first the resulting difference of longitude is too small by these small quantities. But if, retaining the same adjustments and equal battery strength, signals be sent from W. to E., the resulting longitude will be as much too large, and the mean of the two values will be correct. This simple method, requiring, first, the precise determination of local times, second, their comparison (which should be repeated several times) by the telegraph line, gives a higher precision over long lines than any of the preceding. It involves, however, the estimation of fractions of a second by the ear in receiving signals which may be sent in coincidence with the beats of the timepiece. The difficulty may be avoided by using a mean solar timepiece at one station and a sidereal at the other. The sidereal gains on the mean solar a second in about six minutes, and so often the beats will coincide. As the time of perfect coincidence can be determined within ten or fifteen seconds, the error in comparing the timepieces is only 15 seconds divided by 360, or $\frac{4}{100}$ths of a second. Still higher precision is reached by causing the timepiece to make or break the circuit at each beat, instead of requiring the observer's finger to do it. It is effected by causing the pendulum in a clock or a wheel in a chronometer to lift a small piece of metal through which the circuit passes, thus breaking it once a second. The method becomes perfect when in addition each timepiece is made to write its own record of time, thus avoiding the necessity of noting signals received by the ear. Recording is accomplished in the simplest way by the Morse register. Every one has seen the long strips of paper on which by dots and dashes telegraphic messages were formerly written. These strips of paper were made to move by clockwork uniformly, under a point that could from time to time be dropped upon them (by the operator at a distant station), making a mark. Replacing the operator by a clock which sends signals once a second, there can be made a series of points on the paper one second apart in time. If the observer at either station wishes to record any intermediate event, such as a star transit, he taps his key, and a dot intermediate to the seconds dots is made; the corresponding time can be read with a scale from the paper strip to 0.02*s*. Such an instrument for recording a time-scale is called a chronograph. If while the timepiece at the first station is writing its beats on the chronograph at the second the observer at the second makes his clock write its record on that chronograph, the difference of times of the two clocks can at once be read from the paper. Reading off these differences in many places, correcting them for clock-errors, and using signals sent from both stations, the mean result will be the difference of longitude. The form of chronograph which has been most used in this country is that of Bond. A sheet of paper is wrapped around a horizontal cylinder turned on its axis by clockwork once in a minute. A pen on a carriage moves slowly along this cylinder, tracing thus a spiral on it. Clock or other signals demagnetize a magnet connected with the pen, so that a spring can move the pen for an instant at right angles to the spiral when the signal is sent, thus writing it on the chronograph sheet. Steadiness of movement is obtained by an ingenious device called the spring governor.

By the telegraphic method differences of longitude can be determined so precisely that their probable errors do not exceed a few hundredths of a second of time. When two stations are not too far apart, so as to require long use of the telegraph line and steady clock-rate for hours, each observer may register on the chronograph all his star transits, the same stars being used at both stations. After correction the interval between such transits of the same star on the chronograph sheet is the difference of longitude, free from any error in the right ascensions of the stars used.

Different observers differ in their estimate of the time a star crosses a spider-line, whether the observation is chronographic or by eye and ear, the difference sometimes amounting to a second for the latter method. Hence, before comparing clocks whose errors have been found by different observers, this difference, called *personal equation*, must be taken into account. It appears to arise from different habits of observing, physiological conditions, character of telescope, rate of star's motion, etc., and is not entirely constant for the same two observers.

To show the errors which may still remain in longitudes determined from many observations and with great care by other methods than the telegraphic one, the following values of the longitude of the Naval Observatory, Washington, are given. The telegraphic value is undoubtedly very nearly correct, having been obtained by the Coast Survey by three routes, whose results agree closely:

Longitude of Washington.

Telegraphic..................................		5*h*. 08*m*. 12.39*s*.
Moon culminations........	1846–60,	5*h*. 08*m*. 11.6*s*.
" "	1862–63,	5*h*. 08*m*. 9.8*s*.
Bond, 175 chronometers.	1849,	5*h*. 08*m*. 12.26*s*.
" 52 "	1855,	5*h*. 08*m*. 13.49*s*.
Occultations of Pleiades.	1856–61,	5*h*. 08*m*. 13.13*s*.

References.—Loomis's *Practical Astronomy;* Chauvenet's *Astronomy; Coast Survey Reports*, 1856–67; Bruhns, *Laugen-Differenz* (Bonn-Leiden); Plantamour, *Différence de Longitude entre Righi-Kulm et Neuchatel.* C. B. COMSTOCK.

Long'mont, R. R. junction, Boulder co., Col. (see map of Colorado, ref. 2–E, for location of county), on the St. Vrain River, 40 miles N. of Denver and 17 miles N. E. of Boulder City, was laid out in 1871, since which time it has rapidly increased in population, being in the midst of a fine agricultural region. It is well built, having broad streets, good buildings, and a public library. Pop. in 1880, 773.

Longobards. See LOMBARDS.

Longomontanus (CHRISTIAN), b. Oct. 4, 1562, at Longberg, a village of Jutland, Denmark, of poor peasant parents. His name is simply a Latinized form of that of his native town. Nevertheless, he contrived to be educated in the Latin school of Viborg, and in 1588 he entered the University of Copenhagen, where his thorough knowledge, especially of mathematics, and great general ability soon attracted the attention of the professors. He was introduced to Tycho Brahe, became his assistant, spent eight years with him in the island of Hveen, and accompanied him into exile. He did not desire to stay in Prague, however, but returned home, and was appointed rector of the Latin school in 1603, and in 1605 professor of mathematics and astronomy in the University of Copenhagen, at which place he d. Oct. 8, 1647. He was one of the best astronomers of his time.

Long Prairie, on R. R., cap. of Todd co., Minn. (see map of Minnesota, ref. 7–C, for location of county), 25 miles W. of Little Falls. Pop. in 1880, 220; in 1885, 586.

Longshore (Hannah Myers). See Appendix.

Long'street (Augustus Baldwin), LL.D., b. in Augusta, Ga., Sept. 22, 1790, son of William; prepared for college under Rev. Moses Waddell, D. D., at his school at Willington, S. C.; graduated at Yale College in 1813; studied law under Judges Reeve and Gould at their law-school at Litchfield, Conn., and was admitted to the bar in Richmond co., Ga., in 1815, but established himself in Greensboro', Ga., where he soon rose to eminence in his profession; was in 1821 elected to the general assembly of the State, and promoted to the bench in the Ocmulgee judicial circuit in 1822, which he soon resigned, removing to Augusta; continued the practice of the law and established the Augusta *Sentinel*, consolidated in 1838 with the Augusta *Chronicle*, taking the title of the *Chronicle and Sentinel*, which is still (1875) a leading political journal. Entering the ministry, he joined the Methodist Episcopal conference in 1838, and was assigned to the church at Augusta for the next year. During this period of his ministerial duties Augusta was severely afflicted with yellow fever, but he, with his associates, Rev. Caleb W. Key and Rev. Father Barré of the Catholic church, remained at his post, faithfully ministering to the spiritual and the physical wants of the sick and the dying; in 1839 was elected to the presidency of Emory College at Oxford, Ga., which position he filled with great ability until 1848, when he accepted a similar post in Centenary College, La., and shortly afterwards in Mississippi University at Oxford, Miss. He became president of the South Carolina College in 1857, and just before the war returned to the presidency of the University of Mississippi. He attended the General Conference of the Methodist Church of the U. S. in New York in 1844, and acted a conspicuous part in that body in the discussions of the case of Bishop Andrew, which ended in the rupture of the Church. With his most devout piety, Judge Longstreet was always a decided politician. Reared in the Jeffersonian school of strict construction and State Rights, he adhered inflexibly to those principles in all that he wrote or spoke until the time of his death. He also possessed a wonderful taste for humor, of which the marked exhibitions that contributed to his fame were so delicately done, and with such a moral tone, as not to detract in the least from his clerical office. This was one of the most striking features in his varied and extraordinary character. His *Georgia Scenes* (1840) and *Master William Mitten, or the Youth of Brilliant Talents who was Ruined by Bad Luck* (1858), stand among the first works of American wit and humor. Among his graver writings may be mentioned his sermon on *Infidelity* before the Young Men's Christian Association, *Letters from Georgia to Massachusetts*, *Letters to Clergymen of the Northern Methodist Church*, and *A Review of the Decision of the Supreme Court of the U. S. in the case of McCulloch* v. *The State of Maryland*. His pen was never idle. Up to the time of his death he was a regular contributor to a number of periodicals. Many of his valuable unpublished manuscripts were destroyed with his library during the war. D. Sept. 9, 1870.

A. H. Stephens.

Longstreet (Gen. James), b. in South Carolina in 1820; removed at an early age with his parents to Alabama, from which State he was appointed to the U. S. Military Academy in 1838; graduated in 1842, entering the army as lieutenant of infantry, and after a few years of routine life in garrison and on the frontier in the South-west, the threatened troubles with Mexico called him into more active service. From the occupation of Texas he was engaged in all the principal battles of the war up to the storming of Chapultepec, where, in the assault upon the castle, he received severe wounds. For Contreras and Churubusco he was brevetted captain, and major for Molino del Rey. As adjutant of his regiment he served mostly on duty at frontier posts in Texas (1847–52), when he was appointed captain, but remaining in Texas until transferred to the staff in 1858 as paymaster, with the rank of major. In June, 1861, Longstreet resigned to join the Confederacy, and commanded a brigade at Bull Run the following month. Promoted to be major-general in 1862, he thereafter bore a conspicuous part and rendered valuable service to the Confederate cause. In command of the rear-guard of the army falling back from Yorktown, he had passed through Williamsburg May 5, 1862, when he was called back to oppose the hastily advancing Union forces, a battle lasting nearly nine hours resulting, thus allowing the escape of the main army to Richmond, himself following rapidly under cover of night. At Seven Pines he directed the main attack, and in the subsequent fighting at Gaines's Mill, Frazier's Farm, Malvern Hill, etc. his division fought bravely, losing nearly one-half its numbers in killed and wounded. At the second battle of Bull Run he skilfully made the passage of the Thoroughfare Gap, and on the second day held the right of the line and contributed largely to the success of the day. At Antietam he commanded the right wing; the left at Fredericksburg, where the assault was so fatal to the Federal army. After the latter battle he was temporarily detached with three divisions of his corps to operate below the James, and in April attacked Gen. Peck at Suffolk, Va., which place he invested until recalled by Gen. Lee after the battle of Chancellorsville. In the organization of the army with which it was designed to invade the North, Longstreet was assigned to the command of one of its three corps, with the rank of lieutenant-general, and in the ensuing battle of Gettysburg commanded the right of the line during the second and third days of the fight. The importance of impending operations in the West caused Lee, who felt secure against attack, to again detach Longstreet, and on this occasion the change was timely and precious, for he arrived with his corps in time to decide the fortunes of the day at Chickamauga. The following month Bragg assigned Longstreet to lead a movement against Burnside in East Tennessee, and in November he compelled that officer to seek the intrenchments of Knoxville with his army, which place Longstreet beleaguered, but was compelled to abandon the siege upon Grant's victory at Chattanooga, and hastily moved eastward to Virginia, where he rejoined the army of Gen. Lee; in the ensuing campaign he was severely wounded by his own troops in the Wilderness battle (May 6), and disabled for months. Returning to duty in October, he commanded the defences of Richmond N. of the James, and was partially engaged in the action around Petersburg the day of evacuation. The war ended, Gen. Longstreet accepted the result, and having renewed his allegiance to the general government, has labored earnestly to obliterate all traces of war, and promote an era of good feeling between all sections of the country. Taking up his residence in New Orleans, he was appointed (in 1869) surveyor of the port, resigned in 1871; was appointed commissioner of engineers for Louisiana, served four years, and has been a school commissioner. In 1875 he settled in Georgia, where he became supervisor of internal revenue, was U. S. minister to Turkey 1880–81, and U. S. marshal of Georgia 1881–84.

G. C. Simmons.

Longstreet (William), b. in New Jersey in 1760, but in early life moved to Augusta, Ga. He was by nature a genius, and but for the want of means might have won the laurels which the more fortunate Fulton secured in the application of steam to the propulsion of boats on navigable waters. As early as Sept. 26, 1790, he addressed a letter to Thomas Telfair, governor of Georgia, stating that his plan was completed, and expressing his "thorough confidence in its success" if he had means to perfect it. These he asked of the governor or the legislature, to which the matter was submitted. No action, however, was taken. This was three years before Fulton's letter to the earl of Stanhope announcing his ideas "respecting the moving of ships by the means of steam." Longstreet's plan was very different from Fulton's. Failing in obtaining public aid at the time, several years afterwards he procured funds from private sources, which enabled him to put his boat in operation on the Savannah River, and it moved against the current of the stream at the rate of five miles an hour a few days after Fulton's like success on the Hudson in 1807. He also invented and patented the "breast roller" of cotton-gins, which was of incalculable value to the growers of the long staple or sea-island cotton. D. in Georgia in 1814.

A. H. Stephens.

Long'ton, town of England, county of Stafford, on an affluent of the Trent, has 19,748 inhabitants, mostly engaged in the manufacture of china and earthenware.

Lon'gus, a Greek Sophist of the fourth or fifth century of our era, but of whose personal life nothing is known, was the author of a small erotic novel, *Daphnis and Chloe*, which has come down to us. It was first printed at Florence (1598) by Columbianus. One of the latest and best editions is that by Hercher (Leipsic, 1835). It was translated into English by G. Thornley (London, 1657).

Longview, railroad junction, Gregg co., Tex. (see map of Texas, ref. 2–J, for location of county), situated at the junction of the Texas and Pacific with the International and Great Northern Railroad, on the Sabine River, 66 miles W. of Shreveport, in one of the richest, best-timbered, and most healthful regions of the State, has about 40 saw-mills in the vicinity, from which, with the cotton crop, it derives its prosperity. It is a shipping-point of recent growth, and was incorporated in 1871. The Galveston Sabine and St. Louis R. R. has been completed for a distance of about 20 miles S. from Longview. Pop. in 1880, 1525.

Long'worth (Nicholas), b. at Newark, N. J., Jan. 16, 1782; settled in 1803 in Cincinnati, and studied law with Jacob Burnet; after twenty-five years' legal practice left the bar, having become wealthy, chiefly by the rise in value of his lands; devoted himself with great ultimate success to the wine-manufacture. His still and sparkling catawba wines acquired much reputation. He was widely known as an observer and writer upon the growth of the strawberry, was somewhat eccentric in his habits, and took especial pleasure in bestowing charities upon vagabonds, whom he called "the devil's poor." His estate at his death was valued at $15,000,000. D. at Cincinnati Feb. 10, 1863.

Long'year (John W.), b. in Shandaken, Ulster co., N. Y., Oct. 22, 1820; was educated at Lima, N. Y.; removed in 1844 to Mason, Ingham co., Mich., where he was admitted to the bar 1846; settled at Lansing 1847, and gradually acquired an extensive practice; was a member of Congress 1861–65, a delegate to the Loyalist convention at Philadelphia 1866, a member of the State constitutional convention of Michigan 1867, and was appointed judge of the district court of Michigan May, 1870. His decisions in that capacity, especially those in admiralty and bankruptcy cases, were extensively quoted, and regarded as very able and judicious. D. at Detroit Mar. 10, 1875.

Loni'go, a considerable town in Northern Italy, in the province of Vicenza. Its trade is chiefly in wheat and horses. At the annual fair in March 2000 horses are sometimes brought to market. Pop. in 1881, 9880.

Lönn'rot (Elias), M. D., b. Apr. 9, 1802, at Sammatti, Finland; apprenticed first to a tailor, then to a druggist; commenced in 1822 the study of philology and natural science at the University of Åbo, then that of medicine at the University of Helsingfors in 1827; took his degree in 1832; began practice as a physician at Kajuna in 1833, and was appointed professor of the Finnish language and literature at the University of Helsingfors in 1853. By his rare talents and still rarer energy he not only rendered great service to linguistic science in general, but made the Finnish, which had been relegated to the lower classes of the people, a literary language, displaying an individual civilization. Travelling on foot from the Gulf of Finland to the White Sea, he gathered the songs and tales which lived among the Finns without ever having been written down, and the results were the *Kalevala*, the *Kanteletar*, and two large collections of proverbs and enigmas. (See Finnish Language and Literature.) He also gave a Swedish-German-Finnish dictionary (1847), founded Finnish monthly and weekly periodicals, and wrote a number of valuable essays on subjects relating to the Finnish, Lappish, and kindred languages.

Lonoke, cap. of Lonoke co., Ark. (see map of Arkansas, ref. 3–D, for location of county), on the Memphis and Little Rock R. R., 23 miles E. of Little Rock, in a beautiful plain, was first settled in 1869; has a collegiate institute, Masonic hall, steam flouring-mill, a cotton-gin, and ships over 5000 bales of cotton annually. Pop. in 1870, 371; in 1880, 659.

Lons'dale, a flourishing manufacturing and post-v. of Lincoln tp., Providence co., R. I. (see map of Rhode Island, ref. 4–G, for location of county), on the Providence and Worcester R. R., 7 miles N. of Providence. Pop. in 1880, 847.

Lonsdale (Henry), M. D., b. at Carlisle, England, in 1816; studied at Edinburgh and Paris; became lecturer on anatomy at Edinburgh; made important discoveries in the histology of nerve-tissues; became in 1845 physician to the Cumberland Infirmary, Carlisle; has written much and ably upon sanitary questions; and published several volumes of biographical and other literature, notably the *Worthies of Cumberland* (6 vols.), containing *Lives* of the Howards, Sir James Graham, M. P., the Loshes, Addison, and other celebrities. D. Aug., 1876.

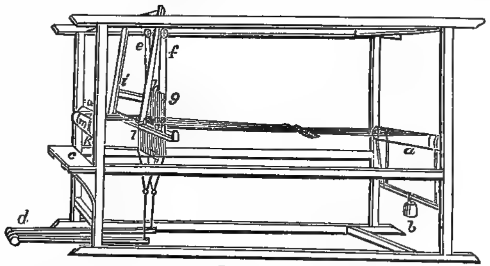
Lons-le-Saulnier', town of France, department of Jura, beautifully situated among vine-clad hills at the confluence of the Seille, Vallière, and Solman, has a celebrated salt-well, discovered in the fourth century, from which 9500 tons of pure salt are annually drawn, besides 885 tons of sulphate of soda and 300 tons of chloride of potassium. Another important industry is the manufacture of sparkling wines. It was the birthplace of Rouget de Lisle, the composer of the "Marseillaise." Pop. in 1881, 12,873.

Lonyay, Count, a Hungarian statesman, b. Jan. 6, 1822, descended from an old Magyar family; was elected a member of the diet in 1843, and afterward appointed a secretary in the ministry of finance; fled in 1849 when the Hungarian rebellion was put down, and lived in London and Paris; returned in 1850 in consequence of a general amnesty, and devoted himself to questions of political economy and the relations of the Church to the schools in Hungary. He was one of the most prominent members of the diet of 1865; was very active in 1866 and 1867 for the settlement between Hungary and Austria accomplished by Beust, and accepted the ministry of finance in the Hungarian cabinet which Andrássy formed in 1867. He was very successful in his financial policy, but fell out with Andrássy, retired in May, 1870, and entered then the imperial cabinet as minister of finance. When Andrássy became president of the imperial cabinet instead of Beust (Nov. 16, 1871), Lonyay was appointed president of the Hungarian cabinet, but (Nov. 18, 1872) he was accused by his adversaries in the lower house, especially by Deputy Csernatony, of having misused his official position for personal purposes, in consequence of which he gave in his resignation Dec. 2, 1872. He has published *Recent Works on Political Economy* (1863), *Survey over the Finances of Hungary* (1873), *The Banking Question* (1875), a collection of his speeches, etc. August Niemann.

Loo-Choo', or **Lew-Chew,** a chain of thirty-five small islands stretching from Japan to Formosa, 400 miles off the coast of China. They are very imperfectly known, as foreigners are not allowed to visit them, but they seem to be very fertile, well cultivated, and densely peopled. The climate is mild and humid. Snow never falls, but much rain. Excessive heat never occurs. The two largest islands are Okinawa, or Great Loo-Choo, and Oshima. The former is the political centre of the whole chain of islands, and contains over thirty towns besides Napa, the capital. The population of the former is estimated at 200,000; that of the latter, at 30,000. The inhabitants are a mixture of Japanese and Chinese, the former element being the predominant one. The Japanese are the only foreigners who are allowed to live on the islands; and although a number of young natives are annually sent to China to be educated, yet the Chinese are treated with the same suspicion and inhospitality as the Europeans. The religion is Booddhism blended with the doctrines of Confucius.

Loodia'nah, district of British India, on the eastern bank of the Sutlej, and comprising an area of 750 square miles, with 527,722 inhabitants. Its capital, of the same name, lies in lat. 30° 55′ N. and lon. 75° 54′ E., has large manufactures of shawls of an inferior quality, and carries on a considerable banking business and transit trade. Pop. 47,900.

Loom [Ang.-Sax. *lôma*], the machine by which weaving is effected. In its simpler forms it is probably one of the earliest of human inventions. The Indian native fabrics, notwithstanding their extreme delicacy, are wrought upon looms of the rudest description, sometimes two trees serving for the frame, and bamboo sticks and string completing the mechanism by which silks unequalled for splendor are perfected. The object of Weaving (which see) is the making of cloth by the intersection of materials. The portions running lengthwise are called the warp, or chain, and those across, the woof or weft. There is no variation in principle between the looms for silk and woollen, though their relative strength is of course widely different. In describing the hand-loom we shall be able to indicate the principles upon which every loom, even the most complicated, is constructed. The framework consists of four uprights, with three horizontal beams at the top, centre, and base. The only object of these is to keep the more important working parts in position. At one end is the beam or yard-roll (*a*) on which the threads of the warp are wound, passing through the heald, a sort of comb (*l*), and extending to the cloth-beam or breast-roll (*m*) at the other extremity of the loom. Round the latter the fabric is rolled as it is woven. It is kept tight by weights suspended from the yard-roll (*b*). The treadles (*d*) are pressed by the feet; one is connected with the harness or heddle (*e*) and the other with *h*, *g*, *f*. The alternate depression and elevation of the treadle causes a corresponding movement in the harness to which it is attached. The harnesses are each formed of two horizontal bars, connected by many small



Loom.

cords of varying lengths, and united by a rope and pulley, so that the depression of the one necessitates the elevation of the other. Where the harnesses are intersected by the warp (*o*) there are loops or metallic eyes. Each separate thread is passed through the cords of one or other of the harnesses in regular order, so that the alternate warp-threads go through the loops of one heddle, whilst the intermediate threads are passed through the cords of the one and the loops of the other harness. When the treadle-action lowers one harness, all the warp-threads passing through its loops will be depressed, whilst the other harness, with all the intermediate threads, will by the same motion be raised, thus leaving between the two divisions a space for the passage of the shuttle, which carries the thread of the weft. As soon as it passes the action is reversed. The reed (*i*), sometimes made of small portions of split reed, but usually of flattened wires, drives the threads tightly after each intersection. The wires are fixed like comb-teeth in a frame which rests upon the shuttle-race, the warp-thread passing through the interstices. At the top is a cover with a groove along its lower side, known as the lay-cap. The weaver's seat (*c*), being hung by rounded ends, accommodates itself to the various movements of the body required by the various operations described. The movement of the batten is produced by the hand of the weaver.

Such is a description of the simplest form of loom, and the highly complex machines now employed are identical in principle, although their action is now automatic in place of depending upon human motive-power. The first suggestion of a power-loom appears to be one contained in a paper by M. de Gennes, an officer of the French navy, which was printed in the *Journal des Savants* in 1678 (No. xxvii.). It was quite impracticable. In the summer of 1784, Dr. Edward Cartwright happened to meet some Manchester gentlemen, who remarked that when Arkwright's patent ran out there would not be sufficient hands to weave all the cotton that would be spun. Cartwright replied to Arkwright, "We must then invent a weaving-mill." This the "practical" men declared impossible. The subject recurred to Cartwright's mind. He had never seen any weaving done, but considering that "there could only be three movements, which were to follow each other in succession," there would be little difficulty in producing and repeating them. He constructed a loom which did produce cloth: although "the warp was placed perpendicularly, the reed fell with the weight of at least half a hundredweight, and the springs which threw the shuttle were strong enough to have thrown a Congreve rocket." When he had obtained a patent and seen weaving he was astonished at the greater ease of the usual operations. The details of the power-loom were modified in his successive patents, but the principle has remained unchanged until now. Ninety years of mechanical ingenuity have been expended upon the perfection of this machine, and the number of patents for its improvement is truly marvellous. One great difference between the hand-loom and the power-loom is the mechanical arrangement by which the shuttle is thrown in the latter. At each side of the loom, and in a line with the *shed*, is a groove. Along these *shuttle-races* the shuttle flashes, impelled by a leather and strap arrangement acting on the principle of a sling. The warp unwinding from a beam passes round a roller above it, passes through the two leaves of the heddles, thus forming the *shed* through which the shuttle flies, the weft is then pressed up by the batten, and the finished cloth results.

In weaving figured fabrics two persons were formerly necessary. In 1779, William Cheape patented a mechanical "draw-boy," as the assistant was called. This, with sundry improvements, continued in use until it was superseded by the famous Jacquard machine. Joseph Marie Jacquard was a native of Lyons, the son of a weaver, but following the trade of a straw-hat maker. Having heard of the premium offered by the Society of Arts for a machine to weave nets, he conceived the possibility of earning it. He produced a machine-made net, but not meeting with any encouragement from his fellow-citizens, he threw the project aside and gave the net to a friend. By some means it got to the hands of the authorities in Paris, and when Jacquard himself had forgotten the matter he was required by the prefect of the department to make a net-weaving machine. When it reached Paris the emperor ordered the inventor's arrest, which was done so suddenly that he was not allowed to go home to prepare for the journey. He was placed in the Conservatoire des Arts, and reconstructed the machine in the presence of inspectors. He was presented to Napoleon, who put the characteristic question: "Are you the man who pretends to do what God Almighty cannot do—to tie a knot in a stretched string?" He was then shown Vaucanson's loom, on which from 20,000 to 30,000 francs had been expended for making fabrics for Bonaparte's use. He determined to achieve the object of this complicated machine by a simpler process, and the result was the Jacquard frame. The silk-weavers of Lyons were indignant with him for contriving a labor-saving apparatus; he was thrice exposed to the danger of assassination; the Conseil des Prudhommes broke up his loom in the public square, in the same place where his statue now stands. His patent-rights were purchased by a municipal pension authorized by the emperor, who also decorated him with the cross of the Legion of Honor. There are varying versions of the earlier part of his career as an inventor, some attributing to Carnot the phrase about tying a knot in a stretched string.

The Jacquard frame can be adapted to nearly all looms, its object being to direct the movements of the warp-threads which produce the pattern. Although the principle is beautifully simple, the arrangements for carrying it into practice depend on delicate mechanical adjustments which bewilder the eye of the uninitiated. The warp-threads are passed through loops in the lifting-threads, so as to be raised by the action of the treadles upon the lifting-bars. This is precisely the same as in common weaving, but in the Jacquard apparatus the lifting-threads hang on wires terminating in a hook. In the ordinary course this hook catches upon a projection on the lifting-bar, but fails to do so if thrown out of the perpendicular. Each wire passes through a horizontal needle at right angles; the needle is furnished with a loop for this purpose. It moves freely through at one side, and at the other extremity is looped on to another rod ending in a spring-box. When pushed back into this box, it presses upon a spiral spring, which restores it to its former position immediately the pressure ceases. When pressure is exerted upon any wire it is thrown out of the perpendicular, and so fails to catch upon the projection in the lifting-bar; the wires not so acted upon reach the bar, drawing the threads of the warp attached to them. It will be evident from this that by regulating the pressure upon the horizontal needles any variation of thread can be effected. For this purpose a square roller is used, with its four sides pierced with holes corresponding to the number of threads in the warp, in the same way as the wires and needles. A row of needles fit into a row of perforations, and each row of the latter is brought in succession against the needles by a motion received from the machinery. In the ordinary course the simple effect would be that all the wires would act, and all the warp-threads be hooked upon the projections in the bar. In order to produce the variations in the arrangement of threads required for the production of the pattern, this roller is masked with what are known as pattern-cards. These are perforated in accordance with the desired pattern, the holes, where there are any, corresponding with those of the rollers they cover. Where not perforated the card resists the action of the needle, pressing it back upon the spring, and so throwing the lifting-bar out of the perpendicular, and preventing the lifting of the warp-thread to which it is attached. The cards are looped together at the corners, and act as an endless chain, their perforations indicating the pattern.

The simplicity of the Jacquard has been improved by Vincenzi of Modena, who, in addition to a great saving of bulk, has rendered the needle-action so delicate that in place of thick cardboard for the pattern-card, paper can be used, and thus a pattern can be reproduced without extra trouble. It was thought Signor Bonelli's electric loom would displace the Jacquard, but that beautiful piece of mechanism has not yet come into much practical use. The pneumatic loom (Harrison) is intended to lessen the waste of power caused by the shock of throwing the shuttle. In place of the picker a jet of compressed air is discharged from the shuttle-box on to the end of the shuttle at each stroke. There are many minor annoyances which the application of graduated air-pressure is expected to obviate. (See *Abridgment of Specifications of Patents* (English) *relating to Weaving.*) W. E. A. AXON.

Loomis (A. L.), M. D. See APPENDIX.

Loo′mis (ELIAS), LL.D., b. in Tolland co., Conn., in Aug., 1811; graduated at Yale College in 1830; was for several years tutor in that institution (1833–36); made important researches in astronomy, magnetism, and meteorology, both in the U. S. and at Paris, where he resided in 1836–37, attending lectures; became professor of natural philosophy in Western Reserve College 1837, called to the University of the City of New York 1844, and to Yale College 1860. He has made many contributions to the exact sciences, most of which were communicated to the American Philosophical Society and to the *American Journal of Science*, and published a series of textbooks in the higher mathematics, comprising *Plane and Spherical Trigonometry* (1848), *Recent Progress of Astronomy* (1850 and 1856), *Analytical Geometry and Calculus* (1851), *Elements of Algebra* (1851), *Elements of Geometry and Conic Sec-*

tions (1851), *Tables of Logarithms* (1855), *Natural Philosophy* (1858), *Practical Astronomy* (1855), *Elements of Arithmetic* (1863), *Treatise on Meteorology* (1868), *Elements of Astronomy* (1869), and a genealogical work, *The Descendants of Joseph Loomis* (1870).

Loomis (Gen. Gustavus), b. at Thetford, Vt., Sept. 23, 1789; graduated from the U. S. Military Academy in 1811; entered the army as second lieutenant of artillerists, and after a service of two years in garrison in New York harbor was ordered to the Niagara frontier, and was engaged in the capture of Fort George, U. C., May 27, 1813, and made prisoner at the surprise of Fort Niagara, N. Y., Dec. 19, 1813. Subsequently to the close of the war he served on the varied duty of an artillery, infantry, and staff officer, and in all sections of the country—in Texas and Florida against hostile Indians; on similar duty on the Western frontier; in command of department and on quartermaster, ordnance, and coast survey duty; transferred to the infantry as captain 1st Regiment in 1821, he was successively promoted to be colonel 5th Infantry in 1851. During the civil war he served on court-martial and recruiting duty, and as mustering officer; retired from active service June 1, 1863; brevet brigadier-general Mar. 13, 1865. D. Mar. 5, 1872.

Loomis (Justin Rolph), LL.D., b. Aug. 10, 1810, at Bennington, Wyoming co., N. Y.; graduated at Brown University 1835; professor of natural sciences in Colby University (Waterville, Me.) 1836–52, and held the same position in the university at Lewisburg, Pa., 1853–58, since which time he has been president. Author of *Elements of Geology* and *Elements of Physiology*.

Loomis (L. C.). See Appendix.

Loon, or **Great Northern Diver,** the *Colymbus* or *Eudytes torquatus*, a swimming bird of the family Colymbidæ, found in both hemispheres. It is a large solitary bird, 32 inches long, very difficult to shoot. It is a fine diver, perfectly at home in air or water, but by no means so on the land, its feet being set so far back that it cannot walk at all, but scrambles along scraping its breast on the ground. Its loud startling cry is a very familiar sound in the woods of North America.

Lo'pes, or **Lopez** (Fernão), b. about 1380, in Portugal, was made chief archivist of the kingdom by King Dom João I., and devoted his life to the collection and study of materials for the history of his country and the composition of chronicles of several of her kings. Like Froissart, he also personally visited the scenes of battles and of other important events, and conferred much with eminent soldiers and statesmen who had participated in the wars and other public affairs of Portugal. The chronicles of Lopes possess great literary and critical value, and are probably surpassed in merit by no historical works of the century in which they were written. The field of action and the period of time embraced by the narratives of Lopes are narrower than those covered by the immortal work of Froissart; and doubtless this is one of the reasons for the much greater accuracy of Lopes in point of date, detail, and attending circumstances. The style of Lopes is generally less picturesque than that of Froissart, but in some cases—as, for instance, in the description of the battle of Aljubarota, known in Portuguese history as "*the* battle," fought in the year 1386 on ground which is now the site of the renowned monastery and church of Batalha—the Portuguese writer has a decided superiority over the French chronicler. Lopes is always animated with a patriotism which much enlivens his annals, but is altogether wanting in the *borderer* Froissart, who is never quite French or quite English. The works of Lopes are—*Chronica do Senhor Rei Dom Pedro I.; Chronica do Senhor Rei Dom Fernando*, both printed in vol. iv. of the *Collecção de Livros Ineditos de Historia Portugueza* (Lisbon, 1816), and the very rare and important *Chronica del Rey Dom João I.* (Lisbon, 1644, 2 parts, folio), with a third part or continuation by Gomes Eannes d'Azurara.

George P. Marsh.

Lo'pez (Carlos Antonio), b. at Asuncion, Paraguay, Nov. 4, 1790; was educated at the ecclesiastical seminary of that city, and became better versed in civil and canon law than any of his contemporaries. To escape persecution by the dictator, Dr. Francia, he resided many years in an obscure village; returned to Asuncion on the death of Francia in Sept., 1840; was appointed secretary of the military junta then in power; was elected one of the two consuls in 1841; president for ten years in 1844; re-elected for three years in 1854, and again for ten years in 1857, with power to appoint a successor by will. He governed despotically, convoking a congress only at intervals of many years, and allowing it liberty only to sanction his edicts. He opened the country to foreign commerce, constructed a railway, sent a considerable number of Paraguayan youth to Europe for education, especially in mechanics, provided abundant war-material, bought several steamers as the foundation of a navy, levied and maintained under strict discipline a considerable army, built an arsenal, foundries, and fortifications, asserted a government monopoly for tobacco and *yerba mate*, the most important products of the country, made an unsuccessful attempt to establish a French colony in the Grand Chaco, made treaties with foreign powers, engaged in desultory warfare with the dictator Rosas of Buenos Ayres, was involved in diplomatic controversies with France, England, Brazil, and the U. S., narrowly escaping hostilities with the three latter powers, and successfully labored for the material prosperity of Paraguay, bequeathing his power to his son, Francisco Solano, on his death, which occurred at Asuncion Sept. 10, 1862.

Lopez (Francisco Solano), b. near Asuncion, Paraguay, July 24, 1826 or 1827, was the eldest son of Carlos Antonio Lopez, president of Paraguay from 1844 to 1862. Though his early education during the dictatorship of Francia had been almost entirely neglected, Francisco was at the age of nineteen years made general and commander-in-chief of the Paraguayan army, then engaged in hostilities with the dictator Rosas of Buenos Ayres, who refused to recognize the independence of Paraguay or to concede the right of navigation on the Parana. Young Lopez spent some months in the Argentine province of Corrientes, then in rebellion against Rosas, and probably derived some rudimentary ideas about war from his Mentor, the Argentine general Paz, though he saw no actual engagements. Returning to Asuncion in the following year, he was successively entrusted by his father with all the more important offices of the state, with a view to prepare the way for his succession to the presidency. In 1853 he was sent to Europe, accredited as minister to the courts of London, Paris, and Turin for the ratification of treaties concluded the previous year, and spent eighteen months in European capitals, attended by a suite of forty persons. He engaged the services of numerous engineers, bought steamers, contracted for the building of a railroad and the establishment of a French colony, and purchased large quantities of arms and materials of war. He also acquired some knowledge of French and of the condition of European affairs, and made the acquaintance of the celebrated Madame Lynch, who followed him to Paraguay, became his mistress, and had an important influence upon his later career. In 1855, Lopez became minister of war under his father, and the successive difficulties with the U. S., England, France, and Brazil (see Paraguay) stimulated his already formed resolution to make Paraguay a military power which at a future time should humble the surrounding countries, wrest from them their frontier provinces, and perhaps lay the foundations of a vast inland empire. In 1862, on the death of his father (Sept. 10), Lopez assumed the executive power by virtue of a nomination as vice-president made in the will of the former, according to a singular power previously conferred upon him, and convoked a congress by which he was elected (Oct. 16) president for ten years. He now hastened his preparations for war, secretly procuring from Europe immense stores of arms and ammunition; and in Sept., 1864, believing himself ready for the struggle, availed himself of the fact of Brazilian intervention in a civil war then existing in Uruguay to declare himself the protector of the "equilibrium" of the La Plata regions. He summoned Brazil to abstain from the hostilities already commenced in Uruguay, and as that empire paid no attention to his challenge, he inaugurated hostilities in Nov., 1864, by seizing treacherously and without warning in the port of Asuncion a Brazilian merchant-steamer, which in conformity with treaty-right was on its way to Matto Grosso, conveying the president of that province, who with his suite was thrown into a prison from which none of them ever emerged. In the following month, before news of this proceeding could reach Brazil, Lopez sent a force to occupy the vast province of Matto Grosso, situated to the N. of Paraguay, and early in the following year despatched another large force across the Argentine territory into the southern Brazilian province of Rio Grande do Sul. The refusal of the Argentine government to consent to this passage of troops afforded Lopez a pretext for hostilities against that country. Hastily summoning a "congress" composed of his own nominees, in Mar., 1865, Lopez procured therefrom the ratification of his previous acts, a formal declaration of war against Brazil and the Argentine Republic, and the military grade of marshal for himself, with extraordinary war-powers. The Argentine merchant-steamers in port were detained and subsequently confiscated, and an expedition was sent to the Argentine province of Corrientes which seized the capital and two men-of-war (Apr. 14) before the declaration could be known in Buenos Ayres. On May 1 a triple alliance against Paraguay, offensive and defensive, between Brazil, the Argentine Republic, and Uruguay was signed at Buenos Ayres, and a war of gigantic proportions for South America was thenceforward carried on for five years. (For the outline of the military operations reference must be made to the article PARAGUAY.) Early in 1866 the allies had recovered their own provinces and invaded Paraguay, where they were kept at bay for years before the fortifications of Humaitá, Tebicuarí, and Angostura, until nearly the whole male population of Paraguay had been impressed into military service and had perished in the trenches or by famine and pestilence. Lopez possessed no knowledge of military science; he was even deficient in personal courage, and never participated in a battle but from a safe distance; through the employment of a vast system of terrorism and espionage he coerced a reluctant people to sacrifice itself for his ambition. Always cruel, unscrupulous, passionate, and morbidly suspicious, his evil qualities were stimulated by a long succession of military failures, by the ruin of his ambitious hopes, the certainty of impending downfall, and by increasing habits of intemperance, until in 1868 they culminated in the arrest, torture, and execution of several hundreds of Paraguayans and foreigners on an absurd charge of conspiracy against his government and life. From July to Dec., 1868, scarcely a day passed without the execution of new batches of prisoners in his camp, among whom were included all his brothers, brothers-in-law, cabinet ministers, judges and prefects, and nine-tenths of the civil employés of every grade. The bishops and priesthood shared a similar fate, as did most of the higher military officers, and more than 200 foreigners, embracing all except about a score, whose services in various capacities were indispensable. Several members of the scanty diplomatic and consular corps were among these victims; the minister-resident of the U. S., Hon. Charles A. Washburn, was charged with complicity with the alleged treasonable plot, and only escaped with his life by the opportune arrival of the U. S. gunboat Wasp, which came to take him away, he having resigned his office some months before. Two members of the American legation were seized in the streets of Asuncion, Sept. 10, 1868, while on their way with the minister to embark for the U. S., and subjected for three months to the same system of starvation and torture as their more hapless companions, until in December of the same year they were surrendered to the squadron commanded by Admiral Charles H. Davis. Driven by successive defeats to the northern extremity of Paraguay, his forces being reduced to a few squadrons, Lopez was surprised and killed by a Brazilian force on the banks of the river Aquidaban, Apr. 1, 1870, along with his eldest son, a boy of sixteen years, who ranked as a colonel. He was buried near the spot, and Mrs. Lynch was allowed to go to Europe with her children. PORTER C. BLISS.

Lopez (Gen. NARCISO), b. in Venezuela in 1799; entered the military service of Spain at an early age; was engaged in the war against the independence of his native country, attaining the rank of colonel in 1822; settled in Cuba after the withdrawal of the Spanish army from Venezuela; engaged in military operations against the Carlists in Northern Spain, and became governor of Madrid and senator for Seville, but resigned those posts in consequence of the illiberal policy of the court towards Cuba. Returning to Cuba, he became an exile, and led three filibustering expeditions to Cuba from American ports in 1849, 1850, and 1851, all of which were unsuccessful, the last resulting in his capture and execution by the *garrote* in Havana Sept. 1, 1851.

Lophi′odon [Gr. λόφος, "crest," and ὀδούς, "tooth"], an extinct genus of Tertiary mammals, first described by Cuvier from remains occurring in the Eocene of France. These animals were allied to the tapir. They derive their name from the structure of the true molars or grinding teeth, which have their crowns crossed transversely by two crests or ridges of dentine covered with a layer of enamel. The last lower molar has also a small posterior lobe. The premolars are more simple in structure, and compressed, resembling the first premolar of the tapir. The upper molars also resemble those of the tapir, but approach in some respects those of the rhinoceros. The diastema or toothless interval between the canine and molar teeth was much shorter than in the tapir. Several species of *Lophiodon* are described from the Eocene of France and England, but little is really known of the skull or skeleton. The species of tapiroid mammals formerly referred to this genus from the early Tertiary deposits of America are now regarded as belonging to other genera, and no true *Lophiodon* is yet certainly known from this country. O. C. MARSH.

Lophobranchii. See APPENDIX.

Lo′quat, the *Eriobotrya Japonica*, a handsome fruit-bearing shrub of the order Rosaceæ, a native of Japan, cultivated in parts of the U. S. Its fruit is very early, has a yellow color, and is as large as a gooseberry.

Lorain, O. See APPENDIX.

Loraine (Sir LAMBTON), BART., b. in England Nov. 17, 1838; succeeded to the baronetcy (which dates from 1664) July 11, 1852. In 1868 he attained the rank of commander in the British navy, and in 1873, while in command of the Niobe steam-sloop, gallantly rescued the survivors of the *Virginius* affair, while stationed off the coast of Cuba.

Lor′ca [anc. *Eliocroca* or *Ilorcum*], city of Spain, province of Murcia, on the Sangonero—which is here called the Guadalentin—is an old but well-built and prospering place. In the vicinity are important lead-mines, and large manufactures of soap, dyestuffs, leather, and paper are carried on. It suffered very severely in 1802 by the bursting of the reservoir in which the waters of the Guadalentin are stored up for purposes of irrigation; 600 persons were drowned. Pop. 52,934.

Lord (ELEAZAR), LL.D., b. at Franklin, Conn., Sept. 9, 1788; studied at Andover, Mass.; removed in 1809 to New York; entered the Presbyterian ministry in 1812; was one of the founders of the American Education Society and the New York Sunday-school Union (of which he was corresponding secretary 1818–26 and president 1826–36); engaged in 1818 in banking; founded the Manhattan Insurance Co., and was its president 1821–34; was also the first president of the Erie R. R.; in 1836 removed to Piermont, N. Y.; aided in founding the theological seminaries at East Windsor (now at Hartford), Conn., and at Auburn, N. Y. D. at Piermont, N. Y., June 3, 1871. Among his works are *Principles of Currency* (1829), *Geology and Scriptural Cosmogony* (1843).

Lord (JOHN), LL.D., b. at Portsmouth, N. H., Dec. 27, 1810; graduated at Dartmouth College in 1833, and at Andover Theological Seminary in 1837; was agent of the American Peace Society from 1837 to 1839: preached for a time in New Marlborough, and in Stockbridge, Mass., but was never ordained; and in 1840 gave himself up to historical study and lecturing. In 1843 he visited and lectured in Europe, as also more than once afterwards. In 1855 he settled down in Stamford, Conn., which was his home for many years. His lectures, which embrace the great names of ancient, mediæval, and modern history, are marked by vividness of description and loftiness of moral tone. They were published in five volumes, beginning in 1884. Their title is *Beacon-Lights of History.* He has also published school histories and other works. His career as a lecturer has been unique. R. D. HITCHCOCK.

Lord (NATHAN), D. D., LL.D., b. at South Berwick, Me., Nov. 28, 1793; graduated at Bowdoin College in 1809, and at Andover Seminary in 1815; was two years instructor at Phillips Academy, Exeter, N. H.; was pastor of a Congregational church at Amherst, N. H., 1816–28, and president of Dartmouth College 1828–63. He was a man of marked ability, but in his later years became conspicuously conservative. He published several pamphlets, addresses, reviews, and sermons, two of which, the *Letters on Slavery* (1854, 1855), excited much comment in the North, for Dr. Lord maintained the lawfulness of that institution. D. at Hanover, N. H., Sept. 9, 1870.

Lord (SCOTT), b. Dec. 11, 1820, in Nelson, Madison co., N. Y.; studied law in Buffalo; began practising in Livingston co., N. Y., and was elected judge in 1846, serving on the bench eight years. In 1872 he moved to Utica, N. Y., and in 1874 was elected to Congress from the Oneida district. After the close of his Congressional term he resumed his profession in the city of New York. D. Sept. 10, 1885. H. L. STUART.

Lord's Day, a name for the first day of the week, derived from Rev. i. 10. The rendering "Lord's Day" is Wycliffe's (1380). In all of the editions of Luther's New Testament previous to his revision of 1541 he renders *Am. Sontage*, and Tyndale (1526–34), Coverdale (1534), Cranmer (1539), follow him, and translate "on a Sondaye." The Æthiopic renders it "the first day." The word κυριακός is found also in 1 Cor. xi. 20: "*the Lord's* supper." The day of our Lord's resurrection was observed in the apostolic times, and the title "Lord's Day" is applied to that day in Ignatius, Irenæus, the Clementine Constitutions, and Tertullian, and at a later period universally. (Suicer, *Thesaurus Ecclesiast. Ed. Sec.*, 1728, ii. 184. See SABBATH and SUNDAY.) C. P. KRAUTH.

Lords, House of. See PARLIAMENT.

Lord's Supper. See EUCHARIST.

Lore′lei, The, an imposing cliff on the right bank of the Rhine, half a mile above St. Goar. It is 447 feet high, and is now penetrated by a railway tunnel. At its foot is a whirlpool and a famous salmon-basin. The tradition is that a cave in the rock is the abode of the Lorelei, a wicked siren, whose beauty and sweet song attracted hither the boatmen, whom she wrecked in the whirlpool. Here is a famous echo, sometimes repeated fifteen times, but not audible from the steamer.

Lorencez, de (CHARLES FERDINAND **Latrille**), COUNT, b. in France May 23, 1814, grandson of Marshal Oudinot; received a military education at St. Cyr; entered the army in 1832; rose to a colonelcy in Algeria; was made brigadier-general for gallantry at the first assault upon the Malakoff (June 11, 1855) in the Crimean war, and in Jan., 1862, was sent to Mexico in command of the French army of invasion; was made general of division Mar. 20; commenced hostilities in April on the rupture of the treaty of Soledad; occupied Orizaba Apr. 20; forced the pass of Aculcingo Apr. 28, and marched upon Puebla, where he was repulsed with great loss in an attempt to carry Forts Guadalupe and Loreto; retreated to Orizaba; at his own request was recalled to France in Nov., 1862, since which time he has not figured prominently in military affairs.

Lo'renz (OTTOKAR), b. at Iglau, Moravia, in 1832; studied at Vienna in 1851, and was appointed professor of history at the university in 1860; in 1857 had received an appointment in the office of the secret archives, but this position he had to give up in 1865, on account of some indiscreet publications against the cabinet of Schmerling. The most prominent of his writings are *Deutsche Geschichte in 13 und 14 Jahrhundert* (2 vols., 1863–67) and *Geschichte des Elsass* (1871, together with Sherer).

Lorenzo Marques, the chief place of a district of the same name, which forms part of the Portuguese province of Mozambique, in South-eastern Africa. The town stands on the Delagoa Bay, at the mouth of the river Lorenzo Marques, in lat. 25° 58′ S. It has the best harbor on the eastern coast of Africa from the Cape to Zanzibar, and is a regular port of call for steamers going to the Indies. A railway has been projected from Transvaal to Lorenzo Marques, which, when completed, will make the settlement a place of importance. The whole district contains only 458 white persons.

Lore'to, city of Italy, in the province of Ancona, about 20 miles S. W. of the city of Ancona. The chief interest of this place is the magnificent sanctuary of Our Lady of Loreto, which draws hither thousands of pilgrims yearly. This vast building, designed by Bramante, is said to contain the house in which the Holy Family dwelt at Nazareth. According to the legend, this humble dwelling was borne through the air by angels, who would not leave it to be desecrated by the infidels, and deposited first near Fiume on the Croatian coast; then, after several other translations, it was finally set down at Loreto. This last removal, it is asserted, took place on May 29, 1299, during the pontificate of Boniface VIII. The *Santa Casa*, or Holy House, stands in the centre of the Latin cross which forms the interior of the church, and over it rises an octagonal cupola decorated with exquisite frescoes. The original building, of reddish stone and consisting of a single square room, is entirely encased in sculptured marbles, the bas-reliefs being the work of some of Italy's best artists. Rich lamps of silver are suspended all around the interior, the most costly hanging before an image of the Virgin said to be carved by St. Luke out of the cedar-wood of Lebanon. The treasury of this sanctuary is—or at least was—one of the richest in the world, but it was heavily drawn upon by some of the popes, especially by Pius VI.; then it suffered severely from the cupidity of the French during the Bonaparte occupation; and more recently, if common report is to be believed, those who should be the most faithful sons of the Church have not scrupled to lay sacrilegious hands on the priceless gems which were once its pride. Pop. 8083.

Lore'to Apruti'no, town of Southern Italy, in the province of Teramo. This town has but one school for boys and one for girls, though its population is about 5500.

Loreto, Sisters of, or "Friends of Mary at the Foot of the Cross," a Catholic religious order for females, founded in 1812 in Kentucky by Charles Nerinckx (1761–1824), a priest, have many establishments in the Western States, and devote themselves to the cause of education and the care of destitute orphans.

Lorette', post-v. of Quebec co., Canada, 9 miles from Quebec, is a beautiful place, resorted to for the view of its waterfall, and has some manufactures of paper and flour. The inhabitants are partly Huron Indians. At this place are waterworks for the supply of Quebec. Pop. of subdistrict Ancienne Lorette in 1881, 2488.

Lorica'ta [Lat. *lorica*, "cuirass"], a term applied to those reptiles which are "loricated," or furnished with a coat of mail formed by an epidermal exoskeleton of bony scales, as in the crocodiles, or of bony plates, as in the Chelonians. The term is, however, generally used in reference to the Crocodilians.

Lorient', or **L'Orient,** town of France, department of Morbihan, at the mouth of the Scorf, in the Bay of Biscay, was founded in the middle of the seventeenth century by the French East India Company, whence its name, Port de l'Orient, and had an immense trade, which, however, has declined. In 1770 it was made one of the four stations of the French navy, and has a capacious and safe harbor lined with handsome quays, and protected with strong fortifications at its entrance. Its dockyards and arsenals are extensive, and its manufactures of all kinds of naval equipments are very important. Pop. in 1881, 37,812.

L'Orignal', cap. of Prescott co., Ont., Canada, on the Ontario River, 59 miles E. of Ottawa, has 1 weekly paper. Pop. in 1881, 853.

Lor'ikeet, a name applied to the very numerous species of parrots of Australia and the Eastern Archipelago, belonging to the genus *Trichoglossus*, and having the tongue covered with bristly hairs, with which the birds collect honey from flowers. They are showy birds and fly in great flocks, sometimes containing more than a thousand birds.

Lo'ring (CHARLES GREELEY), LL.D., b. at Boston, Mass., May 2, 1794; graduated at Harvard in 1812; was for many years an eminent lawyer of Boston; was 1857–67 actuary of the Hospital Life and Trust Co.; author of *Neutral Relations of the U. S. and England* (1863) and a *Life of William Sturgis* (1864), besides published addresses, etc. D. at Beverly, Mass., Oct. 8, 1867.

Loring (FREDERICK W.), b. at Newtonville, Mass., in 1846; studied at Phillips Academy, Andover; graduated at Harvard College in 1870, and made a brilliant *début* as an author in the pages of the *Atlantic*, *Old and New*, *Every Saturday*, the *Independent*, and *Appletons' Journal*. His verses and serial stories were of unusual promise, and a novel, *Two College Friends*, displayed high powers. Joining the party of Lieut. Wheeler for the exploration of Arizona in the capacity of literary correspondent, he was murdered by the Indians near Wickenburg, Arizona, Nov. 5, 1871.

Loring (GEORGE BAILEY), M. D., b. at North Andover, Mass., Nov. 8, 1817; graduated at Harvard College 1838, and at the Harvard Medical School 1842; was physician to the Chelsea Marine Hospital for some years; has devoted himself since 1850 entirely to scientific agriculture and the pursuits of public life, being almost constantly occupied in the preparation and delivery of speeches, lectures, and occasional addresses upon political, historical, scientific, educational, and agricultural topics, and the writing of reports and essays on similar subjects. He took up his residence at Salem; represented that city for several terms in the Massachusetts house of representatives and senate; was for three years president of the latter body, and for many years president of the State Agricultural Society, and was a member of the Republican national conventions of 1868 and 1872. Dr. Loring enjoys a wide reputation as an orator, and has been frequently invited to deliver addresses upon memorial occasions, as at the dedication of memorial tablets at Bolton, Mass. (1866), at the bi-centennial anniversaries of the settlement of Dunstable (1873), and of Sherborn (1874), of the massacre at Swanzey by King Philip (1875), and the centennial of the resistance to the British at the North Bridge, Salem (1875). Among his speeches in the Massachusetts senate, that on scientific education in behalf of Prof. Agassiz (1873), that in defence of Senator Sumner's position on the "regimental colors question" (1874), and that on the railway policy of Massachusetts (1874), were published in pamphlet form. An address at the opening of the scientific course of the American Institute, New York, 1870, was widely copied. He has contributed largely to Flint's *Agricultural Reports*, to Murray's work *On the Horse*, and wrote a serial for the Boston *Globe*, called *The Farmyard Club of Gotham*, dealing with New England life and modes of thought. Became U. S. com. of agriculture 1881. PORTER C. BLISS.

Loring (Gen. WILLIAM W.), b. in North Carolina about 1815; entered the U. S. army as second lieutenant in command of a detachment of mounted volunteers, and served in the Florida war 1835–42; became captain of mounted rifles 1846, major in Feb., 1847; commanded a regiment in the battles in the Valley of Mexico; was brevetted lieutenant-colonel for gallantry at Contreras and Churubusco, and colonel for gallantry at Chapultepec; lost an arm at the Belen gate of Mexico; commanded an expedition on the Gila River, New Mexico, 1857, where he fought the Mogollan Indians; resigned his colonelcy May 13, 1861; became a brigadier-general, and subsequently a major-general, in the Confederate army, serving in West Virginia

1862, at Vicksburg 1863, and with Gen. Bragg at Chattanooga and in the ensuing campaign. Afterward went to Egypt, and became pasha and chief of staff of the khedive in the army. Returned to U. S. in 1879, and published *A Confederate Soldier in Egypt* (1883).

Lor′inser (KARL IGNAZ), b. July 24, 1796, at Nimes, in the Bohemian Mountains; studied medicine at Prague and Berlin, where he took his degree in 1817; held several medical offices in Prussia, from which he retired to private life in 1850, and d. Oct. 2, 1853, at Patschkau in Silesia. His *Untersuchungen über den Rinderpest* (1831) proved on several occasions of great benefit to the farmers; and his *Zum Schutze der Gesundheit auf Schulen* (1836), which caused a long and vehement controversy, occasioned the re-establishment of *turn-places* at the Prussian schools.—His son, FRANZ LORINSER, b. at Berlin Mar. 12, 1821, has acquired a name as a Roman Catholic theologian, and as well versed in Spanish literature, from which he has made several successful translations.

Lo′ris (the indigenous name), a genus of prosimian mammals of the lemur family (sub-family Nycticebinæ). There are two species—the slender loris (*L. gracilis*) of Ceylon and the Indian Peninsula, and the lazy loris, or slow lemur (*L. tardigradus*), of the Eastern Archipelago. They are slow-moving, nocturnal, arboreal, mostly carnivorous, with a rich fur, and are not much larger than rats.

Lorne (MARQUIS OF). See ARGYLE.

Lorraine′ [Ger. *Lothringen*], a territory between the rivers Rhine, Saône, Meuse, and Scheldt, and forming a plateau from 500 to 800 feet high, which leans against the Vosges with a northern and north-western inclination. (See ELSASS-LOTHRINGEN.) It derived its name from Lothaire II., son of the emperor Lothaire I., who received this territory at the division of his father's dominions, and called it *Lotharii Regnum* (Lotharingia). Under the Carlovingian dynasty the country was an object of perpetual strife between France and Germany. After the extinction of the Carlovingian house the emperor Otho I. gave it to his brother Bruno, archbishop of Cologne, who divided it into two parts—Upper Lorraine, between the Rhine, Saône, and Meuse, and Lower Lorraine, between the Rhine, Meuse, and Scheldt. The latter received the name of the duchy of Brabant, became a part of Burgundy, fell to the house of Austria, and is now incorporated with Belgium. Upper Lorraine was ruled for centuries by a dynasty of its own, subject, however, either to French or to German authority. But in 1733, in the Polish war of succession, it was conquered by the French, and in 1737 the legal heir, Frantz Stephan IV., the husband of Maria Theresa, exchanged it for the grand duchy of Tuscany, and it was given to Stanislaus, the ex-king of Poland and father-in-law to Louis XV., at whose death in 1766 it fell to France. The inhabitants, however, although they became very much attached to France, remained German in language and customs in the eastern and northern districts, and this part of the country, with the fortress of Metz, was ceded to Germany May 10, 1871. It is now governed, in connection with Alsace, as a province of the new German empire.

Lorraine (CLAUDE). See GELÉE (CLAUDE).

Lort′zing (GUSTAV ALBERT), b. at Berlin Oct. 23, 1803; educated for the stage; led an errant life as actor, singer, composer, and orchestra-leader in different theatres of second rank in Germany, and d. at Berlin Jan. 21, 1851. Of his many operas, the *Zar und Zimmermann* (1837) and *Der Wildschütz* (1842) were received with much applause, and are still successfully performed.

Lo′ry [Hind. *lûri*], a name given to various birds of the parrot family, but especially to those of the genus *Lorius* or *Domicella*, whose head-quarters are the islands of the Sunda-Moluccan Archipelago and Polynesia. (See TRICHOGLOSSINÆ.)

Los Angeles, city and R. R. centre, cap. of Los Angeles co., Cal. (see map of California, ref. 6–C, for location of county), on both banks of the Porciúncula (now the Los Angeles) River, 30 miles from its mouth, occupies an area of 6 miles square. The most important place on the line of the Southern Pacific R. R., it is distant 482 miles from San Francisco and 249 miles from Fort Yuma. Branch lines of the S. P. R. R. extend 22 miles S. to WILMINGTON (which see), its port; 33 miles S. E. to Santa Ana; 16 miles W. to Santa Mónica, a seaside resort. There is communication by rail *viâ* Colton, 58 miles E., on the S. P. R. R., and the California Southern R. R., 127 miles long, with San Diego, and, *viâ* Mojave, 100 miles N. on the S. P. R. R., and a branch line, 240 miles to the Needles, with the W. terminus of the Atlantic and Pacific R. R. The steamers of the Pacific Coast Steamship Company on their frequent voyages between San Francisco and San Diego touch at Wilmington, and the port is visited by vessels from all maritime countries. Los Angeles was founded Sept. 4, 1781, under the patronage of Nuestra Señora la Reina de los Angeles ("Our Lady the Queen of the Angels"), by twelve families of Indian, negro, and mixed blood, with whom a contract for that purpose had been made by the viceroy of Mexico. This element of the population is now greatly in the minority. Los Angeles is the centre of a region characterized by a delightful climate and a soil which produces in profusion almost all the fruits of semi-tropical as well as temperate climes. It is also rich in silver and other minerals. The city is lighted by the Brush electric light and has a gaslight company. It has 4 lines of street railway, abundance of water, a board of trade, a produce exchange, and an efficient fire department. It has 16 churches and is the seat of the Roman Catholic bishop of Monterey and Los Angeles, 4 banks and 1 for savings, 1 theatre, several hotels, 4 daily, 7 weekly (1 Spanish, 1 French, 1 German), and 1 monthly public prints, 2 flouring-mills, 1 woollen-mill, and many wineries, canneries, foundries, and other manufacturing establishments. Two terms of the supreme court of the State are held here each year, as well as the annual fair of the sixth district of California. The University of Southern California, the Roman Catholic college of St. Vincent, and a branch State normal school are located here; there are also 17 public schools, a flourishing seminary directed by the sisters of charity, many other private schools, and a public library. Los Angeles is an important station of the U. S. Signal Service, and the only magnetic observatory in the country W. of the Mississippi River is located here. There are 3 hospitals, 7 cemeteries, 3 benevolent associations, 2 orphan asylums, 26 organizations of secret societies and others. The assessed value of real estate—about one-third of its actual value—is $30,000,000. Highly favored by nature, situated near to a port on the Pacific Ocean, as well as to others on the Gulf of Mexico, and having connection with the railway systems of the U. S. and Mexico, Los Angeles is destined to become the metropolis of a region excelled in prosperity by no other in the U. S. Pop. of city in 1870, 5728; in 1880, 11,183; in 1885, about 35,000—an increase relatively greater than that of any other city in the U. S. GEO. BUTLER GRIFFIN.

Loskiel (GEORGE HENRY), b. in Courland, Russia, Nov. 7, 1740; entered the Moravian ministry; wrote a *History of the Mission of the United Brethren to the Indians of North America*, from the accounts of the missionaries Gottlieb Spangenburg and David Zeisburger (Eng. trans. by C. J. Latrobe, London, 1794); became bishop at Hernhutt Mar. 14, 1802, and came to the U. S. in the same year as superintendent of the Moravian churches and pastor at Bethlehem, Pa. D. Feb. 23, 1814.

Los Lunas, N. M. See APPENDIX.

Los′sing (BENSON JOHN), LL.D., b. at Beekman, Duchess co., N. Y., Feb. 12, 1813; was employed as a watchmaker in Poughkeepsie from 1826 to 1835; was next a journalist at that place for several years, and in 1838 became a wood-engraver in New York, where he edited the *Family Magazine*, an illustrated periodical. He conducted *The Young People's Mirror* (1848–49), and in 1872 established the *American Historical Record.* His principal works are an *Outline History of the Fine Arts* (1841), *Lives of the Signers of the Declaration of Independence* (1848), *Pictorial Field-Book of the Revolution* (1850–52), *History of the U. S.* (1854–56), *Our Countrymen* (1855–57), *Mount Vernon and its Associations* (1859), *Life of Philip Schuyler* (1860–62), *Life of Washington*, *Lives of the Presidents*, *Pictorial Field-Book of the War of 1812* (1868), *The Civil War in America* (3 vols., 1866–68), the *American Centenary*, 2 vols., a work illustrating American progress from 1776 to 1876 (1875), *Cyclopædia of U. S. History* (1881), *History of the City of New York* (2 vols., 1884). Most of his works are adorned with numerous illustrations by himself.

Lossi′ni [Ger. *Lussin*], an island in the Gulf of Quarnero, an inlet of the Adriatic Sea, belonging to the government of Triest, Austria, 19 miles long and 3 miles broad, with 10,600 inhabitants, mostly engaged in agriculture, fishing, and commerce. The principal town is Lossini Piccolo, a thriving place, with 5200 inhabitants, an excellent harbor capable of receiving the largest men-of-war, and an active trade in wheat, wine, olive oil, fruits, and fish.

Lot, a river of France, rises in Mont Lozère, in the Cevennes, becomes navigable at Entraigues, and joins the Garonne at Aiguillon after a course of 270 miles.

Lot, department of France, on both sides of the river Lot. Area, 2004 square miles. The surface is elevated and mountainous, traversed by a range of hills, the sides of which are covered with vines, while the valleys abound in wheat, hemp, tobacco, and fruits. Some iron is mined.

Pop. 280,268. Of the entire area of the department, 691,920 acres are arable and 222,402 acres are forest-land; 168,038 acres are occupied by vineyards; 64,250 acres are heath and 61,778 meadow. Wine is the principal product of the department, that of Cahors being the most valued. Sheep are the most abundant kind of livestock; poultry and bees are reared in great quantities. Cap. Cahors.

Lot-et-Garonne′, department of France, extending along the Lot and the Garonne, and comprising an area of 2027 square miles. The soil is exceedingly fertile in the river-basins; hemp here reaches an extraordinary height; the wine is strong and rich, and capable of being transported across the sea without losing its fine qualities; more wheat is raised than used. But outside of the river-basins the soil consists of a ferruginous clay or of sandy tracts which are entirely unproductive. Much iron is manufactured in this department. The forges, high furnaces, and foundries are important. Brazier's ware is manufactured; also agricultural implements and other machines. Plaster, lime, cement, bricks, tiles, etc. are made. Pop. in 1881, 312,081. Cap. Agen.

Lothaire′ I., Roman emperor from 840 to 856, b. about 796, a son of Louis le Débonnaire; shared, together with his two younger brethren, Pepin and Louis, in the government of the empire during the latter part of the reign of his father, whom he succeeded in 840. On the death of Louis war immediately broke out between the three brothers, and Lothaire was defeated in the battle of Fontenay June 25, 841. But in 843 the famous treaty of Verdun was concluded between them, according to which Lothaire retained the imperial title and dignity, Italy, and a strip of land between Germany and France, stretching from the Mediterranean to the North Sea, and extending between the Rhine on the one side and the Rhone, Saône, Meuse, and the Scheldt on the other. Lothaire was a weak, violent, and treacherous character, and utterly unable to defend and govern his land. The Saracens attacked him in Italy, the Norsemen in the Netherlands, while the clergy, the dukes, and his own sons filled the interior with violence and bloodshed. After dividing the country between his sons he retired to the monastery of Prüm in the Ardennes, where he d. a few weeks afterward, Sept. 29, 855.

Lothaire II., THE SAXON, king of Germany and Roman emperor from 1125 to 1137, b. in 1075 of a family not very conspicuous; married in 1100 Richenza, the heiress of the wealthy house of Brunswick, and received in 1106 Saxony as a fief of Henry V. At the death of this prince in 1125, Lothaire was elected king of Germany, chiefly through the intrigues of Bishop Adalbert of Mentz, who hated and feared the Hohenstaufen house. His reign was vigorous and fortunate. Bohemia was again brought under German authority; the refractory dukes, especially Duke Frederick of Suabia, were compelled to submit; the two Italian campaigns undertaken in defence of Innocent II. against the antipope Anicletas were successful. Nevertheless, he bought his crown and the assistance of the Church by surrendering the right of investiture almost wholly to the pope, and in order to retain Henry the Proud of Bavaria and other dukes in his party, he allowed the principle of heredity to establish itself with respect to the fiefs of the Crown. But thus he weakened the royal power, and made it incapable of consolidating and governing Germany. D. near Trent on his return from his second Italian campaign, Dec. 3, 1137.

Lo′throp (SAMUEL KIRKLAND), D. D., b. at Utica, N. Y., Oct. 13, 1804; graduated at Harvard in 1825; ordained at Dover, N. H., in 1829, and in 1834 became pastor of the Brattle street church, Boston, Mass.; wrote the *Life of Samuel Kirkland*, his grandfather, for Sparks's collection of biographies, a *History of the Brattle Street Church* (1851), and occasional addresses and other papers; received the degree of D. D. from Harvard University in 1852.

Lothrop (Capt. THOMAS), b. probably in England; was a freeman of Salem, Mass., in 1634, where he resided many years, and was representative in "general court" 1647, 1653, and 1664. He afterwards settled at Beverly, founded a church there, represented that town four years, and on the breaking out of King Philip's war was chosen captain of a fine company of militia, celebrated in New England as the "flower of Essex," nearly all of whom were surprised and killed by the Indians, with Captain Lothrop, at Bloody Brook, Deerfield tp., Sept. 29 (new style), 1675. A marble monument was placed over the remains of Captain Lothrop and his companions in 1838.

Lotoph′agi, or **Lotus-eaters** [Gr. Λωτοφάγοι], are first mentioned by Homer as a people who fed upon the sweet fruit of the lotus, of which the quality was such that all who ate of it immediately forgot their native land and all desire of return, and chose rather to dwell there and eat of the lotus still. The ancient geographers placed the lotus-eaters on what is now the coast of Eastern Tripoli, near the Great Syrtis. At the present day the cave-dwellers on that coast subsist upon jujubes, and drink a syrup made of that fruit, perhaps the lotus wine of the ancients. (See LOTUS.)

Lot′tery, a game of chance in which prizes are drawn by lots. The word is directly derived from the Italian *lotteria*. The root, however, is Germanic: Gothic, *hlauts;* Icelandic, *hlutr;* Anglo-Saxon, *hlot*. As an institution in modern society the lottery is an Italian invention, but the decision by lot, although by no means entirely unknown to the Romans and Greeks, was a specific feature in the life of the ancient Germanic tribes, and formed a prominent element in the working of all their social, political, and religious institutions; gambling with dice was also one of the most conspicuous vices of many Germanic tribes. Two kinds of lottery are generally distinguished—the class or Dutch lottery, and the numerical or Genoese—but both originated in Italy. In the early Middle Ages it was quite common among the Italian merchants to dispose of their goods by lot—a custom which is generally put in connection with the so-called *sortes conviviales* invented by Augustus. When he made a popular feast, each guest received a sealed packet, and each packet contained a present. The packets were all alike, but the value of the presents differed immensely, some packages containing only a pea-bean, which had no other value than that which the superstition of the receiver might ascribe to it, others containing a diamond of immense value; some only an order for a measure of wine, others a deed of a whole vineyard, etc.: chance decided. Earlier, the magistrates who presided over the distribution of the *congiaria* in Rome had found out how to relieve the monotony of this institution and revive the interest of the people by introducing chance in the distribution. Some of the tickets contained orders for larger quantities of corn, wine, and oil, and chance decided into whose hands these tickets should fall. The invention of Augustus was afterward much improved by his successors, and the taste of the Italian people for all kinds of chance-decisions, and for the excitement which they occasioned, was soon so far developed that merchants were able to utilize it in selling their goods. From Italy the custom spread to other countries, showing itself remunerative everywhere; and in the sixteenth and seventeenth centuries governments generally adopted it with some modifications as a method of procuring money. The simplest and most common organization of these state enterprises was as follows: A certain value was divided into a certain number of unequal prizes; and then a certain number of lots, each lot giving a chance of winning one of the prizes, was sold for a certain price. If all the lots were sold, the profits of the lottery were generally enormous; if not, the lottery diminished its risks by playing the unsold numbers itself and retaining the prizes which might fall on them. From a machine called the "wheel of fortune" as many numbers were drawn as there were prizes, and the prizes were drawn from another similar machine, the order in which they came out determining to what lot they should belong. This is the origin and fundamental organization of the so-called class or Dutch lottery; the numerical or Genoese lottery has more the character of a wager, and originated also as a wager. At Genoa the five members of the great council were elected by throwing the names of ninety candidates into a wheel of fortune, from which then the names of the five elected were drawn. Bets were made both on the names which would come out and on the order in which they would appear. Afterward, numbers were substituted for names, prizes were calculated according to the doctrine of probabilities, and a regular lottery was thus established under the supervision of the government. When five numbers out of ninety are drawn, there is a chance of 1 to 18 that a certain number will come out, and the managers of the lottery generally agree to pay the stake placed on the number sixteen times; the chance of two numbers, an *ambe*, is only 1 to 400, and that of four numbers, a *quarterne*, is 1 to 511,038; but as the chance of winning decreases the rate of the prize increases; in the Austrian lottery a *quarterne* is paid 60,000 times, and in the Bavarian 64,500 times, the stake placed on it. The interest which this kind of lottery excited was enormous. It was introduced into nearly all European countries, and was generally drawn two or three times a week. But thereby the evil consequences connected with all kinds of lotteries became more apparent, and led finally to their abolition in most countries. In the large cities in which the lotteries were drawn a great portion of the population lived in a perpetual excitement, which made men unfit for serious business, and generally ended by thoroughly demoralizing them. The poorer classes left their regular habits of working and saving, and gave themselves up to idleness and misery, deceived by these prospects of winning a fortune in the next hour which were held out to them by the government.

In England the first lottery was instituted in 1569. The prizes were plate, and the profits were devoted to the repair of the harbors of the kingdom and to other public works: 400,000 tickets were sold at ten shillings each, and the drawing took place at the W. door of the old cathedral of St. Paul in London. In 1612 a lottery was instituted for the benefit of the English colonies, by which the Virginia Company especially profited. During the seventeenth century, however, lotteries, especially private, multiplied in such a degree, and were often organized on such fraudulent principles, that Parliament felt compelled to look into the matter, and by an act in 1709 all private undertakings of this kind were prohibited. From this period and up to 1823 a state or Parliamentary lottery was annually licensed by act of Parliament under various regulations. The prizes were often paid in terminable or perpetual annuities. Thus, in 1746 a loan of £3,000,000 was raised on 4 per cent. annuities, and a lottery of 50,000 tickets at £10 each; and in the following year £1,000,000 was raised by the sale of 100,000 tickets at £10 each, the prizes in which were founded on perpetual annuities at the rate of 4 per cent. per annum. The British Museum was founded, the Westminster bridge was built, from the proceeds of such lotteries. But although in this way the profits of the lotteries were generally employed for some internal improvement of national interest, the abuses practised under cover of the law by the contractors, and the general demoralization which accompanied this kind of gambling, caused Parliament in 1778 to demand an annual license of £50 from every one who kept a lottery-office, whereby the number of such offices was reduced from 400 to 41, and finally in 1826 entirely abolished the whole institution. In France, the lottery was introduced in 1539, and it soon became a popular passion. It was generally some modification of the Genoese form, and private; a tax was paid to the government on every lot. But in 1798 the government forbade all private and foreign lotteries, and took the whole institution into its own hands. The so-called *loteries nationales* were established in all the large cities, and drawn two or three times a week; between 1816 and 1828 they yielded an annual revenue to the state of 14,000,000 francs. Nevertheless, here as everywhere their demoralizing influence on the population, especially on the lower and poorer classes, which are most strongly attracted by them, soon became very apparent, and in 1836 all kinds of lotteries were prohibited; in the next year the deposits in the savings banks of Paris alone increased by 425,000 francs. In Germany, the first lottery was established in 1699 in Nuremberg. It was a class lottery, and various forms of this kind of lottery soon became very popular, and are still in existence in Prussia, Saxony, Brunswick, Hamburg, and Mecklenburg. Lotteries, especially with prizes consisting of goods, not of money, are very common in Germany. Every day in every city some kind of lottery is drawn by which an estate, a set of diamonds, a piece of art, a coach, a pianoforte, or perhaps only a Christmas cake, is sold. In 1870, Prussia derived an income of 1,339,500 thalers from its lotteries; Saxony, 800,000 thalers. About 10,000 persons are engaged in the business throughout the country. There is, nevertheless, very little real gambling passion in Germany proper, while in the German division of Austria, where the Genoese lottery flourishes as a government institution, the influence on the population is very apparent. In 1868, Austria derived a revenue of 5,777,958 florins from the lotteries in its German territories alone, and whenever the question has been raised by the Diet of abolishing the institution, the answer of the government has always been that it cannot afford to lose the revenue. Some very ingenious arguments have been heard there in defence of the institution.

In the U. S. lotteries were formerly very commonly resorted to as a means of raising money for some public improvement—the foundation of colleges and hospitals, the building of roads, bridges, ferries, etc.—though they were denounced as early as 1699 by an assembly of ministers at Boston as "cheats," and their agents as "pillagers of the people." In 1833 appeared at Philadelphia Job R. Tyson's *A Brief Survey of the Great Extent and Evil Tendencies of the Lottery System of the United States*, and a society was formed in Pennsylvania with the purpose of working for the abolition of the institution. It was indeed abolished in Pennsylvania and Massachusetts in the very same year, in Connecticut in 1834, in Maryland in 1836, etc. At present it exists only in Kentucky and Louisiana as a State institution, and in most of the other States, though not in them all, the sale of tickets for foreign lotteries is prohibited by law, and to advertise them has been made a penal offence. In the U. S., as well as in England and France, a lottery is often instituted by the so-called art-unions, under the authorization of the government, for the purpose of disposing of pictures or statuary. But it may be doubted whether this method affords any real encouragement to art—indeed, whether it is not a degradation.

CLEMENS PETERSEN.

Lott (JOHN A.), b. at Flatbush, Kings co., N. Y., in 1805; studied law; commenced practice in Brooklyn, N. Y., in 1835, and was for many years a prominent lawyer there; belonged to the Democratic party, and was county judge 1838–42; in the mean time was elected to the assembly in 1841, holding both offices: New York State senator 1842–46; justice of supreme court 1857–65; in 1869 elected to court of appeals, which was abolished in 1870, and he was chief of the commission appointed to finish up its work; member of commission appointed by Gov. Tilden in 1875 to draft a uniform law for the government of cities in the State; was president of Brooklyn Flatbush and Coney Island R. R., but resigned a short time before his death; was president of the Flatbush board of improvement. D. at Flatbush, N. Y., July 20, 1878.

Lo'tus, or **Lotos** [Gr. λωτός], a name applied in literature to many widely different plants: (1) To the *Zizyphus Lotus*, a kind of jujube tree of Barbary (order Rhamnaceæ), whose fruit is extensively gathered as food. It is the subject of much Arabic poetry. (See JUJUBE.) It is probably the tree whose fruit beguiled the LOTOPHAGI (which see). (2) The *Melilotus Messinensis*, a valuable forage-plant of the Levant (see MELILOT), and of the order Leguminosæ. (3) The ebenaceous date-plum or pishamin (*Diospyros Lotus*) of Europe and Asia, much resembling our persimmon, and producing a valuable fruit. (4, 5) The fragrant blue and white Nilotic water-lilies (*Nymphæa cærulea* and *N. Lotus*), which were greatly honored by the Egyptians, and were everywhere worshipped. They were mystically connected with their mythology. The stalks and roots furnished food. (6) The *Nelumbium speciosum*, or sacred Egyptian bean, another beautiful pink water-lily, mystically honored in China and India, as well as in ancient Egypt. Its large seeds and roots were, and are still, eaten. This is the lotus-flower (*padme*, "lily-pad") of India. (7) A North African and European hackberry tree, *Celtis australis*, whose wood is prized by carvers and whose fruit is edible. Most of the above, with other trees, have been claimed as the source of the food of the fabled lotus-eaters. (8) There is a large genus of clover-like leguminous plants called *Lotus* by Linnæus, and still bearing that name. It includes the bird's-foot trefoils and other Old-World plants, which are in Europe cultivated as forage-herbs. The pods of some kinds are used as food; others are well known as garden flowers. (9) Recent American writers speak of the *Nelumbium luteum* as the lotus. It is one of our finest native water-plants (closely resembling No. 6 of this article). It is known as the water-chinquapin, and its seeds and roots, if cultivated, would yield a valuable supply of food. Many writers believe that the Homeric lotus was *Nitraria tridentata*, a thorny shrub of doubtful affinity.

Lotze (HERMANN RUDOLF), b. at Bautzen, Saxony, May 21, 1817, studied medical science, natural philosophy, and metaphysics at Leipzig, and was appointed professor of mental philosophy there in 1843. In the following year he accepted a call to Göttingen, and in 1881 to Berlin, where he d. July 1 of the same year. He was one of the most prominent representatives in Germany of the theistic view of the universe, and his mastery of natural science made him a formidable adversary of the prevailing materialism. He very early pronounced against the Hegelian pantheism on the one side and the atheistic materialism on the other, and, joining the small circle of theistic philosophers—Charles Philip Fischer, I. H. Fichte, Jr., H. Weisse, Ulrici, etc.—he gradually developed his own conception of theism. Unable to answer any questions about the relation between the two forms of existence, the material and the psychical, about their procession from one common source, about their diverging into violent differences, etc., he starts from a purely ethical basis, the relation between individual man and his Maker, and ends in the very centre of the doctrinal system of Christianity, His principal works are *Mikrokosmus* (1856–64, 3 vols.), *System of Philosophy* (1874–79, 2 vols.), *History of Esthetics in Germany* (1868), etc. His *Grundzüge der Religions philosophie* was published posthumously by his son.

Loudon, cap. of Loudon co., Tenn. (see map of Tennessee, ref. 6–I, for location of county), 30 miles S. of Knoxville, on the Little Tennessee River and East Tennessee Virginia and Georgia R. R., has a flourishing college. Pop. in 1880, 832.

Loudon (JOHN CLAUDIUS), b. at Cambuslang, Lanarkshire, Apr. 8, 1783; was educated at Edinburgh University; became a landscape gardener near London 1803; travelled extensively as an observer and student of horticulture, and became a practical instructor in the art. The best of his numerous works are the *Encyclopædias*—of Gardening (1822), of Agriculture (1825), of Plants (1829), of Architecture (1832)—and the *Arboretum et Fruticetum* (1838); was editor of the *Gardener's Magazine* (1826–43), of the *Magazine of Natural History* (1828–36). D. Dec. 14, 1843.—His wife, JANE WEBB LOUDON, b. near Birmingham in 1808, was married in 1831, and d. July 13, 1858. She was an able and pleasing writer, chiefly upon botanical and horticultural subjects.

Lou'donville, on R. R., Ashland co., O. (see map of Ohio, ref. 3-G, for location of county). Pop. in 1870, 811; in 1880, 1497.

Lough'borough, town of England, county of Leicester, on the Soar. Its manufactures of cotton and woollens, especially of the so-called patent Angola hosiery, are important. Pop. in 1881, 14,681.

Louis le Débonnaire, or THE PIOUS, Roman emperor from 814 to 840, b. at Casseneuil in 778, a son of Charlemagne by his third wife, Hildegard. His elder brothers having died, he succeeded his father Jan. 28, 814, and the first years of his government were quite successful. But in 817 he yielded to the wishes of his sons, and gave each of them a share in his dominions, and hence arose complications which he was utterly incapable of managing, and from which resulted the dissolution of the empire. Lothaire received Austrasia and the title of emperor; Pepin, Aquitania; and Louis, Bavaria, Bohemia, and the Avarian districts on the eastern frontier. Bernard, a nephew of Louis, who had inherited Italy after his father, received nothing, and revolted, but the emperor allured him to Chalons, took him prisoner, put out his eyes, and gave Italy to Lothaire. As soon as done the abominable atrocity of the deed struck the mind of the emperor with horror; he went to the Church to be comforted, and from this period he was merely a tool in the hands of the clergy. In 819 he married a second wife, Judith of Bavaria. In 823 she bore him a son, Charles, who later received the surname of *the Bald*, and in 829 he proposed to undertake a new division of the empire in favor of his youngest son. The three elder brothers were unwilling to lose anything, and a war broke out which, often stilled, always reopened, and lasted to the death of the emperor. Twice the father was defeated, taken prisoner, deposed, and subjected to various indignities by his three sons, but both times the avarice and ambition of Lothaire, who wished to reign alone, disunited the brothers, and Louis and Pepin again raised the father to the throne. Pepin d. in 838, and the emperor now proposed to give his dominions to Charles the Bald, thus excluding his sons from their inheritance; but when he at the same moment gave Italy and Austrasia to Lothaire and nothing to Louis, the latter revolted immediately, together with the sons of Pepin. During this war the unhappy emperor d. at Ingelheim, near Mentz, June 20, 840, and was buried at Metz.

Louis II., Roman emperor from 855 to 875, b. in 822, the eldest son of Lothaire I. After the death of Louis le Débonnaire, the empire was divided between his three sons, Lothaire I., Louis the German, and Charles the Bald, by the treaty of Verdun. This division of the empire of Charlemagne was carried still further on the death of Lothaire I., his part being subdivided between his three sons, Louis, Lothaire, and Charles. Louis II. received Italy and the title of emperor; Charles, Provence and Lyons; and Lothaire II., the territory between the Rhine, Saône, Meuse, and Scheldt, called Lotharingia (Lorraine). Louis II. fought successfully against the Saracens in Italy, defeated them at Benevento in 848, and expelled them from Bari. He also understood how to vindicate his authority over the great Italian families, of which many steadily conspired with the Byzantine empire. Charles d. without children in 863, and Louis II. and Lothaire II. divided his dominions; but when in 869 Lothaire II. also d. childless, Charles the Bald and Louis the German took advantage of the emperor's being implicated in a new and less successful war with the Saracens in Italy, and divided Lothaire's dominions between themselves. Louis II. d. at Brescia Aug. 13, 875, and as he left no male issue his two uncles seized his possessions, of which Lorraine fell to Germany.

Louis III., THE CHILD, Roman emperor from 908 to 911, b. in 893, a son of Arnulf, and raised to the throne of Germany on his father's death in 899 by Duke Otto of Saxe, Margrave Luitpold of Austria, and Archbishop Hatto of Mentz, who wished to govern the country during his minority. But the state of Germany while under their rule was miserable; the Hungarians invaded the country, and devastated it as far as Thuringia. In 908, Louis assumed the title of Roman emperor, but he d. in 911, and with him the Carlovingian dynasty became extinct in Germany.

Louis IV., THE BAVARIAN, emperor of Germany from 1314 to 1347, b. in 1286, a son of Duke Louis the Severe of Bavaria and Matilda of Hapsburg. On the death of Henry VII. of Luxemburg in 1313 he was chosen emperor by a majority of the electors, while a minority chose his cousin, Frederick III. of Austria. A long and devastating war commenced between the two emperors, but Frederick was at last defeated in the battle of Mühldorf, Sept. 28, 1323, taken prisoner, and compelled to renounce his claims. Having supported the Viscontis in Milan against Pope John XXII., a quarrel arose between the pope and the emperor. Louis IV. was excommunicated, but went in 1327 with an army to Italy, was crowned in Milan and Rome, deposed John XXII., and established Nicholas V. as antipope. In spite of his success, he was soon compelled to leave Italy, and John XXII. and his successors, supported by French intrigues, continued to oppose and harass him; Germany was placed under interdict. A diet at Reuse on the Rhine (July 15, 1338) declared that an emperor legally chosen by a majority of the electors needed no confirmation from the pope, nor was he in any way subject to his authority. Thus supported by the German princes, and having strengthened his position by large acquisitions of personal property, the emperor prepared for a new campaign against the pope, when he suddenly d. at Fürstenfeld, near Munich, Oct. 11, 1347.

Louis, the name of eighteen kings of France: (1) LOUIS I., LE DÉBONNAIRE, Roman emperor, 814–840 (which see).—(2) LOUIS II., LE BÈGUE (877–879), b. in 846, a son of Charles the Bald.—(3) LOUIS III. (879–882), b. in 864, a son of Louis II., divided the country with his brother Carloman, who inherited the whole after his death.—(4) LOUIS IV., D'OUTREMER (936–954), b. in 921, a son of Charles the Simple, was educated at the court of King Athelstane of England, a brother to his mother, Ogive. In 936, on the death of Raoul of Burgundy, he was called to the French throne by Hugh of Paris and William of Normandy, but his reign was only a series of contests with these two vassals, who in the war with Otho I. of Germany even allied themselves with the enemy.—(5) LOUIS V., LE FAINÉANT (986–987), b. in 966, a son of Lothaire and Emma, was the last king of the Carlovingian dynasty.—(6) LOUIS VI., LE GROS (1108–37), was b. in 1078, a son of Philip I. The possessions of the French king were at that time the cities of Paris, Orleans, Étampes, Melun, and Compiègne, with their territories, and the kingship itself was a rank rather than a power, but Louis VI. declared that his royal precedence among the princes of France involved a public charge, and he began to act according to this idea. Under him the *oriflamme* was first used as a national banner, and a feeling of national unity became prevalent in the population.—(7) LOUIS VII., LE JEUNE (1138–80), b. in 1119, a son of Louis VI., married Eleanor of Aquitaine, thereby uniting this large territory to the possessions of the Crown, but after the unfortunate crusade (1147–49) Eleanor demanded and obtained a divorce, because her "husband was a monk and not a man," and she then married Henry Plantagenet, who already possessed Anjou, Maine, and Touraine, and soon also Normandy and England.—(8) LOUIS VIII., CŒUR LE LION (1223–26), b. in 1187, a son of Philip Augustus, was stopped by the pope in his progress against the English, who at this time were nearly driven out of France. He made a crusade against the Albigenses, which contributed much to the development of the royal power by assembling the vassals under the royal banner.—(9) LOUIS IX., SAINT (1226–70), b. in 1215, a son of Louis VIII., was only eleven years old when his father died; during his minority the country was governed by his mother, Blanche of Castile, a lady of great energy, sagacity, and virtue. In 1236, Louis assumed the throne himself, and shortly after the count of Marche rose in insurrection, supported by Henry III. of England. But Louis defeated them at Taillebourg and Saintes in 1242, and after the victory he treated the rebellious count with so much magnanimity that he won not only the respect, but the good-will, of all his vassals. The most prominent trait in the character of St. Louis was his piety. His conscience, and not his ambition, governed his will. Religious enthusiasm was the motive-power in most of his actions. When the massacre of the Christian inhabitants of Jerusalem in 1244 became known in Europe, St. Louis took the cross in spite of all the remonstrances of his mother and councillors, and in August, 1248, he departed with an army of 80,000 men from Aigues-Mortes on the Mediterranean for the island of Cyprus. In June, 1249, he landed in Egypt and took Damietta, but when, after five months' postponement, he began to push forward to Cairo, he was stopped by the Egyptians in the battle of Mansoorah, and on Apr. 5, 1250, was compelled to surrender himself and his whole army, whose number meanwhile had been reduced to about 30,000. After paying a large ransom he was liberated and sailed for Syria, where he remained several years laboring to do something for the cause of Christianity in these regions. In 1254 he returned to France with about 500 followers. The following fifteen years of his reign were marked with many wise and vigorous reforms, such as "La Quarantaine de Roi," by which a truce of forty days was established from the committal of an offence, during which term the case was tried by the royal courts, and any attempt at private revenge was prohibited; "La Pragmatique Sanction," by which it was forbidden to levy money in France for the pope without the consent of the king, and those cases were defined in which ecclesiastics were to be tried by the secular courts; the foundation of the Sorbonne, of the library of Paris, etc. In June, 1270, the king embarked with an army of 60,000 men for a new crusade. He landed in Tunis, and formed a camp near the ruins of Carthage; but the plague broke out in the army, and he d. Aug. 25. His son Philip led the army home.—(10) Louis X., le Hutin (1314–16), b. in 1289, a son of Philip IV.—(11) Louis XI. (1461–83), b. in 1423, a son of Charles VII., was personally one of the most hideous characters to be met with in history—suspicious, faithless, cruel, and superstitious—but a man of great talent as a ruler. He consolidated the territory of France and the authority of the French crown in this territory, and he founded numerous institutions which were of great benefit to the public in general. But the means by which he curbed the feudal houses of France and brought them into absolute dependency on the Crown were detestable. The count of Armagnac was murdered in 1473; the duke of Alençon died in prison in 1474; the count of Luxembourg was beheaded in 1475; the duke of Nemours was kept for years in an iron cage, and beheaded in 1477; in all, he is said to have put about 4000 persons to death, most of them secretly. By intrigues of the vilest kind he came into possession of Provence, Maine, Anjou, Perpignan, etc., but his principal acquisition was the inheritance of Charles the Bold. Charles was a member of the league which was formed against Louis in the beginning of his reign by all the principal vassals of the French crown, among whom was the king's own brother, the duke of Berry. After the battle of Mont l'Héry in 1465, Louis made great concessions to all the members of the league, but having succeeded in disuniting some of the associates, he had the whole treaty annulled in 1466 by the States General of Tours, and recommenced the quarrel. He now invited Charles to an interview at Peronne, and while this took place he incited the citizens of Liege to revolt against him. As soon as Charles heard of this treachery he seized the king, and liberated him only on very hard conditions. Louis now allied himself with the duke of Lorraine and the Swiss, and when Charles fell in the battle of Nancy (in 1477) he at once incorporated Champagne, Artois, Picardy, and parts of Flanders with France, and managed to keep them in spite of the protest of Charles's heirs. In his internal policy he favored the lower and middle classes, especially the cities, encouraged learning, art, manufactures, and trade, improved public roads and canals, established the first post-system, made the administration of justice regular and cheap, etc.; nevertheless, he was feared and hated, not only by the feudal lords, but by all, and he spent the last years of his life in the fortress of Plessis-les-Tours, surrounded by soldiers and half crazy for fear that somebody should murder him.—(12) Louis XII. (1498–1515), b. in 1462, a son of Duke Charles of Orleans, succeeded Charles VIII. As a descendant of Valentina Visconti he laid claim to Milan, and in 1500 conquered the city and took Ludovico Sforza prisoner. In connection with Ferdinand of Aragon he soon after conquered Naples too, but disagreeing about the partition of their conquest, war broke out between the two allies, and in 1503, Gonsalvo de Córdova expelled the French from Southern Italy. In 1508, Pope Julius II. formed the League of Cambray between Ferdinand of Aragon, Louis XII., and the emperor of Germany against the republic of Venice; but Venice having satisfied the pope by ceding several towns to him, and the pope having become much alarmed at the progress of the French in Italy, the league was suddenly dissolved, and a new one, the so-called "Holy League," was formed between the pope, the emperor, Venice, Ferdinand of Aragon, and Henry VIII. of England against France. Defeated at Novara, the French were driven out of Italy in 1513. At the same time Henry VIII. landed in France with an army of 45,000 men, and having joined the imperial army pushing forward from the Netherlands, he defeated the French at Guinegate. Thus hard pressed on all sides, Louis began to negotiate, and succeeded in escaping from the difficult situation without any great loss.—(13) Louis XIII. (1610–43), b. in 1601, a son of Henry IV. and Marie de Médicis. His education was much neglected. During his minority the country was governed by his mother and her favorite, Concini, who was made a marshal and marquis of Ancre, but the government was only a mixture of weakness, violence, and intrigue. After the murder of Concini in 1617, Albert de Luynes, a favorite of the king, who was made a duke and peer of France, grasped the reins, but his government was in nowise better. After his death in 1624, Cardinal Richelieu (which see) entered the council, and from this moment it was he who ruled France with almost absolute power. The king lived mostly in seclusion, occupied in hunting, drawing, and quiet social enjoyments. He stood in awe of his minister; he had a dread of business; he hated his own family; and Richelieu always understood how to calm down his jealousy when now and then it awakened.—(14) Louis XIV. (1643–1715), b. at St. Germain-en-Laye Sept. 5, 1638, a son of Louis XIII. and Anne of Austria. During his minority his mother and Cardinal Mazarin (which see) governed the country, and brought to a final close the contest between the royal power and the wealthy and ambitious aristocracy, represented at this period by the league of the Fronde. Mazarin d. Mar. 9, 1661, and the next day, when the chiefs of the different departments of the administration asked the king to whom they had to address themselves in the future on questions of business, he answered, "To me." He was from this moment his own prime minister, and in the despatch of business he developed, besides an almost Asiatic despotism, great energy and much sound judgment. He believed that a king was something divine, and he acted on this belief. He surrounded his person with a most magnificent splendor, and guarded his dignity with the most minute forms of etiquette. But his haughtiness did not offend people; it dazzled them. And while his brilliant personal gifts fascinated all who came in contact with him, and attracted to his court all that was eminent in France, the extraordinary prosperity of his government during the first half of his reign made him the idol of the nation. Colbert brought order not only in the finances, but in the whole internal administration, and under his leadership great enterprises were undertaken with signal success. The harbors and shipyards of Brest, Rochefort, Lorient, Havre, Dunkirk, Cette, and Toulon were constructed and fortified; the canal of Languedoc, uniting the Atlantic with the Mediterranean, was built, and other canals and public roads were improved; commercial treaties were concluded with Holland and Italy; manufactures of different kinds were established; and while the people arose from poverty to affluence, the revenues increased immensely and the king grew rich. No less successful was Louis XIV. in the organization and development of the intellectual life of the French people. The Academy of Inscriptions and Belles-Lettres was founded in 1663, the Academy of Sciences in 1666, the Academy of Painting and Sculpture in 1667; nineteen new professorships were founded at the Royal College; the Royal Library was greatly increased; an observatory was built at Paris; and all these institutions were not only amply supported with means of subsistence, but the interest the king showed for them gave their social position dignity and influence. A new taste was created—not in the sense of a new fashion, but of a new ideal of beauty—and this taste was actually imposed on the whole civilized world by Racine, Molière, Boileau, Fénelon, Bossuet; by Lebrun, Poussin, Claude Lorraine; by Perrault, Mansard, Blondel; by Le Notre and others. To these successes it must be added that Louvois, Vauban, and the duke of Beaufort created a powerful army and navy, which under the leadership of Turenne, Condé, Luxembourg, Vendôme, Duquesne, Tourville, and others made any movements of the king with respect to his foreign policy most effective. It has been said of Louis XIV. that he aspired at a universal kingdom, and dreamt the same dream as Charles V. and Napoleon. But for such an idea his mind was too small. His ambition was fired by his imagination, not by any passion. The theatrical effect satisfied him; he was vain only. His first wars were sensible, however. They seem to have had for their principal purpose the establishment of a safe frontier to the N. and N. E., and France certainly needed a reconstruction of her boundaries on these sides. They are blamable, nevertheless, on account of the arrogance and entire disregard of all international rights with which they were commenced, and the almost unexampled barbarity with which they were conducted. In 1665, Philip IV. of Spain died, and Louis, who in 1660 had married his daughter, Maria Theresa, now claimed the Spanish possessions in the Netherlands, and overran the country with a large army. A triple alliance was formed between England, Holland, and Sweden for the purpose of establishing peace between France and Spain, but by the treaty of Aix-la-Chapelle (May 2, 1668) Louis obtained the so-called French Flanders, besides a number of places along the frontier. His first object after the peace was to separate England from Holland, and, a master in intrigue, he completely succeeded in seducing the weak Charles II., and when in 1670 he began the war against Holland, England was his ally. In Holland, William of Orange was appointed stadtholder and commander-in-chief, and by his diplomatic skill a new league was formed against France between Holland, Brandenburg, the emperor of Germany, and Spain. By the Peace of Nymwegen (in 1678) Louis nevertheless obtained the whole Franche Comté and Alsace. Not content, however, with that which he gained by actual wars, he now began to seize cities and territories during time of peace and under the most futile pretexts. Thus, in 1681 he took Strasbourg, in 1684 Luxemburg, and so on. In order to put an end to such proceedings, a league was formed at Augsburg in 1686 between Holland, Austria, Spain, Bavaria, and Savoy, but although the king opened the war with his usual energy, overrunning the Palatinate and transforming this beautiful country into a desert, and although his armies gained one brilliant victory after the other, yet the victories proved sterile, and by the Peace of Ryswick (Sept. 20, 1697) he had to give up all the conquests he had made during the war, make considerable commercial concessions to Holland, and, what was most humiliating to his pride, recognize William III. as king of England. A great change had taken place during this period in Europe, in France, and in Louis himself. The accession of William III. to the throne of England indicates the turning-point of the fortune of Louis XIV. William was his equal in diplomatic craftiness, and far his superior in statesmanship. In France, Colbert d. Sept. 6, 1683, Louvois July, 1691, and the government passed into the hands of Madame Maintenon, whom the king married secretly in 1685. The Revocation of the Edict of Nantes (Oct. 22, 1685) threw the whole internal development of the country into a most disastrous confusion. The building of Versailles and the expensive armaments for the re-establishment of James II. in England completely exhausted the finances; and while the means of realization became more and more limited, the plans of the king became more and more arrogant. His pride and egotism assumed the most odious forms. He maintained a bloody war along the whole frontier merely for the whims of his vanity. He banished, persecuted, and ruined his own subjects merely because they did not hold the same creed. He sanctioned by his example crimes utterly destructive of the very foundation of civilized society, merely because they suited his passions. And at last he dragged the exhausted and already suffering people into misery for a mere dynastic purpose. At the end of the war of the SPANISH SUCCESSION (which see) the state of France was nearly desperate. The public debt amounted to over 3,000,000,000 f., and seven-eighths of the whole population were utterly impoverished. All business and all industry were in many places entirely destroyed, and famine began to show itself. No actual insurrection took place, though confusion and disorder reigned everywhere, but when the old king d. (Sept. 1, 1715) the whole nation felt it as a liberation.—(15) LOUIS XV. (1715–74), a great-grandson of Louis XIV., b. at Versailles Feb. 15, 1710. During his minority the country was governed by the duke of ORLEANS (which see). After the death of the duke in 1723, Cardinal Fleury, who had been the teacher of the young king, became prime minister, and his parsimony restored some order to the finances, which had been brought to the very verge of bankruptcy by the prodigality of Louis XIV. and the wild schemes of the regent. The young king, who had married in 1725 Maria Leszczynski, a daughter of Stanislaus, ex-king of Poland, seemed to be a noble and honest man, and the war with Saxony, Russia, and Austria, which France commenced in 1733 for the purpose of reinstating Stanislaus on the Polish throne, was conducted with success, and brought the country the beautiful province of Lorraine by the Peace of Vienna (1738). But these encouraging prospects were soon changed in the saddest manner. During the Austrian war of succession Cardinal Fleury d. in 1743, and in the mean time the frivolous and corrupted court had succeeded in seducing the young king, whose profligacy and dissipation soon assumed an extent and openness hitherto unheard of. Châteauroux was succeeded by Pompadour, Pompadour by Du Barry, and besides the official mistresses the king maintained a harem, the so-called Parc-aux-Cerfs, whose story belongs to the most revolting pages of history. The finances ran rapidly into ruin; Dubarry was allowed to squander 180,000,000 f. in five years. On Pompadour's instigation, France took part in the SEVEN YEARS' WAR (which see), but she lost her colonies, her fleet was destroyed, her armies were beaten one after the other, and to the immense material losses and sufferings was added national disgrace. The king was conscious of the perilous state of affairs, but he thought, "Apres nous le déluge," and went on. The popular opposition to the horrible abuses of the royal authority began to show itself through the Parliament of Paris, whose privilege it was to countersign the royal tax-edicts, but which refused to do so. The resistance, however, was curbed with violence. The Parliament was broken up, its members punished and replaced by more willing tools, and the king was allowed to rot in peace. When he died at Versailles on the afternoon of May 1, his corpse, a heap of "confluent smallpox" and other still more loathsome diseases, was carried away to St. Dénis in the evening in a hurry, without ceremonies, unaccompanied by any even of his nearest kinsmen or servants, but reviled with the execrations of all passers-by.—(16) LOUIS XVI. (1774–93), a grandson of Louis XV., b. Aug. 23, 1754, was a good-natured, well-meaning, honest man, of pure morals, and capable of making a sacrifice for the public weal, but his will was weak and his intellect narrow. He was unable to comprehend the situation, and he was entirely destitute of political instincts. Thus he hastened the approach of the Revolution. The finances, burdened by a new debt of 1,500,000,000 f., contracted by the participation of France in the American war of independence, formed the point of issue. The annual budget showed a deficit of 140,000,000 f. There were two remedies—restriction of the expenses, which the queen and the court opposed, and taxing the privileged classes, which the Parliament opposed. The king, a good printer and an ingenious locksmith, but incapable of deciding in such a dilemma, hoped to find a third expedient by appealing to the people; and thus it came to pass that he himself appealed to the Revolution. (See FRANCE—*History*.)—(17) LOUIS XVII., a son of Louis XVI. and Marie Antoinette, b. at Versailles Mar. 27, 1785; shared at first the imprisonment of his parents in the tower of the Temple, but was after the decapitation of his father separated from his mother, and died of ill-treatment and neglect in his cell (June 8, 1795). A number of impostors pretended to be Louis XVII., and excited some attention, but their claims were easily disproved.—(18) LOUIS XVIII. (1814–24), b. at Versailles Nov. 17, 1755, a brother of Louis XVI., received at his birth the title of count of Provence. In 1791 he fled, and lived in Coblentz, Verona, Mitau, and England. After the death of Louis XVII. he assumed the title of king of France, but his pretensions elicited generally only a smile, and the court of emigrants he assembled around him often excited disgust. Nevertheless, after the fall of Napoleon he was called to the French throne. Both the French people and the foreign powers wished peace, and the re-establishment of the Bourbons was considered its only safe guaranty. There was, however, only one fraction of the French people with which the king was in full harmony—namely, the old emigrants, who hoped through him to get not only restitution, but also vengeance; and even these partisans he was compelled to disappoint in order to preserve his throne. His reign was a time of confusion and dulness, and in the actual process of restoration and reorganization, which went on silently and instinctively, he took no part. Personally, he was indolent, apathetic, good-humored, and shrewd in a small way.

CLEMENS PETERSEN.

Louis the German [Ger. *Ludwig der Deutsche*], b. about 805, a son of the emperor Louis le Débonnaire, received by the first division of the empire of Charlemagne (in 817) Bavaria and the Slavic countries on the eastern frontier, but by the treaty of Verdun in 843, which ended the war between the heirs of Louis le Débonnaire, he obtained the whole territory W. of the Rhine, and became the founder of the German empire. Invited by the discontented vassals of Charles the Bald, he broke into France in 858, and conquered the country, but the difference between the Eastern and Western Franks—that is, between the Germans and the French—were at this period so great that a union of the two tribes proved impossible, and Louis was compelled to give up his conquests. Against the Bulgarians in the S. E. and the Normans in the N. W. he fought with valor, though not always with success; the bishopric founded at Hamburg in 834 he was compelled to remove to Bremen in 858, as the pagans burnt down the former city. After his death in 876 his sons divided the empire between them.

Louis the Great, king of Hungary from 1342 to 1382, a son of Charles Robert of Anjou, was one of the most successful of the elective monarchs of that country. Although he failed in his expeditions to Naples for the purpose of avenging his brother Andrew, who had been murdered by his wife Joanna, queen of Naples, he extended the boundaries of Hungary to the S. E., and united Poland to it on the death of Casimir the Great in 1370. He expelled the Jews, but by decreasing the duty on merchandise he greatly encouraged the commerce of the country. On the general development of civilization in his realm he exercised great influence. He founded a rich college in Fünfkirchen, and Buda became one of the most splendid capitals of Europe.

Louis Napoleon. See Napoleon III.

Louis Philippe, king of the French from the revolution of July, 1830, to that of Feb., 1848, b. at Paris Oct. 6, 1773, the eldest son of Duke Louis Philippe Joseph of Orleans. From his father and governess (Madame de Genlis) he imbibed the revolutionary ideas of the period, entering the National Guard and the Jacobin Club, and renouncing his titles for the name of Citizen Égalité. He greatly distinguished himself as General de Chartres in the battle of Jemappes, and, what is not so well known, made the journey to Paris to dissuade his father from voting for the death of Louis XVI. Though the edict which banished the Bourbon family exempted him and his father, his position became difficult, especially as his commander, Dumouriez, was suspected by the Convention of intriguing to place him on the throne. Orders of arrest were issued both against him and Dumouriez, and on Apr. 4, 1793, they fled across the Austrian frontier. For more than twenty years he was an exile, often contending with very hard circumstances, as shortly after his flight his father was executed, his mother banished from France, and all the property of the family confiscated. He lived for some time in Switzerland, teaching mathematics in a school; for some time in Scandinavia, where he travelled as far as the North Cape; from 1796 to 1800 in the U. S.; from 1800 to 1807 at Twickenham near London; and after 1809 at the court of Ferdinand I. of Sicily, whose daughter, the princess Marie Amélie, he married. He twice attempted to join the adherents of the Bourbon family in Spain, but was both times foiled by the English diplomacy. After the fall of Napoleon he returned to Paris, was reinstated in the possession of the immense property of the Orleans family, taking up his residence in the Palais Royal; but although a reconciliation had taken place between him and the elder line of the Bourbon family, the king, Louis XVIII., disliked, suspected, and feared him. The duke of Orleans, as was now the title of Louis Philippe, was a man of great gifts and of great attainments, eloquent, accomplished, fascinating, with vivid instincts and large views, shrewd and sound in his judgment of persons and things. Alexander of Russia marked him out as the most prominent member of the Bourbon family, and although he lived in a rather retired manner in Paris and took very little part in politics, he soon became very popular. On the outbreak of the revolution of July, 1830, the Chamber of Deputies, after deposing the king, chose him lieutenant-general of the realm, Charles X. recognizing him as such, and hoping through him to preserve the throne for the count of Bordeaux. Whether this could have been done is doubtful; the crown was offered by the Chamber of Deputies to Louis Philippe, who accepted it, though henceforth he was considered by the pure Legitimists disloyal to the cause of legitimacy. His reign of eighteen years does not show a series of extraordinary events, welcome themes to the historian, but filling the people with sadness and misery —a fact honorable to him rather than a subject of reproach —one which is to this day vividly felt by the French lower classes smarting under the burden of war and other taxes, legacies of the last Napoleon. Nevertheless, France was not left without substantial benefits from his reign. The foundation of the kingdom of Belgium, which protected the northern frontier, and the conquest of the large and beautiful colony of Algeria, are among the most notable, and may well be set off against what have been considered the reproaches of his reign. Louis Philippe was both a statesman and a shrewd administrator, but his government was too little *en rapport* with the feelings of the French people; many causes of discontent arose (see Nemours, Duc de), accompanied with charges of corruption in the ministry. An extension of the elective franchise was demanded. Resisted by the king, the revolution broke out which deprived him of his throne and banished him from the country. D. at Clermont, near London, Aug. 26, 1850. Those who would appreciate Louis Philippe in his domestic relations should read Prof. Schubert's charming *Life* of Helen of Mecklenburg-Schwerin, duchess of Orleans.

J. G. Barnard.

Louis (Pierre Charles Alexandre), M. D., b. at Aï, Marne, France, in 1787; graduated in medicine at Paris in 1813, and became connected with the Charité Hospital, and afterwards with the Pitié and the Hôtel Dieu; he acquired a worldwide fame as a diagnostician, pathologist, and clinical observer. He was the first to distinguish properly the difference between typhus and the so-called typhoid or enteric fever; became in 1826 a member of the Academy of Medicine. His *Recherches sur la Phthisie* (1825), *Recherches sur la Fièvre typhoïde* (1828), and other works had an extensive and valuable influence. Louis was one of the fathers of the modern methods of clinical observation. D. at Paris Sept., 1872.

Louisa, cap. of Lawrence co., Ky. (see map of Kentucky, ref. 3–K, for location of county), on R. R. and Big Sandy River. Pop. in 1870, 425; in 1880, 496.

Louisa Court-house, cap. of Louisa co., Va. (see map of Virginia, ref. 5–G, for location of county), on the Chesapeake and Ohio R. R. Pop. in 1880, 315.

Lou'isburg, a famous fortress built by the French soon after the Peace of Utrecht (1713) upon the eastern coast of Cape Breton Island, in lat. 45° 53′ 30″ N., lon. 60° W., receiving its name in honor of Louis XIV. The works constructed here were of the heaviest and most complete description, and were built of stone. A large and well-built town of some 3000 inhabitants sprang up, favored by the spacious and excellent harbor. Since the existence of so strong a place threatened the colonial and English fisheries, it was determined in 1745 by the legislature of Massachusetts Bay (France and Great Britain being then at war) to strike a blow at the town. Accordingly, a force of colonists consisting of 3250 Massachusetts militia, aided by 516 men from Connecticut and 304 from New Hampshire, set sail in 100 vessels, and landed near the town Apr. 30, 1745. An active but irregular siege (though the men were without tents and the proper means of conducting such operations) was terminated June 17, 1745, by the capitulation of the French under Duchambon—an event that caused the greatest joy throughout the British empire. But the Peace of Aix-la-Chapelle (1748) gave back all Cape Breton to France. The town was invested in 1758 by Gen. Amherst with 14,000 British troops, 20 line ships, 18 frigates and other vessels. After a tremendous bombardment, which quite destroyed the town and breached the walls badly, the garrison and French fleet surrendered, July 26, 1758. The defence was very spirited. The number of prisoners was 5637. The English overthrew the fortifications at an expense of $50,000. The first cost was one hundred times that sum. The ruins still remain. There is a lighthouse. The village is in Cape Breton co., N. S., and is 24 miles S. E. of Sidney. Pop. of census subdistrict in 1881, 999.

Louisburg, cap. of Franklin co., N. C. (see map of North Carolina, ref. 2–H, for location of county), on Tar River, 10 miles E. of Franklinton and 31 miles N. E. of Raleigh, has flouring-mills, steam saw-mills, steam cotton-gins, a female seminary, and a considerable trade in cotton. Pop. of v. in 1870, 750; in 1880, 730.

Louis d'Or ("Louis of gold"), a French gold coin, first struck in 1641 under Louis XIII., not coined since 1795, but the name is often given to the twenty-franc piece or gold Napoleon, and to certain German five-thaler pieces. The value of the louis fluctuated considerably, but may be roughly stated to be about five dollars in Federal money.

Louisiana, loo-e-ze-ah'na, a Gulf State of the U. S. (see map of Ark., La., and Miss., in article Arkansas), wholly within the Mississippi Valley, and the greater part of it in delta of Mississippi River, is between 89° and 91° W. lon., and 28° 56′ and 33° N. lat.; extreme length from E. to W., 298 miles; extreme breadth from N. to S. about 280 miles; area, 48,720 square miles, or 31,180,800 acres; bounded N. and E. by Arkansas and Mississippi, S. and S. E. by the Gulf of Mexico and several sounds and estuaries from the Gulf, and W. by Texas.

Seal of Louisiana.

Louisiana, by census of 1880, ranked 22 among the States in population, 22 in value of agricultural products, and 25 in value of manufactures.

Face of the Country.—The N. and N. W. portions of the State rise into low hills not exceeding 240 feet in height, and from these the land slopes gradually toward both the Mississippi and the Gulf. A large portion of the delta of the Mississippi is marshy and actually below the river at high water. In all, about 8450 square miles is subject to inundations, though not all of it annually. Along the Mississippi River much of the land is below the surface of the river at the spring freshets, and is protected from overflow by levees or artificial embankments. These levees extend over 750 miles within the limits of the State. They are sometimes worn and broken through by the floods, and the "crevasses" thus produced cause the submergence of hundreds of thousands of acres. Local topographers classify the lands of the State as "good uplands;" "pine hill lands," usually not very fertile; "alluvial tracts;" "bluff or loess regions;" "marsh-lands;" "the prairie regions," and "the pine flats." The whole alluvial region of the delta is very fertile, and its deep black loam will yield enormous crops; the hilly country, on the contrary, is not very productive, and some portions of it are sandy barrens.

Rivers, Lakes, Sounds, and Bays.—The Mississippi River has a course of about 590 miles in the State, and is navigable for the largest steamers throughout its whole extent. The Red River, the second in size of the great tributaries of the Mississippi, enters the State in the N. W. and crosses it diagonally. Its principal affluents in the State are the Washita, with its two large branches, the Tensas and the Bœuf, the Dugdemona, the Sabine Bayou, and the Bistineau River and Lake. The Sabine River forms a part of the W. boundary of the State, and the Calcasieu and Mermenteau are considerable streams, the latter having several tributary bayous or sluggish streams. The Pearl River, having Bogue Chitto for a tributary, the Tangipahoa, Tickfaw, and Amite are the principal streams E. of the Mississippi. There are, besides these, several large bayous or estuaries which are really outlets or secondary mouths of the Mississippi. The principal of these are Atchafalaya Bayou, with its series of lakes, Vermilion Bayou, Bayou Teche, which connects with it, Bayou de Large, Bayou la Fourche, and the estuaries, lakes, and bayous which debouch into Barataria Bay. The distinction between lakes, sounds, and estuaries in this State is not very marked. Lake Pontchartrain is perhaps a lake, but its waters are salt and rise and fall with the tide; Lake Borgne is only a sound or bay; Lake Maurepas is closely connected with Pontchartrain; Sabine Lake, Calcasieu Lake, Lake Mermenteau, etc., are all estuaries connected with rivers or bayous. In Northern Louisiana there are ten or twelve lakes which are expansions either of the Red River or its tributaries. Some of these are of considerable extent. Along the coast there are Chandeleur and Isle au Breton sounds, Bay Ronde, Garden Island Bay, East and West bays, Timbalier, Terre Bonne, Caillou, Atchafalaya, Côte Blanche, and Vermilion bays.

Minerals, etc.—In the N. W. part of Louisiana brown coal of fair quality is found in considerable quantity; iron is somewhat abundant in this region, and salt springs and salt deposits; that on Petit Anse Island has been mined to a depth of 60 feet below the level of the Gulf, 58 feet through solid rock-salt of the purest quality. Ochre, marl, gypsum, lead, sulphate of soda, sulphate of iron, and a very pure carbonate of lime occur in considerable quantities. In the S. part of the State there are deposits of sulphur, and at one point between the Calcasieu and Sabine rivers artesian wells have been bored and shafts sunk, which demonstrate that, beginning at a point about 428 feet below the surface, there is a deposit of sulphur 112 feet in thickness, and which yields from 60 to 96 per cent. of pure sulphur. The more superficial strata at this point contain petroleum, but not in sufficient quantity to be worked with profit. Copper has also been found in several parishes. Among the minerals not of economic value are quartz-crystals, jasper, agates, carnelians, sardonyx, onyx, feldspar of fine quality, and meteoric stones. Fossils of various kinds have also been discovered at different points. Most of these minerals have been found in the Tertiary.

Soil and Vegetation.—The entire alluvial deposits furnish a soil of extraordinary permanence and fertility. The delta lands are unsurpassed for the culture of sugar-cane, cotton, rice, wheat, barley, buckwheat, sweet potatoes, and figs. The islands produce sea-island cotton equal to the best. The orange flourishes well. The Tertiary region has not so rich a soil, but Indian corn does better there than in the alluvium. Cotton grows everywhere. A portion of the Tertiary region is covered with heavy though not dense pine forests. About one-fifth of the area of the State is too swampy and marshy for cultivation, and much of it is covered with lofty cypress trees, from which the Spanish moss hangs in graceful festoons. The other forest-trees of the alluvial portion of the State are ash, sweet gum, hickory, black walnut, magnolia, live-oak, Spanish, water, black, chestnut, white, and post oaks, tulip tree, Florida anise, linden, lance-leaved buckthorn, four or five species of acacia, wild cherry, pomegranate, holly, arbor vitæ, tillandsia, lime, pecan, sycamore, white and red cedar, and yellow pine, and in the Tertiary sassafras, mulberry, poplar, hackberry, red elm, maple, honey locust, dogwood, tupelo, box elder, black locust, prickly ash, persimmon, etc. Along the rivers the cottonwood, willow, basket elm, palmetto, wild cane, papaw, and wild orange are found. Of fruit trees, the peach, quince, plum, fig, orange, papaw, and olive do well; the apple and pear are not so thriving. The grazing in the uplands generally is excellent; in the Attakapas country, along the Atchafalaya and Bayou Teche, the pasturage is unsurpassed in quality. Louisiana, like Florida, is a land of flowers.

Zoology.—In the forests black bears and wolves, and in the cypress swamps panthers of large size and great ferocity, are occasionally met with, while the wild-cat, raccoon, polecat, opossum, otter, squirrel, two or three species of rat, mouse, dormouse, and mole are abundant. The alligator inhabits all the bayous; there are several species of turtle; lizards, horned frogs, many species of toad, the gecko, and chameleon, while rattlesnakes, vipers, moccasin, horned, and other snakes are very common. The birds of most note are the bald and the gray eagle, the king vulture, the turkey-buzzard, and other vultures, kites, hawks, owls, gulls, the pelican, cranes, herons, wild-turkeys, pigeons, partridges, wild-geese, brant, and wild-ducks generally abundant, and a great variety of smaller birds, many of them of brilliant plumage. The fish are generally those common to the Gulf.

Climate.—The climate of New Orleans and the lower portion of the delta is to some extent malarious. Bilious and congestive fevers are very prevalent, and the worst forms of intermittent not uncommon. The yellow fever may be considered endemic in New Orleans, though it is not epidemic oftener than once in seven or eight years. Western and North-western Louisiana is perhaps as healthy a region as any part of the U. S. The average temperature of the year is not so high as in other States and countries in the same latitude.

Agricultural Products.—The most valuable crop in Louisiana is cotton, valued at over $20,000,000. Next to this is the sugar-cane, producing more sugar and molasses by nine-tenths than all the other States. The crop of 1879 (census of 1880) was 171,706 hogsheads of sugar and 11,696,248 gallons of molasses; rice, 23,188,311 pounds; Indian corn, 9,889,689 bushels; cotton, 508,569 bales.

**Farm Animals.*—By the census of 1880, Louisiana had, of horses, 104,428; cattle, 470,601; sheep, 135,631; swine, 633,489.

Levees.—The people of Louisiana have built and now maintain in repair more than 1500 miles or 51,000,000 cubic feet of levees within the State limits. But for these the greater part of the delta would be a slimy swamp.

Railroads.—In 1880, Louisiana had 1231 miles of railway, costing $44,869,349, with gross earnings, $3,288,318; net earnings, $984,497. The most important lines were the Louisiana and Texas (166 miles), the Louisiana Western, and the New Orleans and Mobile.

Commerce.—The foreign commerce of Louisiana is large; total exports in 1881, $103,743,986, principally breadstuffs and cotton; total imports in 1881, $12,213,920. The interior commerce is also heavy, by both river and railway.

Manufacturing and Mining Industry.—Louisiana is not largely engaged in manufactures. In 1880 it had 1553 manufacturing establishments (value of cotton-seed oil and cake, $3,739,466). Sugar-refining has increased since 1870, but other manufactures have languished. The mining industry of the State consists of some coal-mines, rather inefficiently worked, a little iron mined, the salt-mine of Petit Anse island, and the sulphur-mine at Calcasieu Springs. In 1880 there were engaged in cotton manufactures 108 persons, running 120 looms, with 6096 spindles, and using 1354 bales of cotton. New Orleans had, in 1880, 915 manufacturing establishments, with capital of $8,565,303; hands employed, 9504; wages paid, $3,717,557; and total products, $18,808,096.

Finances of the State.—The valuation of taxable property, by census of 1880, was $160,162,439; State tax, $1,771,084; total taxation, local and State, $4,395,876; State debt, 1881, $12,171,940, having been "scaled" by liquidation at 60 cents on the dollar.

Banks.—In Oct., 1881, Louisiana had 7 national banks, all at New Orleans, with capital, $2,875,000; circulation, $2,157,100; bonds to secure circulation, $2,475,000; and deposits, $8,478,487. There were 7 State banks and trust companies, with $5,147,188 deposits; 1 savings bank, with $2397 deposits; and 5 private banks, deposits not given.

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* On farms only.

Education.—Number of children of school-age, six to eighteen years, in 1880, 273,845, of whom only 68,440 were enrolled in public schools, about half white; number of schools, 1669; whole amount expended, $455,758. There are over 300 private schools, and 8 colleges, with 68 instructors and 677 students, paying in tuition, in 1880, $15,327. There are (1882) 102 newspapers and periodicals, of which 9 are daily.

Churches.—Louisiana has about 1300 churches, of which the Baptists claim the largest number, having 752 churches and 56,593 members; Methodists, 217 churches and 31,210 members; Roman Catholics, 107 churches; Presbyterians, 50 churches and 3218 members; Protestant Episcopal, 44 churches and 2983 members; and 12 other denominations, varying from 3000 members down to 20.

Population.—In 1860, 708,002; 1870, 726,915; 1880, 939,946 (white 454,954, colored 484,992, including 848 Indians and 489 Chinese).

Principal Cities and Towns.—New Orleans, the commercial metropolis, and since the war, until 1881, the political cap. of the State, in 1880 had 216,090 inhabitants; Shreveport, 8009; Baton Rouge, the cap., 7197; Natchitoches, 2785; New Iberia, 2709; Donaldsonville, 2600; Gretna, 2396; Monroe, 2070; Plaquemines, 2061; Alexandria, 1800; Franklin, 1702; Opelousas, 1676; St. Martinsville, 1606; Thibodeaux, 1515; Minden, 1113.

PARISHES.	* Ref.	Pop. 1870.	Pop. 1880.	PARISH TOWNS.	Pop. 1880.
Ascension	10–E	11,577	16,895	Donaldsonville...	2,600
Assumption	11–E	13,234	17,010	Napoleonville ...	497
Avoyelles	9–D	12,926	16,747	Marksville.........	553
Bienville............	7–B	10,636	10,442	Sparta................	160
Bossier	6–B	12,675	16,042	Bellevue.	
Caddo................	6–B	21,714	26,296	Shreveport.........	8,009
Calcasieu.	10–B	6,733	12,484	Lake Charles......	838
Caldwell	7–D	4,820	5,767	Columbia	219
Cameron	10–B	1,591	2,416	Cameron.	
Catahoula...........	8–D	8,475	10,277	Harrisonburg ...	243
Claiborne	6–C	20,240	18,837	Homer	718
Concordia...........	8–E	9,977	14,914	Vidalia	449
De Soto	7–B	14,962	15,603	Mansfield...........	770
E. Baton Rouge..	10–E	17,816	19,966	Baton Rouge......	7,197
East Carroll........	6–E	......	12,134	Lake Providence	
East Feliciana....	9–E	13,499	15,132	Clinton	1,129
Franklin............	7–D	5,078	6,495	Winnsborough.	
Grant.................	8–C	4,517	6,188	Colfax.	
Iberia	10–D	9,042	16,676	New Iberia.........	2,709
Iberville..	10–D	12,347	17,544	Plaquemine	2,061
Jackson	7–C	7,646	5,328	Vernon..............	83
Jefferson	11–F	17,767	12,166	Gretna...............	2,396
Lafayette	10–D	10,388	13,235	La Fayette.........	815
Lafourche..........	11–F	14,719	19,113	Thibodeaux.......	1,515
Lincoln..............	7–C	......	11,075	Vienna	368
Livingston	10–F	4,026	5,258	Port Vincent.	
Madison	7–E	8,600	13,906	Delta................	399
Morehouse.........	6–D	9,387	14,206	Bastrop.............	822
Natchitoches... ..	8–B	18,265	19,707	Natchitoches......	2,785
Orleans	10–G	191,418	216,090	New Orleans	216,090
Ouachita............	7–D	11,582	14,685	Monroe..............	2,070
Plaquemines......	11–G	10,552	11,575	Pointe a la Hache	
Point Coupée......	9–D	12,981	17,785	Point Coupée.	
Rapides.............	9–C	18,015	23,563	Alexandria........	1,800
Red River..........	7–B	......	8,573	Coushatta..........	488
Richland............	7–D	5,110	8,440	Rayville............	216
Sabine	8–B	6,456	7,344	Many.................	143
St. Bernard.........	11–G	3,553	4,405	St. Bernard.	
St. Charles	11–F	4,867	7,161	Hahnville	414
St. Helena..........	9–E	5,423	7,504	Greensburg........	297
St. James...........	10–E	10,152	14,714	Convent.	
St. John Baptist..	10–F	6,762	9,686	Edgard.	
St. Landry.........	10–D	25,553	40,004	Opelousas..........	1,676
St. Martin..........	10–D	9,370	12,663	St. Martinville...	1,606
St. Mary's..........	11–D	13,860	19,891	Franklin	1,702
St. Tammany.....	10–F	5,586	6,887	Covington	567
Tangipahoa........	9–F	7,928	9,638	Amite City.........	1,120
Tensas..............	8–E	12,419	17,815	St. Joseph..........	486
Terrebonne........	11–E	12,451	17,957	Houma	1,084
Union...............	6–C	11,685	13,526	Farmersville......	712
Vermilion.........	10–D	4,528	8,728	Abbeville..........	255
Vernon	9–B	......	5,160	Leesville.	
Washington	9–F	3,330	5,190	Franklinton.	
Webster............	6–B	......	10,005	Minden	1,113
W. Baton Rouge..	10–E	5,114	7,667	Port Allen.	
West Carroll	6–E	......	2,776	Floyd.	
West Feliciana...	9–E	10,499	12,809	Bayou Sara.......	710
Winn................	8–C	4,954	5,846	Winnfield	133
Total...............		726,915	939,946		

History.—Louisiana was first visited by Europeans in 1541, when De Soto with his followers came to the Mississippi River. In 1673, Father Marquette and his Canadians descended the Mississippi to its mouth, but established no colony. In 1682, La Salle again descended the Mississippi, and took possession of the country in the name of Louis XIV., giving it the name "Louisiana." In 1699, Iberville with a considerable number of colonists attempted a settlement at Biloxi. He d. soon after, and his successor in command, Bienville, led his fellow-colonists to a somewhat sunken spot on the river-bank, and there made his last stand. This was about 1706, and the new location was on the present site of New Orleans. In 1717 the province of Louisiana fell into the hands of John Law, and the Mississippi bubble expanded to vast dimensions—and burst. In 1718, Bienville was appointed governor, and built up the town whose site he had selected twelve years before. In 1723 the capital of the colony was removed from New Biloxi to New Orleans. The "Western Company"—or "The Company of the Indies," as Law's organization was known—remained in existence for ten years or more after the failure and escape of Law, but in 1730 it surrendered its grant to the Crown, by whom the colony was managed until 1762, when the whole province was secretly ceded by France to Spain, and for thirty-eight years was under the control of that power. In 1800 it was restored by the treaty of Ildefonso to France, and in 1803 it was sold to the U. S. for the sum of $11,250,000 and the assumption of the claims of citizens of the U. S. against France, known as the "French spoliation claims." These were assumed to amount to $3,750,000; so that the price of this vast territory, comprising nearly all of the present States of Louisiana, Arkansas, Missouri, Iowa, Minnesota, Dakota Territory, Nebraska, most of Kansas and the Indian Territory, part of Colorado, most of Wyoming, and the whole of Montana, Indiana, Oregon, and Washington Territory, was purchased for $15,000,000, but one-quarter of the purchase-money has never been paid by the national government. In 1804 the southern portion of this vast tract was erected into a separate Territory as the Territory of Orleans. In 1810 that portion of the State lying between the Mississippi and the Amite and the Pearl River was annexed to the Territory, and in April, 1812, the Territory of Orleans was admitted into the Union as the State of Louisiana. On Jan. 8, 1815, was fought the great battle of New Orleans, between the British forces under Pakenham and the Americans under Jackson, for the possession of New Orleans. In this battle the British were signally defeated and with heavy loss. The subsequent progress of the State up to 1860–61 was very rapid. The ordinance of secession was passed in convention Dec. 23, 1860: Mar. 21, 1861, the same convention adopted the "Confederate" constitution. In Apr., 1862, Farragut ascended the Mississippi, passed and silenced Forts St. Philip and Jackson, and appeared before New Orleans on the 25th of April, demanding and receiving its surrender. It was controlled by Gens. Butler and Banks, and after numerous conflicts, in July, 1863, the navigation of the Mississippi from St. Paul to the Gulf was secured to the national government. In Apr., 1864, a convention formed a new constitution for the State preparatory to its readmission to the Union. This constitution was not recognized by Congress, and a second convention was called, in Dec., 1867, and its constitution was adopted Mar. 7, 1868. Under it Louisiana was again admitted into the Union on condition of her ratification of the Fourteenth Amendment to the Constitution of the U. S. On July 9, 1868, this ratification was accomplished, and on the 13th the government was transferred by the military to the civil authorities. The adoption of the first constitution in 1864 by a comparatively few individuals, representing only a small portion of the State, gave rise to serious disturbances, and during the four years of military occupation which followed there were discord and turmoil. After the adoption of the second constitution, in 1868, the government was still in confusion for some time. Order was finally re-established.

Governors.

TERRITORY OF ORLEANS.	
W. C. C. Claiborne	1804–12
STATE.	
W. C. C. Claiborne.........	1812–16
Jaquez Villere...............	1816–20
Thomas B. Robertson.....	1820–22
H. S. Thibodeaux (act.)..	1822–24
Henry Johnson.............	1824–28
Peter Derbigny.............	1828–29
A. Bauvais (acting)........	1829–30
Jacques Dupré (acting)..	1830
André B. Roman...........	1830–34
Edward D. White..........	1834–38
André B. Roman...........	1838–41
Alexander Mouton........	1841–45
Isaac Johnson..............	1845–50
Joseph Walker.............	1850–54
Paul O. Hebert.............	1854–56
R. C. Wickliffe..............	1856–60
Thomas O. Moore..........	1860–62
George F. Shepley.........	1862–64
Michael Hahn...............	1864–65
James M. Wells............	1865–67
Benjamin F. Flanders...	1867–68
Joshua Baker......	1868
Henry C. Warmoth........	1868–72
J. F. McEnery (claimant).........................	1872
Wm. Pitt Kellogg (de facto).........................	1872
Wm. Pitt Kellogg..........	1872–77
Stephen B. Packard.......	1877–78
Francis T. Nicholls.......	1878–80
Louis A. Wiltz..............	1880–81
S. D. McEnery..............	1881–88

REVISED BY A. R. SPOFFORD.

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* Reference for location of parishes. See map of Arkansas, Louisiana, and Mississippi in article ARKANSAS.

Louisiana, city and R. R. centre, Pike co., Mo. (see map of Missouri, ref. 3–I, for location of county), on the Mississippi River, 115 miles above St. Louis, on the Chicago Burlington and Quincy, the St. Louis Keokuk and North-western, and the Chicago and Alton R. R., which here crosses the river, has a college, a public library, foundries, a fine public school, paid fire department, public gasworks, noted tobacco manufactories, and is the distributing-point of a fruit-growing region and an extensive lumber business. Pop. in 1870, 3639; in 1880, 4325.

Louis'ville, cap. of Jefferson co., Ga. (see map of Georgia, ref. 4–J, for location of county), 110 miles N. W. of Savannah, on the Georgia Central R. R., in the centre of a fine cotton and grain producing section, has a female seminary and an academy. Pop. of city in 1870, 356; in 1880, 575.

Louisville, on R. R., cap. of Clay co., Ill. (see map of Illinois, ref. 9–F, for location of county), on the Little Wabash River. Pop. of v. in 1870, 529; in 1880, 514.

Louisville, city, Pottawattamie co., Kan. (see map of Kansas, ref. 4–H, for location of county), situated 3 miles N. of Wamego, which is on the Kansas division of the Union Pacific R. R., has fine water-power supplied by Rock Creek, a flouring-mill, and carries on farming and stock-raising principally. Pop. of v. in 1870, 344; in 1880, 432.

Louisville, an important R. R. centre, the commercial capital and largest city of Kentucky, and seat of justice of Jefferson co. (see map of Kentucky, ref. 3–G, for location of county), is situated at the falls of the Ohio River, from which it obtains its name of "The Falls City." It is in 38° 3′ N. lat., 85° 30′ W. lon., and remarkable for the salubrity of its climate, the ratio of deaths to the population being less, perhaps, than any city on the continent. The city is situated on an elevated plateau 70 feet above low water, and with but little variety of surface for miles, and occupies an area of 12½ square miles. The streets are laid out at right angles, varying in width from 60 to 120 feet, clean and well paved. The business parts of the city are on the streets nearest the river, the southern portion being occupied by private residences, which are notable for beauty and elegance. These are almost without exception surrounded by large gardens, while all the residence avenues are bordered by long lines of trees, which give to the city its distinguishing appearance. Until the last few years but little attention had been paid to the appearance of the business streets; since 1870, however, a number of the handsomest business-blocks in the country have been erected on Main, Market, Fourth, Fifth, and adjoining streets.

Louisville was settled in 1775, and has since steadily increased in prosperity and commercial importance. Its business is of the most stable character; there have been remarkably few failures in its history, and its business operations have been largely conducted on home capital. Wealth is quite equally divided among the richer classes, while the poorer and laboring classes are, in the largest measure, thrifty and in comfortable circumstances. The outlying level country, and the facility with which the city may be extended in any direction, have made property in the suburbs very cheap, and the working people have built thousands of little homes in all of these localities. The assessment of the city as a basis of taxation is, in round numbers, $66,000,000. The Board of Trade is a flourishing organization of about 800 members, with a handsome building in the centre of the city. The commercial statistics of the organization are very valuable. The bank system of Louisville is made up of 9 national banks, 14 State banks, and 1 trust company. The aggregate capital and surplus amount to about $11,500,000, and at the last general statement there were $15,000,000 in outstanding discounts. The bank clearings in 1882 were $392,189,932, the clearings in only ten cities in the U. S. exceeding these figures. The internal revenue collection was $5,588,389.95. The most important staples of commerce are leaf and manufactured tobacco, provisions and breadstuffs, Kentucky whiskies, leather, and various products of local manufacture. As the centre of trade in a State (Kentucky) which produces about 40 per cent. of the total tobacco product of the U. S., Louisville controls a larger tobacco trade than any other three forwarding markets. Here the agents of foreign governments and large houses are located for the purchase of tobacco. In 1882, 61,440 hogsheads of leaf tobacco were sold, and the sales steadily increase year by year. The city is also the centre of the Kentucky whisky trade: value of distilled liquors manufactured was reported in census of 1880 to be $1,382,500. Louisville is one of the largest pork-packing cities in the U. S.; value of slaughtering and meat-packing products, not including retail butchering, from the same authority, was $4,287,158.

The U. S. census of 1880 shows 1108 manufactories; capital, $21,767,013; average number of hands employed, 17,448; wages paid during the year, $5,835,545; value of products, $35,423,203. The specialties in manufacturing industry are various: iron manufactures ($2,391,532), oak sole leather ($2,130,990), tobacco ($2,997,644), agricultural implements ($1,220,700), cement, gas and water pipes, malt liquors, bagging, woollen goods, etc.

Education.—Louisville is noted for the excellence of its public schools, the system having been pronounced, for thoroughness and efficiency, second only to that of Boston. The school buildings proper number 30, constructed in the most substantial and even elegant style. The female high school was built at a cost of $120,000. Three handsome colored-school buildings are among the number named, one of which cost $28,000. Louisville is one of the great centres for medical education in the U. S. The medical department of the University of Louisville, founded forty years ago, has embraced among its professors some of the most distinguished physicians and surgeons in the country, and its alumni are scattered over every State in the Union. Three other medical colleges have full corps of instructors. The Southern Baptist Theological Seminary, with a strong faculty, is also located here. The private schools and seminaries of the city number 55, making a total of 85 public and private schools. The University of the Public Schools of Louisville embraces three departments—the academic, medical, and law. The total number of scholars enrolled in the public schools is nearly 16,000; cost of conducting the schools in 1882 amounted to $300,000; the total value of the public-school property was nearly $1,000,000.

The public buildings of Louisville are costly and of unusual architectural beauty. Among the most prominent are the city hall, almshouse, female high school, Kentucky school for the blind, public library of Kentucky, the court-house, city hospital, U. S. marine hospital, eruption hospital, and the male and female houses of refuge. The Galt House is also a very notable building architecturally, and the *Courier-Journal* occupies one of the largest and finest printing-houses in the world. The U. S. government is now building here one of the handsomest custom-houses and post-offices in the South. There are 120 churches of all denominations, the most noteworthy of which are the cathedral, the Dominican, the Second Presbyterian, the Warren Memorial, the Jewish synagogue, and the church of the Messiah.

The list of charities attached to the various churches and orders is large. Prominent among these are the new Masonic Widows' and Orphans' Home, the largest in the country; St. Mary's and St. Elizabeth's Hospital, St. Joseph's Industrial School, St. Vincent's Orphan Asylum, all Catholic; the Baptist Orphans' Home, and the German Baptist Orphan Asylum. The Public Library of Kentucky is a free institution, with some 70,000 books, an extensive museum, and a fine collection of pictures and statuary. Louisville has 28 lodges of Freemasons; 24 lodges of Odd Fellows; 10 lodges of Knights of Pythias; 11 Temperance lodges and societies; 10 lodges of the Harugari; 6 of the order of Red Men; 5 of the U. A. O. D.; 7 Hebrew societies, and a large number of other social and benevolent societies.

Of the cemeteries, Cave Hill, situated on a hill back of the city, is said to be the most beautiful and best arranged in the West. There are 31 newspapers published in the city—5 daily (4 in English and 1 in German). There are 3 theatres and 1 opera-house.

The future of Louisville seems assured. Her R. R. system is one of the most comprehensive in the country. It has recently been extended in all directions, and the Louisville and Nashville Company operates over 2000 miles of road. The other lines are the Chesapeake and Ohio, to Richmond; the Chesapeake Ohio and South-western, to Memphis; the Ohio and Mississippi, to Cincinnati and St. Louis; the Jeffersonville Madison and Indianapolis, to Indianapolis and the East; the Louisville New Albany and Chicago, to Chicago; the St. Louis Air Line to Evansville and St. Louis; the Cincinnati Southern to Chattanooga. The Louisville and Nashville controls the lines to Cincinnati and Lexington, and has through lines to Knoxville and Memphis. Located on the great highway between the North and the South, Louisville's position will always make her the great distributing-point between the two sections. With an admirable climate, the outlying country favoring almost any expanse, the centre of two large industries, the metropolis of a State constantly increasing in wealth, with thousands of acres teeming with undeveloped minerals, now first beginning to be worked, her railroad system being enlarged every year, her business energies based on a substantial and enduring basis, the elements that unite in making her prosperity are many, varied in their character, and certain in their results. The third exhibition of the Southern Exposition closed here Oct. 24, 1885. It lasted ten weeks, and was a great success. Pop. in 1880, 123,758; in 1885, about 150,000.

Ed. "Courier-Journal."

Louisville, cap. of Winston co., Miss. (see map of Mississippi, ref. 6–H, for location of county), is 30 miles W. of Macon. Pop. in 1870, 385; in 1880, 418.

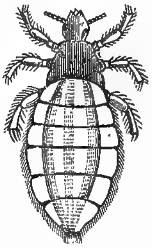
Loule', town of Portugal, in the province of Algarve, beautifully situated about 5 miles N. W. of the port of Faro, and surrounded with walls of the times of the Moors. The church of Neustra Senhora da Pietade, in the vicinity, is much frequented by pilgrims. Pop. 8245.

Loup City, cap. of Sherman co., Neb. (see map of Nebraska, ref. 10–E, for location of county), founded in 1873 as the last trading-point on the N. line of the State, is the trading-point for settlers and trappers N. and W. The settlers are energetically developing the resources of the region. Pop. in 1885, 378.

Lourdes, a town of the department of Hautes-Pyrénées, France, is the capital of a canton, the seat of the civil court of the arrondissement of Argèles, and is 12 miles S. W. of Tarbes, on the Gave de Pau. Marble and slate quarries are extensively worked in the vicinity. The town is chiefly noted for the grotto of Massavielle, in which Catholics believe the Virgin Mary revealed herself frequently in 1858 to a peasant-girl. A large church has been built above the grotto, and the place is visited by pilgrims from all parts of the world. The town has considerable trade in rosaries and in the water of its so-called miraculous fountain. Pop. in 1881, 5864.

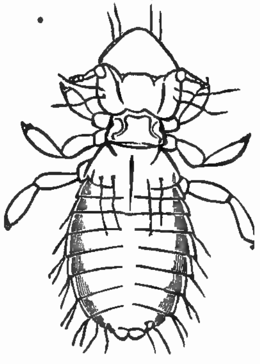
Louse [Ang.-Sax. *lûs;* Goth. *liusan,* to "devour"]. With the same mode of development as the Hemiptera—*i. e.* the bed-bug, chinch-bug, etc.—the louse differs chiefly in being wingless, with a small, indistinctly jointed thorax, while the abdomen is large, oval, and made up of nine segments. The minute antennæ are filiform, five-jointed. The eyes are minute and nearly simple. The eggs are cylindrical and attached to the hairs of its host. Schiödte has best observed the structure of the beak or proboscis of the louse. It is formed of the elongated mouth-parts, on the same plan as the beak of the bed-bug, except that the parts are softer and the labium is capable of being retracted into the upper part of the head, which therefore presents a little fold, which is extended when the labium is protruded. At the base of the soft tube, which is strengthened by the long chitinous ribbon-like mandibles, is a series of hooks by which the louse is anchored to the skin of its host. In order to see how the louse obtains its food, Schiödte placed one of these insects on his hand and observed its movements through a microscope. After the creature had fixed its beak in his hand, he noticed that "at the top of the head, under the transparent skin, between and a little in advance of the eyes, a triangular blood-red point appears, which is in continual movement, expansion and contraction alternating with increased rapidity. Soon this pulsation becomes so rapid that several contractions may be counted in a second. Meanwhile, the whole digestive tube is now in the most lively peristaltic movement, filling itself rapidly with blood, as is easily observed; the long œsophagus is particularly agitated, throwing itself from one side to another inside the neck, bending itself so violently as to remind one of the coiling of a rope when being shipped on deck." The louse of the head is *Pediculus humanus capitis* De Geer, while the body louse is *Pediculus corporis* De Geer (Fig. 1). In dealing with the louse we should remember that the creature breathes by means of a series of holes in the side of the body, in connection with the air-tubes within. By the use of soap, oil, or any other fatty substance the breathing-holes (stigmata) may be closed and the creature smothered to death. The species of true sucking lice are few, but the *Mallophaga* or bird lice, in which the mandibles are well developed and of use in breathing, are very numerous, each species of bird having one, and sometimes two or even more, species parasitic upon it. The hen (Fig. 2, *Goniocotes Burnettii* Pack., louse of domestic fowl), cat, dog, and sheep are sorely afflicted by these pests.

Fig. 1.



Body Louse.

Fig. 2.



Louse of domestic fowl.

A. S. Packard, Jr.

Louth, town of England, in the county of Lincoln, on the Ludd, has large oil-mills, tanneries, and iron-foundries, and carries on a considerable trade in corn and coal. Pop. 10,690.

Louth, county of Ireland, in the province of Leinster, bounded E. by the Irish Sea and S. by the Boyne. Area, 315 square miles. The surface is mostly level or slightly undulating, except in the northern part, where it is traversed by a mountain-range ending in Mount Carlingford, 1935 feet high. Wheat, oats, barley, and potatoes are raised, and cattle of a good breed are reared. Pop. 128,180 in 1841, 107,657 in 1851, 90,713 in 1861, 84,021 in 1871, and 78,228 in 1881. The sea-coast is mostly low and sandy. The most important rivers are the Fane, Lagan, Glyde, and Dee, all of which flow eastward. The principal towns are Drogheda and Dundalk.

Louvain' [anc. *Lovania;* Flem. *Leuven;* Ger. *Löwen*], city of Belgium, in the province of Brabant, on the Dyle. In the fourteenth century it had 200,000 inhabitants, and was one of the largest manufacturing cities in the world, employing 15,000 workmen in cloth manufacturing alone. But its attempt to vindicate its independence with the other towns of Flanders was defeated, and it lost most of its wealth and importance. In the sixteenth century its university, attended by 6000 students, was one of the first scientific institutions in Europe, celebrated especially for its department of Roman Catholic theology. But during the French Revolution the university was suppressed for a long time, and although it has since been restored, it has not regained its past glory. Many buildings attest the former splendor of the city; as, for instance, the hôtel de ville, one of the richest existing structures of Gothic architecture, the cathedral, etc. But, generally speaking, Louvain has now become a quiet place, chiefly noted for its immense breweries and distilleries. Pop. 34,700.

L'Ouverture. See Toussaint (François Dominique).

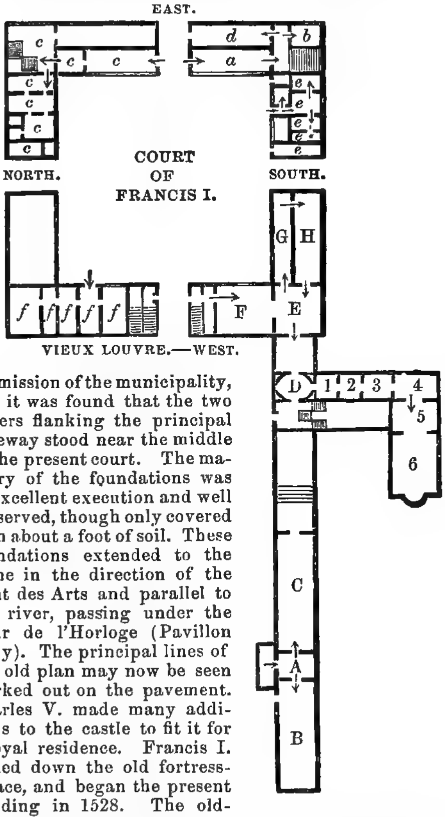
Louvet' de Couvray' (Jean Baptiste), b. at Paris June 11, 1760; received a very insufficient education, and was clerk in a bookseller's store when his romance, *Les Aventures du Chevalier Faublas* (13 vols., 1787–89), suddenly made him famous. In 1790 followed another romance, *Emilie de Varlmont,* less frivolous than *Faublas,* though more radical. Under the ministry of Roland he began the publication of a periodical, *La Sentinelle,* noted for its violent attacks on royalty. Having been elected a member of the Convention, he proved one of the greatest orators of that assembly. He attacked Robespierre with eminent courage as the originator of the September massacre, but after the defeat of the Girondists, his allies, he was compelled to flee and to hide himself till the fall of his great antagonist. He then returned to the Convention, and was member of the Council of Five Hundred, but the defects of his education, which he did not know how to conceal, and his marriage with the beautiful Lodoiska, caused him many troubles and vexations, and ended by making him the laughing-stock of Paris. D. Aug. 25, 1797. His wife, who was much devoted to him, attempted to poison herself, but was saved.

Louviers', town of France, department of Eure, on the river of the same name, was formerly fortified, but is now most noted as the centre of a cloth-manufacturing industry which employs about 9000 operatives. Pop. 10,753.

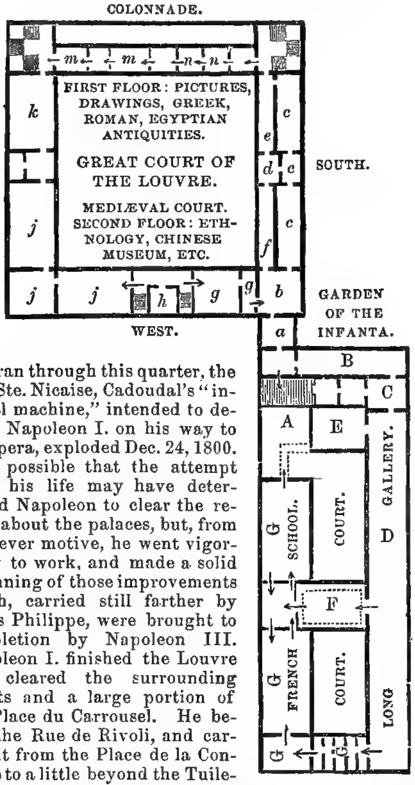
Louvois', de (François Michel le Tellier), Marquis, b. in Paris, France, Jan. 18, 1641; bought in 1654 the right of succeeding his father in the office of secretary of war; applied himself with great energy and assiduity to the study of all the details of the business, and took charge of the whole department in 1666; in a few years created the largest, most effective, and most brilliant army modern Europe had seen, introduced perfect discipline, established regular grades of rank in the command, and gave each of the different arms its perfect development by founding separate schools of engineering, artillery, and cavalry. His genius showed itself still more brilliantly when this army came to be used in war. All its movements were accomplished with an order, rapidity, and precision which doubled its effect and led to astonishing successes. But he was extremely ambitious; to keep himself in office, and to make his office the most important in the kingdom, was his sole aim, and the advice, political and military, which he offered in the king's council was exclusively governed by this aim, often to the great detriment of the country. Still more detestable were the means he applied. The devastation of the Palatinate, one of the greatest barbarities of modern times, was his plan, as also the idea of using the dragoons for converting the Huguenots, with all the horrors resulting from it. After the death of Colbert in 1683 he also assumed the administration of the finances, but knowing no other expedients than extortions and loans, he soon ruined the finances and exhausted the country. The last years of his life were spent in great anxiety. He had become very exacting and overbearing, and the king, who was easily irritated by any want of submission, treated him coldly and even slightingly; and had just made up his mind to throw him into the Bastile when he d. suddenly, July 16, 1691.

Louvre, Palace of the [Fr. *Palais du Louvre*], a famous building in Paris, on the right bank of the Seine, between the river and the Rue de Rivoli. It faces the church of St. Germain les Auxerrois on the E. and the site of the now destroyed palace of the Tuileries on the W. The origin of the name is not known, nor has any probable explanation of its meaning been given. King Dagobert is said to have built a castle on a portion of the site of the present building for a hunting-seat. About the year 1200, Philip Augustus converted this castle into a fortress, but it was not until the end of the fourteenth century that it was included within the walls of the city. In 1866 the foundations of this feudal structure were uncovered by the permission of the municipality, and it was found that the two towers flanking the principal gateway stood near the middle of the present court. The masonry of the foundations was of excellent execution and well preserved, though only covered with about a foot of soil. These foundations extended to the Seine in the direction of the Pont des Arts and parallel to the river, passing under the Tour de l'Horloge (Pavillon Sully). The principal lines of the old plan may now be seen marked out on the pavement. Charles V. made many additions to the castle to fit it for a royal residence. Francis I. pulled down the old fortress-palace, and began the present building in 1528. The oldest portion is the southern half of the western side of the court. It was built after the designs of Pierre Lescot. The successors of Francis in turn added to it. His son, Henry II., carried the western front to completion (now called the Vieux Louvre) and built the wing containing the Galérie d'Apollon. The sculptures of this portion of the building were the work of Jean Goujon and other distinguished artists of the day. In this part of the building the marriage of Margaret of Valois with Henry of Navarre (afterward Henry IV.) was celebrated in 1572. Five days later came the massacre of St. Bartholomew, when Charles IX. fired from the window of the same palace upon the Huguenots, most of whose chiefs had been present at the wedding. The window from which the king fired was in a part of the building afterward pulled down by Louis XIII. The one sometimes pointed out is in a part of the building not constructed till long after the year 1572. Henry IV. began the Long Gallery to connect the Louvre with the Tuileries, and completed it so far as to be able to walk through it before his death. Under Louis XIII. the central portion of the western front and the lower story of the northern side were built, both after the designs of Lemercier. Louis XIV., by the advice of Colbert, determined to complete the palace, and a public competition of architects was opened in order to procure designs. Those of a physician, Claude Perrault, were chosen, but jealousies and rivalries interfered with their execution, and Bernini, then greatly in favor in Rome, was sent for and the work put into his hands. Louis XIV. laid the first stone of the eastern front, but Bernini made so many enemies by his insolence and conceit that he returned to Italy, and in 1666, Perrault was allowed to carry out his original design. He built the eastern front, with its famous colonnade of twenty-eight twin Corinthian columns flanking the grand gateway toward the church of St. Germain les Auxerrois. He also built the southern or river front, and he left at his death designs for three sides of the great court (Cour François I^{er}.). Each side of this court is 408 feet in length. Want of money, however, and the determination of the king to erect a palace at Versailles, put a stop to further work upon the Louvre. The palace was neglected, almost abandoned, until the end of the last century, and indeed until so late as 1802 the greater part of the building was without a roof. Up to this time the Louvre and the Tuileries were separate buildings, the space between them being occupied by a mass of houses threaded by narrow, irregular streets. In one of the streets that ran through this quarter, the Rue Ste. Nicaise, Cadoudal's "infernal machine," intended to destroy Napoleon I. on his way to the opera, exploded Dec. 24, 1800. It is possible that the attempt upon his life may have determined Napoleon to clear the region about the palaces, but, from whatever motive, he went vigorously to work, and made a solid beginning of those improvements which, carried still farther by Louis Philippe, were brought to completion by Napoleon III. Napoleon I. finished the Louvre and cleared the surrounding streets and a large portion of the Place du Carrousel. He began the Rue de Rivoli, and carried it from the Place de la Concorde to a little beyond the Tuileries. Napoleon III. continued the street by cutting through the thickest masses of houses from the Place du Palais Royal to the Hôtel de Ville, thus setting the whole vast palace clear in light and air. The internal arrangements and decorations of the Louvre were principally effected by Charles X. and Louis Philippe. Napoleon III. repaired and restored the fronts toward the place named after himself, and he completed the edifice by raising the vast pile of building connecting the Louvre with the Tuileries. Thus, before the destruction of the Tuileries by the Commune in 1871 the Louvre and the Tuileries made one edifice, of which the complete circuit could be made on the second floor. The continuity of the ground floor was of course broken by the archways which permitted ingress and egress to the interior courts and to the building itself. Although the additions to each building, which were finally to unite and make them virtually one, were begun, as has been shown, at a very early period, it was thus not until our own immediate time that they were completed. Nor had the finishing touches, internal and external, been put to it when the war between France and Germany broke out, which not only prevented further work upon the building, but had for one of its sequences the complete destruction of the greater part of the Tuileries and of the most

PLAN I. *Louvre—Ground Floor.*



PLAN II. *Louvre.—Collections of First Floor.*


COLONNADE.
m
m
n
n
l
k
FIRST FLOOR: PICTURES, DRAWINGS, GREEK, ROMAN, EGYPTIAN ANTIQUITIES.
GREAT COURT OF THE LOUVRE.
MEDIÆVAL COURT. SECOND FLOOR: ETHNOLOGY, CHINESE MUSEUM, ETC.
c
e
d
e
c
f
SOUTH.
j
j
j
h
g
g
b
a
GARDEN OF THE INFANTA.
WEST.
B
C
A
E
G
SCHOOL.
COURT.
GALLERY.
D
F
G
FRENCH
COURT.
LONG
G
G

splendid of the pavilions (Pavillon de Richelieu) of the Louvre. This pavilion contained the very valuable Bibliothèque du Louvre, the private library of the emperor Napoleon III., which library was utterly destroyed; and indeed the Commune would have destroyed the whole Louvre if the Versailles troops had not prevented it. The most valuable of the pictures and other art-treasures of the museum had been carefully packed and removed to Brest at an early period in the war, when the advance of the Prussians upon the city was feared. It was never looked for that one of the chief possessions of France would be in danger at the hands of Frenchmen.

The greater part of the Louvre is occupied with the collections of pictures, statues, and antiquities that constitute the Musée du Louvre. It would be impossible within the limits of an article like this to give anything more than the briefest summary of its contents. The works in sculpture—statues, busts, vases, and inscriptions—are distributed in five collections.

(1) *Ancient Greek and Roman Marbles.*—This collection occupies the lower part of the S. W. wing of the Louvre palace, a part of the ground floor of the Louvre gallery, and two large halls. Entering the building by the Pavillon Denon, the visitor finds himself in a vestibule (A) between these two halls (B and C), which extend to the right and left. The marbles they contain are of little importance, being chiefly antique, but of not the highest quality, placed on pedestals to relieve the otherwise barren look of these long apartments. Turning to the left on entering, the visitor finds at the end of the long hall C a room called the Rotondo (D). The five rooms of this suite (1, 2, 3, 4, 5) are devoted to works of Greek and Roman sculpture, but none of these are very remarkable. A new room (6) has been added; it is at a right angle with the rest, and contains, among other marbles, a respectable statue of Augustus in a niche at the western end. Returning to the Rotondo and turning to the right, the visitor enters a suite of rooms forming a part of the old Louvre. First in order comes the Salle de Diane (E), and on leaving this we see before us a long hall lined with statues on either hand, and at the end the celebrated *Venus of Milo.* Before entering this gallery, however, it is well to turn to the left and visit the Hall of the Caryatides (F), so called from four colossal caryatides by Jean Goujon, a sculptor of whom the French are justly proud, and to whom this noble apartment may be considered a funeral monument, since he was shot here while at work during the infamous massacre of the Huguenots. These caryatides support a gallery on which is a bas-relief of *Diana Reposing,* a copy of the original by Cellini, designed for a fountain at Fontainebleau. Most of the decorations of this room are by Jean Goujon or his scholars. Leaving this room, the visitor returns to the Long Hall, one of a suite of apartments decorated nearly as we see them for Catharine de' Medici. The Long Gallery contains few remarkable works, and indeed everything in it yields perforce to the *Venus of Milo,* which fills the visitor's eye, standing by itself, admirably lighted, and seen from the moment of entering. A door covered by a curtain leads from the hall of the *Venus of Milo* to another long hall (H) parallel with the first, by which the visitor returns on his steps and comes again to the Salle de Diane. The principal statue in this second long hall is the colossal *Melpomene.* Other statues here worthy of notice are the *Borghese Gladiator,* the *Venus of Arles,* the *Huntress Diana.*

(2) *The Egyptian Museum.*—That portion of the rich Egyptian collections of the Louvre which consists of statues, sphynxes, sarcophagi, and in general of the larger and more cumbrous specimens of Egyptian art, is contained in two halls (*a, b*), on the ground floor, occupying nearly the whole of the southern end of the eastern side of the quadrangle. The Collection of Smaller Egyptian Antiquities (Musée Champollion) is on the floor above. The Egyptian rooms on the ground floor are entered from the gateway opposite the church of St. Germain les Auxerrois. This is a very rich collection, and contains, besides fine specimens of the ordinary class of Egyptian sculpture, such as are met with in other European museums, many the like of which are not to be found out of Egypt and the new museum founded by Mariette Bey at Boulâq.

(3) *The Assyrian and Phœnician Museum* fills six rooms in the northern half of the eastern side of the quadrangle and a vestibule on the northern side (*c*). This museum contains valuable specimens of Assyrian sculpture discovered at Nineveh by M. Botta. Other rooms of this suite contain Phœnician sarcophagi, and in others there are curious sculptures, inscriptions, urns, etc., chiefly from Asia Minor. One of the rooms is called Salle du Vase de Pergame, from the fine vase with sculptured bas-reliefs discovered at Pergamus.

(4) *The Algerian Museum.*—In a narrow gallery (*d*) parallel to the Egyptian Hall, and looking out upon the Place du Louvre, is a collection of inscriptions, sculptures, and mosaics of the Roman period, discovered principally in Algeria and on the northern coast of Africa, including Egypt.

(5) *The Museum of Sculpture of the Middle Ages and of the Renaissance* is arranged in five halls (*e*) in the eastern half of the southern side of the quadrangle, facing the river. The collection consists of several monuments, chiefly sepulchral, which were rescued from churches destroyed in the Revolution, and of works by Goujon, Michel Angelo, Cellini, Mino da Fiesole, Jean Cousin, Pilon, Michel Colomb, and others. The chief treasure is the two statues called *The Prisoners,* executed by Michel Angelo for the tomb of Julius II.

(6) *Museum of Modern Sculpture.*—This collection is arranged in five halls (*f*), filling the northern half of the western side of the quadrangle. It consists chiefly of the works of artists of the French school, though there are a few by foreign artists. Here are Puget's *Milo of Croton devoured by the Lion, Psyche* by Pajou, and statues by Clodion, Houdon, Pradier, and others. Here also is Canova's well-known *Cupid and Psyche.*

All these collections are on the ground floor. The oldest of them is the one first described—"Ancient Greek and Roman Marbles"—(Musée des Marbres Antiques). It dates from 1797, and in 1803 was opened to the public as the Musée Napoléon. Napoleon I. first conceived the idea of converting the palace into a national museum, and caused to be collected here not only all the art-treasures of France, but added to these the spoils of all the principal galleries of Europe, especially of Italy, the trophies of his victorious campaigns. The transporting the cases in which these famous statues and paintings were packed across the Alps, through France, and finally through the streets of Paris, was managed in the theatrical way in which Napoleon delighted. As the procession passed through Paris, the immense cases inscribed in large letters with the names of their contents, *La Vénus de Médicis, La Transfiguration,* etc., and drawn by gayly-caparisoned horses, it resembled a Roman triumph, and was hailed with exultation by the whole city that poured forth in holiday attire to meet it. The opening of the gallery to the public attracted swarms of visitors from England and Germany, and indeed from all parts of Europe. But in 1815 the pictures and statues were restored by the allies to their original owners. In 1869 the Musée des Marbres Antiques contained 240 statues, 230 busts, 215 bas-reliefs, and 235 vases, altars, etc.—in all, 920 objects.

The collections on the first floor are reached by a spacious double staircase at the end of the long gallery entered from the Pavillon Denon (Plan II. A). At the head of the stairs we enter the Rotonde, a spacious vestibule handsomely paved with mosaic which gives access to two different series of museums: the one makes the complete circle of the old Louvre palace; the other fills the whole first floor of that wing of the new Louvre which extends along the river and makes the southern side of the Place Napoléon III. Turning to the right on entering the Rotonde, we pass, by two gates of wrought steel of the time of Henry II., into the Galérie d'Apollon (Plan II. B). This was an addition to the Louvre originally begun by Charles IX. and completed by Henry IV. Destroyed by fire in the time of Louis XIV. (1661), it was rebuilt in the same year, but shared in the neglect that the whole palace suffered during the building of Versailles. It was afterward divided up into apartments where the royal academies, especially those of painting and sculpture, had their sittings. Finally, it was restored by Louis Philippe, and opened to the public in 1851 by Louis Napoleon, then president of the republic. The room is 184 feet long by 28 broad. It has twelve windows looking out upon the Garden of the Infanta. This fine room contains a rich collection of Palissy ware, vases of agate, jasper, and other precious materials, Japanese objects, jewelry, etc. A door at the southern end of the western side opens into the Salon Carré (Plan II. C), in which are the choicest specimens the Louvre contains of pictures by artists of the Italian, Flemish, Spanish, and French schools. Here are Veronese's magnificent *Marriage in Cana;* Murillo's *Immaculate Conception;* Holbein's portraits of Erasmus, Anne of Cleves, Sir Thomas More; Raphael's *La Belle Jardinière, Virgin of Francis I., St. Michael subduing Satan;* Titian's *Entombment, Titian and his Mistress;* Leonardo da Vinci's *Portrait of Mona Lisa* (La Joconde), *La Vierge aux Rochers;* Giorgione's *Concert.* These are perhaps the chief glories of the collection.

Leaving the Salon Carré, we enter the famous Great Gallery (Plan II. D), Musée des Tableaux des Écoles Italiennes et Flamandes. This gallery was formerly 1322 feet in length and 42 in width, but owing to the improvements going on it has provisionally lost two-thirds of its length. It formerly contained the pictures of the French school, but these have been removed to other rooms. Immediately on entering the Great Gallery a door to the right opens into a room (Plan II. E) containing important pictures by Italian masters. Here are Mantegna, the celebrated *Madonna della Vittoria;* Palma Vecchio, a *Holy Family;* Sandro Botticelli, a *Holy Family;* Raphael, *Portrait of Joanna of Aragon, Portrait of a Young Man,* the so-called *Raphael and his Fencing-master, Portrait of Balthazar Castiglione;* Leonardo da Vinci, *La Belle Ferronière* and *St. John Baptist;* with others by Titian, Perugino, Cima da Conegliano, Bonifazio, and Carpaccio.

In the Great Gallery, to which the visitor returns from this room, the Italian and Spanish pictures will be found on the walls at the eastern end. The most notable of these are Cimabue's *Virgin and Child;* Giotto's *St. Francis receiving the Stigmata;* Fra Angelico da Fiesole's *Coronation of the Virgin;* with others by Perugino, Veronese, Ghirlandajo, Murillo, etc. In the centre of the northern wall of the Great Gallery a door opens into the noble Salle des États (Plan II. F), once filled with paintings, but in the later days of the Second Empire devoted to state ceremonials. It is over 137 feet long, about 69 wide, and 53 in height. It is lighted by three rows of windows, the upper one being circular in shape. A gallery supported on gilded columns runs round the greater part of it. The western half of the Great Gallery is devoted to the Flemish, Dutch, and German schools. Here are some very fine Van Dycks, *The Children of Charles I.;* Holbein, *Portraits of Nicholas Kratzer* and *William Wareham;* Rubens, *The Kermesse;* with others by Denner, Bol, Quentin Matsys, Paul Potter, Metzu, Teniers, Philippe de Champagne. The most striking contents of the Flemish collection are the twenty-one large paintings by Rubens and his pupils representing events in the life of Maria de' Medici from her birth, and of her husband, Henry IV., from their marriage. They were painted to decorate the gallery of the Luxembourg.

At the western end of the Great Gallery a door to the right opens into a suite of rooms (G) overlooking the Place du Carrousel and the Place Napoléon III., in which have been hung the paintings of the French school. In the first of these rooms are some interesting works of the sixteenth century; then follow two rooms devoted to the pictures of Lesueur. In the next two rooms are Joseph Vernet's *Views of the Ports of France* and other works by the same artist, with battle-pieces by Vandermeulen. All these rooms face the Place du Carrousel, but the visitor now enters a large hall, the first of a suite facing the Place Napoléon III., parallel to the Great Gallery, and containing pictures by French artists of the seventeenth and eighteenth centuries. Here are pictures by Poussin, Claude, Watteau, Joseph Vernet, Vanloo, Greuze, Gérard, bringing the history of French painting down to the early part of the present century. These pictures are arranged in two large galleries separated by the Salon Denon, sometimes called the Salle le Brun, from the paintings it contains representing the battles of Alexander the Great and his triumphal entry into Babylon, by Le Brun.

At the end of the second gallery of French paintings is a door opening upon the landing-place of the great staircase. The visitor now returns to the Rotonde, by which he entered the Salle d'Apollon, and, leaving it by a door on the E. side, begins his survey of the second series of museums on this floor. The room first entered is the Salle des Bijoux (Plan II. *a*), containing a portion of the Campana collection, consisting of Etruscan, Greek, and Roman jewelry. The next room is the Salle des Sept Cheminées (Plan II. *b*). This room has been constructed by throwing into one the several rooms into which it was once divided. The chimney-pieces of the original rooms remain, and give the room its name. It was beautifully fitted up by Louis Philippe to receive the paintings of the great artists of the revolutionary and imperial periods. Here are some of the best works of David, Gérard, Prudhon, Gros, Girodet, Guérin, Géricault—David, *Portrait of Pius VII., The Rape of the Sabines;* Gérard, *Belisarius, Cupid and Psyche;* Girodet, *The Burial of Atala, Endymion, The Deluge;* Prudhon, *Crime pursued by Vengeance;* Géricault, *The Wreck of the Medusa.*

From the Salle des Sept Cheminées three suites of rooms are entered. A door in the S. E. corner gives access to the Musée Napoléon III. (Plan II. *c*), containing a portion of the Campana collection, with antiquities from Syria, Macedonia, Thessaly, and the N. of Asia Minor. They are arranged in nine rooms, subdivisions of one long gallery overlooking the Seine. (N. B. In the Plan all these are thrown into one.) A door from the last of these rooms leads to a suite parallel to the Musée Napoléon III., and looking upon the court of the Louvre—Cour François I^er^. This suite consists of eight rooms, four on each side of a larger central hall called the Salle du Trône (Plan II. *d*), or the Salle des Colonnes, from the fine Corinthian marble columns that support its ceiling. This suite of rooms has been called, from the reign in which it was erected, the Musée du Charles X. (N. B. In the Plan all these have been thrown into one.) The eastern half of the suite contains the Museum of Smaller Egyptian Antiquities (Plan II. *e*), and the four rooms entered on crossing the Salle du Trône, and forming the other half of the suite (Plan II. *f*), constitute the Museum of Smaller Greek, Roman, and Etruscan Antiquities. The last room of this museum opens into the Salle des Sept Cheminées. A door in the northern side of the room (Salle des Sept Cheminées) admits to the Salle Henri II. (Plan II. *g*), in which the Musée Napoléon III. is continued, and which serves as a vestibule to the Salle des Séances, a vast saloon of Corinthian architecture roofed with dulled glass, and with a gallery on all four sides. It is richly gilded, and contains another portion of the Musée Napoléon III. The same valuable collection is continued in the Salle des Bronzes (Plan II. *h*), which is entered from the landing of the grand staircase in the Pavillon Sully. The Campana collection, purchased from the papal government, and now arranged in various rooms of the Louvre under the name of Musée Napoléon III., comprises 11,835 articles, of which the metal portion only is exhibited in this room, together with various Gallo-Roman antiquities.

On the other side of the grand staircase a door, answering to the one that leads to the Salle des Séances, admits to the Musée des Dessins (Plan II. *j*), a collection of drawings and designs by the old masters. It consists of fourteen rooms (N. B. In the Plan these are reduced to three), and comprises 36,000 specimens of the great masters of nearly all the schools. The first four halls on the western side of the palace contain (1) drawings by masters of the Roman and Florentine schools; (2 and 3) the same, with Lombard and Venetian: (4) the Bolognese school. Beyond these is a large hall forming the north-western angle of the palace and looking out upon the Rue de Rivoli. Here are drawings by the Dutch, Flemish, and German schools. Turning to the right, we enter a series of nine rooms, in which the collection of drawings is continued, and devoted to artists of the French school. The first room is a small apartment from which a staircase leads to the Ethnographical, Chinese, American, and Marine Museums on the floor above. The second contains works by Lesueur, N. Poussin, and Claude. The third contains works by Lesueur. The fourth is filled with drawings by Le Brun, Vandermeulen, Jouvenet, and Coypel. The fifth shows us Watteau, Boucher, Fragonard, and Greuze. In the sixth is the cartoon of David's celebrated picture, *Le Serment du Jeu de Paume,* with works by Girodet, Gérard, Granet, Gros, and Prudhon. In the seventh room are paintings on porcelain and miniatures. In the eighth are crayon portraits by French painters of the early sixteenth century. The ninth, which forms the centre of this side of the Louvre, is devoted to works in distemper, chiefly portraits by Maurice, Latour, Chardin, and Nanteuil.

Six rooms in the other half of this northern side of the Louvre (Plan II. *k*) are devoted to the very precious mediæval collections, the greater part consisting of the Musée Sauvageot, formed by the gentleman whose name it bears, and who left it to the Louvre by will in 1856. It consists of furniture, wood-carvings, miniatures, Venetian glass and enamels, bronzes, etc. In other rooms of the suite are admirable collections of Palissy ware and other specimens of French pottery; two rooms devoted to Italian faïence or majolica, with Della Robbia reliefs. At the end of this very interesting suite a door leads to the great staircase in the north-eastern angle. The visitor turns to the right and enters the Galérie de la Colonnade (Plan II. *m*), a name given to three fine halls looking upon the eastern colonnade of the Louvre. Beyond the Galérie de la Colonnade is the Musée des Souverains (Plan II. *n*). This museum, which has now been suppressed, formerly consisted of five halls filled with relics of the sovereigns of France. The last room opens upon the great staircase of the south-eastern angle. From the landing a door gives access to the great colonnade. It was by this door that the insurgents of 1830 obtained admission to the Louvre after a desperate fight with the Swiss guards. The visitor can leave the Louvre by descending these stairs and passing through the Egyptian Museum, or he can return to the Rotonde and so out by the Pavillon Denon.

With the exception of the neither very important nor very interesting museums on the second floor of the Louvre, we have now briefly catalogued the riches of this magnificent museum. The Musée de la Marine occupies eleven rooms. It contains models of Oriental boats and vessels, and of the apparatus used in removing the Obelisk of Luxor, now in the Place de la Concorde; also plans in relief of several of the French ports, models of cannon, of a war-steamer, etc. Beyond this museum is the Musée Ethnographique, a collection of articles of domestic use and of manufacture of uncivilized nations, together with Chinese manufactures and objects from India, etc. There is also an American Museum, consisting of antiquities discovered in Peru, Bolivia, Mexico, Yucatan, etc.; and in another part of this story three rooms containing Chinese objects, mostly the plunder of the emperor's summer palace at Pekin.

The official catalogues of the Louvre, sold in the building, though valuable as books of reference, are too bulky and too many to be of much use to the transient visitor. He must depend upon the excellent guidebooks of Galignani and Murray, although even these are not absolutely necessary, since the titles of all the pictures in each room, with their respective numbers, are inscribed on tablets hung upon the walls. Much assistance in writing this article has been obtained from Murray's *Guide to Paris*, from which our plans have been reduced. The most important information upon the sculpture of the Louvre is contained in Clarac's work, *Musée de Sculpture antique et moderne, ou Description historique et graphique du Louvre et de toutes ses Parties, des Statues, Bustes, Bas-reliefs et Inscriptions, etc. etc.*, 6 vols. gr. in-8vo de texte, et 6 vols. in 4to, avec 1136 planches (Paris, 1841–53). An interesting book is Bayle St. John's *The Louvre, or the Biography of a Museum* (8vo, London, 1858). CLARENCE COOK.

Lovat (SIMON **Frazer**), LORD, b. in Scotland about 1676, grandson of the ninth and cousin of the tenth lord, by whose will he succeeded to the title and estates; but in order to strengthen his title he endeavored to get possession of the sister of the late lord, and failing in the attempt seized upon the widow, whom he compelled to marry him. These daring acts provoked reprisals, and Lord Lovat was for several years obliged in self-defence to maintain an attitude of insurrection against the constituted authorities. On the accession of Queen Anne he was outlawed and forced to flee to the Continent, where he led a mysterious life for twelve years. On the outbreak of the Jacobite insurrection of 1715 he was invited by his clansmen to espouse that cause, but preferred to take the opposite course, inducing them to follow his guidance, for which service he was restored to his estates. In the insurrection of 1745 he sent his clan under command of his son to fight for the Pretender, while he protested his own loyalty to the house of Brunswick. This double game was unsuccessful, and made him especially obnoxious to the government, which brought him to trial for treason, resulting in his execution on Tower Hill Apr. 9, 1747.

Love-feast, a modern restoration of the ancient AGAPÆ (which see). The Moravian Brethren, the various denominations of Methodists, and some other bodies of Christians observe this custom. In some places the love-feast is a simple meal, at which prayer, singing, and religious conversation are in order. Generally, among the Methodists, bread and water alone are used, and all members of the church are allowed to participate. The Sandemanians have a weekly love-feast, eaten on Sunday.

Lovejoy (ELIJAH PARISH), b. at Albion, Me., Nov. 9, 1802; graduated at Waterville College in 1826; became in 1827 a teacher and in 1828 an editor at St. Louis, Mo.; studied theology at Princeton, N. J., and in 1833 was ordained a Presbyterian minister; in 1836, while editor of the St. Louis *Observer*, attacked slavery in its columns, and was in consequence compelled by a mob to remove to Alton, Ill.; here his printing-press was twice destroyed by a mob, and on a third attack, on the night of Nov. 7, 1837, he attempted to defend his property, and shot one of the attacking party, whereupon he was himself shot dead. (See his *Life*, by O. and J. C. Lovejoy, 1838.)

Lovejoy (OWEN), brother of Elijah P., b. at Albion Me., Jan. 6, 1811; educated at Bowdoin College, and removed to Alton, Ill.; was present when his brother was killed, and thereafter conducted many antislavery meetings, often subjecting him to fines and imprisonment; he was a Congregational minister of Princeton, Ill., 1838–54, and member of Congress 1856–64. D. at Brooklyn, N. Y., Mar. 25, 1864.

Love'lace (RICHARD), b. at Woolwich, England, in 1618; graduated at Oxford in 1636; became courtier of Charles I., and colonel in the royal army during the great rebellion; served also in the French army; was twice imprisoned in England, and solaced his lonely hours by the composition of amatory verses, of which two volumes were published, and which have given him a place in the collections of minor poets. D. in London in 1658. An edition of his *Poems* was published by J. Russell Smith in 1864.

Loveland, Col. See APPENDIX.

Lovell (Gen. CHARLES S.), b. in Massachusetts about 1810; enlisted as private soldier in the army in 1831; appointed second lieutenant of infantry in 1837, first lieutenant 1838, captain 1846, major 1861, lieutenant-colonel 1863, and colonel 1865; in the war with Mexico served with his regiment at Churubusco, Molino del Rey, Chapultepec, and capture of the city of Mexico; in the civil war served throughout the Virginia Peninsular campaign; at the second battle of Bull Run, Antietam, Fredericksburg, etc., most of which time was in command of a brigade. Retired Dec., 1870, and d. at Louisville, Ky., Jan. 3, 1871.

Lovell (JAMES), son of "Master Lovell," b. at Boston, Mass., Oct. 31, 1737; graduated at Harvard 1756; was usher of the Latin School under his father 1757–75; delivered the official address before the city authorities Apr. 2, 1771, in commemoration of the first anniversary of the "Boston massacre," thus inaugurating a custom which has continued to the present time. He was imprisoned by Gen. Gage after the battle of Bunker Hill; exchanged in Nov., 1776; was a member of the Continental Congress Dec., 1776–82; receiver of taxes 1784–88; collector of the port of Boston 1788–89, and naval officer 1790–1814. He was at one time master of the North Grammar School, Boston, and published some tracts. D. at Windham, Me., July 14, 1814.—His son, MAJ. JAMES LOVELL, b. July 9, 1758; graduated at Harvard 1776; was adjutant in Jackson's Massachusetts regiment 1776–79, and of Lee's Legion in the Southern campaign. He participated in many of the battles of the Revolution from Lexington to Eutaw Springs. D. at St. Matthew's, S. C., July 10, 1850.

Lovell (JOHN), b. at Boston, Mass., June 16, 1710; graduated at Harvard 1728; became usher of the Boston Latin School 1729, and was its master from 1734 to its suppression by the siege of Boston Apr. 19, 1775. During this long period "Master Lovell" was the instructor of many men eminent in the Revolutionary annals, but his own opinions were so decidedly loyalist that he embarked with the British troops Mar. 14, 1776, for Halifax, N. S., where he d. in 1788. He was an excellent classical scholar, and, though rigid in discipline, was popular for his genial disposition. He delivered the address on the dedication of Faneuil Hall, Mar. 14, 1743, and wrote various miscellaneous publications.

Lovell (JOSEPH), M. D., son of James, b. at Boston, Mass., Dec. 22, 1788; graduated at Harvard 1807; studied medicine, was appointed surgeon of the 9th Infantry in 1812; served on the Niagara frontier, and in 1818 became surgeon-general of the U. S. army. D. at Washington, D. C., Oct. 17, 1836.

Lovell (Gen. MANSFIELD), son of Joseph, b. at Washington, D. C., Oct. 20, 1822; graduated at West Point 1842, and entered the artillery; served under Gen. Taylor in the war with Mexico, and was wounded at Monterey; transferred to the army of Gen. Scott, he was chief of staff of Quitman's division, and severely wounded in the assault on the city of Mexico; resigned from the army in 1854, settled in New York, and was (1858–61) deputy commissioner, and for a time acting commissioner, of public works; in the civil war served as major-general of the Confederate army, and was in command of the department of the South at the time of the capture of New Orleans; subsequently served in the North Mississippi and Georgia campaigns; at the close of the war was in command in South Carolina. D. June 1, 1884.

Lov'er (SAMUEL), b. at Dublin in 1797; early attained some distinction as a painter, poet, and singer; his earliest work, excepting contributions to the journals, was *Legends and Songs of Ireland;* in 1828 became a member of the Royal Hibernian Academy, giving successful attention to portraits and miniatures. His *Rory O'More* (1837), *Handy Andy* (1842), and *Treasure Trove* (1844), comic Irish tales, widely extended his fame. *Songs and Ballads* (1839), *Lyrics of Ireland* (1858), *Metrical Tales* (1859), and several successful dramatic works were written by him. He also gave public exhibitions and lectures in Great Britain, Ireland, and America with much success. D. July 6, 1868.

Love'well (Capt. JOHN), b. at Dunstable, N. H., near the close of the seventeenth century, was son of John Lovewell, an ensign in Cromwell's army, who d. at the reputed age of 120 years. He was engaged as captain of volunteers in several successful expeditions against the Indians in 1724–25, but was killed at the head of his company, May 8, 1725, by a body of Indians under the chief Paugus. This battle, which gave name to Lovewell's Pond, Me., was long famous as "Lovewell's Fight," chiefly through the popularity of a "long and mournful ballad" which commemorated the incidents of the conflict. (See Drake's *Book of the Indians* and the *Expeditions of Capt. Lovewell*, by F. Kidder, 1865.)—A brother, ZACCHEUS LOVEWELL, b. at Dunstable July 24, 1701, was colonel of a New Hampshire regiment in the French war, and d. Apr. 12, 1772.

Lov'ingston, cap. of Nelson co., Va. (see map of Virginia, ref. 6–F, for location of county), on the Virginia Midland R. R. Pop. of dist. in 1870, 5511; in 1880, 6442.

Low (Abiel A.), b. at Salem, Mass., Feb. 7, 1811; after receiving a common-school education, turned his attention to commercial pursuits; moved early in life to New York City and became a prominent merchant; was a member of the chamber of commerce in 1846, and elected its president in 1863, holding that position till 1867.
J. B. Bishop.

Low (Frederic F.), b. at Frankfort, Me., Jan. 30, 1828; went to California in 1849; was first a miner, then a merchant in San Francisco; became a banker at Marysville 1855; was a Republican member of Congress 1861–63, collector of the port of San Francisco 1863–64, governor of California 1864–68, and minister to China 1869–72.

Low (Seth), b. in Brooklyn, N. Y., Jan. 18, 1850, received his early education at the Brooklyn Polytechnic Institute, and graduated at Columbia College in 1870 at the head of his class. During his last year in college he attended lectures at Columbia Law School, although he did not regularly complete the course. After passing a short time in travel he entered the tea-importing house of his father, and finally became a member of the firm and of the Chamber of Commerce, serving upon some of its most important committees. He is also a member of many other important commercial bodies. He was very prominent in the organization of the Brooklyn Bureau of Charities, and is one of that city's most public-spirited citizens. He was first elected mayor of Brooklyn in Nov., 1881, and was re-elected Nov., 1883. The keynote of his highly successful administration of municipal affairs is non-partisanship and the separation of municipal from State and national contests on the ordinary political lines.
Franklin Allen.

Lowe (Sir Hudson), b. at Galway, Ireland, July 28, 1769; entered the army; served in the expedition to Egypt, in the Peninsular war, in Naples, and Sicily; aided in the conquest of the Ionian Islands; became their first governor; was employed in secret missions to Portugal and Sweden; was present at the battle of Bautzen, and carried to London the news of the abdication of Napoleon, to which fortunate circumstance he was perhaps indebted for the honor of knighthood and promotion to the rank of major-general; served during the following year as quartermaster-general of the army of the Netherlands, until removed by the duke of Wellington; is now remembered chiefly as governor of the island of St. Helena during the whole imprisonment of Napoleon; afterward served in India; became lieutenant-general in 1820; published a defence of his conduct at St. Helena (in French, 1830), and d. in London July 10, 1844. A *History of the Captivity of Napoleon from his Journal* was published in 1853.

Lowe (Ralph P.), b. in Montgomery co., O., in 1805, settled at Muscatine, Iowa, in 1839, removed in 1849 to Keokuk, was elected governor in 1867, and went in 1875 to Washington in order to settle the claims of the State of Iowa against the Federal government. He also practised as a lawyer in Washington, as he had formerly done at Keokuk. D. in Washington, D. C., Dec. 22, 1883.

Lowe (Robert), D. C. L., LL.D., b. at Bingham, Nottinghamshire, England, in 1811; graduated at Oxford in 1833; became a fellow of Magdalen 1835, and private tutor 1836; was admitted to the bar, and settled in Australia in 1842, and soon took a prominent part in the politics of that colony; returning to England with a considerable fortune in 1851, he entered Parliament as a Liberal, and rose to high office, becoming chancellor of the exchequer in the second Gladstone ministry 1868–73, and home secretary 1873–74.

Lowell, an important R. R. centre, one of the caps. of Middlesex co., Mass. (see map of Massachusetts, ref. 2–H, for location of county), the second city in population in the State, and the twenty-seventh in the U. S., is 26 miles N. W. from Boston, at the junction of the Merrimack and Concord rivers. It is noted principally for its cotton manufactories. The main source of its water-power is Pawtucket Falls, in the Merrimack, and steam is used as an auxiliary to the amount of 23,500 horse-power. The first mill was built in 1823.

Manufactures.—The U. S. census for 1880 showed 283 manufactories; capital, $20,465,192: average number of hands employed, 20,039; wages paid during the year, $5,996,571; value of products, $33,935,777. The capital invested in the incorporated companies is $17,600,000; number of mills, 156; spindles, 877,000; looms, 22,527; females employed, 13,345: males, 9927; yards of cotton cloth made per year, 231,936,000; woollen, 8,335,000; carpetings, 3,532,000; shawls, 350,000; hosiery, pairs, 12,697,520; amount of cotton consumed annually, 35,350 tons; clean wool, 12,270,000 pounds; yards of cotton cloth dyed and printed, 97,240,000; coal consumed, 82,000 tons. There are many secondary industries connected with cotton and woollen manufactures. The Lowell Machine Shop, one of the largest of these, employs 1500 men and consumes 11,300 tons of iron and steel annually. The American Bolt Company, the Kitson Machine Company, and the Whitehead and Atherton Machine Company do a large business. The J. C. Ayer Company are extensive manufacturers of patent medicines, and print in their establishment 15,000,000 almanacs annually.

Lowell has 7 national banks, with a capital of $2,500,000, and 6 savings banks, with deposits of $11,500,000. Seven railroads connect it with the railroad system of the country. It has 10 hotels, 4 daily newspapers, 6 weeklies, 1 monthly magazine, and 4 public libraries. The assessed valuation in 1882 was $46,419.211. The net debt of the city Jan. 1, 1882, was $1,992,868, of which $1.565,539 was on account of the introduction of water in 1873. Pop. in 1836, 17,633; in 1870, 40,928; in 1880, 59,475; in 1885, 64,051.
E. T. Rowell, Ed. "Courier."

Lowell, Kent co., Mich. (see map of Michigan, ref. 7–H, for location of county), situated at the junction of the Grand and Flat rivers, on the Detroit Grand Haven and Milwaukee R. R., 139 miles W. of Detroit and 15 miles W. of Ionia, has planing-mills, saw-mills, flouring-mills, axe, chair, and furniture factories. Pop. of v. in 1870, 1503; in 1880, 1538.

Lowell (Charles), D. D., b. in Boston Aug. 15, 1782, son of Judge John Lowell; educated at Andover; graduated at Harvard College in 1800; studied law, and afterwards theology; went abroad; studied in Edinburgh, and travelled in Europe; on Jan. 1, 1806, was settled over the West Congregational church in Boston. He was not a man of distinguished learning or intellectual power, but remarkable for the sweetness and benevolence of his heart. In the controversies of his time he took no active part, refused to assume any sectarian name, and, though Unitarian in opinion, discountenanced the separation from the orthodox communion. He published two volumes of sermons (Boston, 1855) and occasional discourses. Dr. Lowell was the father of J. R. Lowell, the essayist and poet. D. in Cambridge Jan. 20, 1861. O. B. Frothingham.

Lowell (Gen. Charles Russell), b. in Boston in 1835, son of Rev. Charles Lowell; educated at the Boston Latin School and at Harvard University, graduating in 1854 with the highest honors; after a time passed in European travel and study, returned to the U. S. and engaged in business pursuits; at the outbreak of the civil war was superintendent of iron-works in Maryland; immediately tendering his services to the government, he was appointed (May, 1861) a captain in the 6th U. S. Cavalry, serving with his company in the Peninsular campaign in Virginia, and subsequently in Northern Virginia and Maryland on the staff of Gen. McClellan; on the recruitment of the 2d Mass. Cavalry was appointed its colonel, and stationed in the vicinity of Washington, and afterward assigned to command a brigade, and rendered valuable service against Mosby's guerilla bands, and in the repulse and subsequent pursuit of the Confederate army under Gen. Early from before Washington, 1864; assigned to Gen. Sheridan's command, his military services in the Shenandoah Valley were conspicuous and brilliant in all the engagements of that army, including the battle of Cedar Creek, where he was wounded while in advance of Getty's division, but would not leave his command, remaining until the final attack was made, in which he was mortally wounded at the moment of victory. In recognition of his services he was appointed brigadier-general of volunteers, to date Oct. 19, 1864. D. at Middletown, Va., Oct. 20, 1864.
G. C. Simmons.

Lowell (Francis Cabot), b. at Newburyport, Mass., Apr. 7, 1775, son of John (1743–1802); graduated at Harvard College in 1793; became a leading merchant at Boston, and was a pioneer in cotton manufacturing in the U. S., and one of the principal founders of the manufacturing interests of Waltham and Lowell, which city was named in his honor. D. at Boston Aug. 10, 1817.

Lowell (James Russell), D. C. L., LL.D, son of Rev. Charles, b. at Cambridge, Mass., Feb. 22, 1819; graduated at Harvard College in 1838 as class poet, and at Harvard Law School in 1840; commenced practice in Boston, but soon devoted himself entirely to literature. He printed in 1841 a small volume of poems entitled *A Year's Life;* edited with Robert Carter in 1843 *The Pioneer, a Literary and Critical Magazine* (monthly), which reached only three numbers; published in 1844 volume of *Poems;* in 1845 *Conversations on Some of the Old Poets;* in 1848 another volume of *Poems,* containing several directed against

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slavery, *The Vision of Sir Launfal*, *A Fable for Critics*, and *The Biglow Papers*, the latter satirical essays in "dialect poetry" directed against slavery and the war with Mexico, which acquired wide popularity both at home and in England. In 1851–52 he travelled in Europe, residing for a considerable time in Italy; delivered in 1854–55 a course of lectures on the British poets before the Lowell Institute, Boston; succeeded Longfellow in Jan., 1855, as professor of modern languages and literature at Harvard College, and spent another year in Europe, chiefly at Dresden, in qualifying himself for that post. From 1857 to 1862 he was editor of the *Atlantic Monthly*, and from 1863 to 1872 of the *North American Review* (quarterly), in both of which many of his miscellaneous writings appeared. He published in 1864 *Fireside Travels*; in 1867 a new series of *Biglow Papers*; in 1868 *Under the Willows*, with which was included his noble *Commemoration Ode* in honor of the alumni of Harvard who had fallen in the civil war; in 1869 *The Cathedral*; in 1870 two volumes of essays, *Among my Books* and *My Study Windows*. He travelled in Europe 1872–74, receiving in person the degree of D. C. L. at Oxford and LL.D. at the University of Cambridge, England. A new volume of essays was announced for 1874, but did not appear. Mr. Lowell's poetical works enjoy great popularity, both in the U. S. and in England. He was U. S. minister to Spain in 1877, and U. S. minister to England 1880–85. He was elected lord rector of St. Andrews University, Glasgow, Scotland, Jan. 2, 1884, but soon after resigned the position as incompatible with his office as U. S. minister to the court of St. James. Author of *Hawthorne* (1885).—His wife, Maria White Lowell (b. July 8, 1821; d. Oct. 27, 1853), wrote verse of considerable merit.

Lowell (John), LL.D., b. at Newbury, Mass., June 28, 1743; graduated at Harvard College in 1760; was admitted to the bar in 1762, and removed to Boston in 1777; was a member of the Continental Congress 1782–83; judge of the court of appeals 1783–89; of the U. S. district court 1789–1801; and a justice of the U. S. circuit court 1801–02. He was the author of the clause in the Massachusetts Bill of Rights which abolished slavery. D. at Roxbury, Mass., May 6, 1802.

Lowell (John), LL.D., b. at Newburyport, Mass., Oct. 6, 1769, son of John (1743–1802); graduated at Harvard College in 1786; was admitted to the bar in 1789; became a successful lawyer; author of many papers and pamphlets upon a great variety of subjects, and was active in the founding of many of the public institutions of Boston, but would never accept office. D. at Boston Mar. 12, 1840.

Lowell (John), b. in Boston May 11, 1799, son of F. C. Lowell; was educated at Harvard College and in Edinburgh, and had fine scholarly tastes. He spent much time in foreign travel. D. at Bombay, India, Mar. 4, 1836, and left $250,000 to found the Lowell Institute in Boston.

Lowell (Robert Traill Spence), D. D., b. in Boston, Mass., Oct. 9, 1816, son of Rev. Charles Lowell; graduated at Harvard College in 1833. In 1842 he took orders in the Church of England; was bishop's chaplain at Bermuda and at St. John's, Newfoundland; held rectorships at Bay Roberts, Newfoundland, Newark, N. J., and Duanesburg, N. Y., and was afterwards principal of St. Mark's School at Southborough, Mass. He published a novel, *The New Priest of Conception Bay* (1863), *Fresh Hearts and other Poems* (1860), and a novel, *Antony Brade* (1874).

Lo'wenthal (Isidor), b. at Posen, Prussian Poland, in 1827, of Jewish parents; became familiar with Hebrew at an early age; exhibited an extraordinary aptitude for philological studies, and at the age of seventeen years had mastered more than the usual course of a liberal education. He then became a mercantile clerk and member of a liberal club, and on account of a poem published in a newspaper was obliged to flee; embarked at Hamburg and reached New York in the autumn of 1846. He was soon reduced to such destitution as to adopt the business of a street-peddler, but having by good fortune attracted the attention of Rev. S. M. Gayley of Wilmington, Del., his accomplishments became known, and he obtained a situation as teacher of French and German at Lafayette College, Easton, Pa., where he also entered the senior class as a student, graduating in 1848, after which he became a teacher of languages at Mount Holly Collegiate School, N. J. Having become a Christian in 1851, he entered Princeton Seminary in 1852; took high rank in philology, contributed learned articles to the *Biblical Repository*; was in 1855 tutor at the College of New Jersey, and in Aug., 1856, went to India as a missionary of the American Presbyterian Board to the Afghans. He soon learned Persian, Cashmiri, Hindostanee, Arabic, and the Afghan language (Pushtoo), into which he translated the New Testament, and had nearly completed a dictionary of that language when he was accidentally killed at Peshawur, Apr. 24, 1864.

Lower (Mark Antony), F. S. A., b. at Chiddingly, Sussex, England, in 1813; became a teacher at Lewes, and attained distinction as an archæologist. He has written *English Surnames* (1842), *Curiosities of Heraldry* (1845), *The Chronicle of Battel Abbey* (1851), *Patronymica Britannica* (1860), a dictionary of family names, *The Worthies of Sussex* (1865), *Compendious History of Sussex* (1870), and *Wayside Notes in Scandinavia* (1874).

Low'estoft, town of England, county of Suffolk, on the German Ocean, much visited during the summer for its excellent sea-bathing, and carries on some shipbuilding and fishing of herrings and mackerel. Pop. in 1881, 16,755.

Lo'wicz, town of Russia, in the government of Warsaw, on the Bzura. It has several good educational institutions, an old palace with a beautiful park, and six annual much-frequented fairs. Pop. 5046.

Lowndes (Rawlins), b. in the British West Indies in 1722; removed in childhood to Charleston, S. C., and became an able lawyer; in 1766 was appointed one of the crown judges; was an early friend of colonial independence; in 1778 became president of South Carolina; was for a time a prisoner in the hands of the British; after the war most vigorously opposed the Federal Constitution, and as ardently defended the African slave-trade. D. at Charleston, S. C., Aug. 24, 1800.

Lowndes (Thomas), b. at Charleston, S. C., in 1765, son of Rawlins; was well educated, and possessed fine talents and eloquence, of which he gave proof as a member of Congress 1800–05. D. at Charleston, S. C., July 8, 1843.

Lowndes (William Jones), LL.D., b. at Charleston, S. C., Feb. 7, 1782, son of Rawlins; studied in England, and graduated at Charleston College; admitted to the bar in 1804; member of Congress 1810–22, and held other important positions; was a son-in-law of Thomas Pinckney. D. at sea Nov. 27, 1822.

Lowndes (William Thomas), b. in England about 1800; published *The Bibliographer's Manual of English Literature* (London, 1834, 4 vols.) and *The British Librarian, or Book-Collector's Guide* (11 parts, 1839, incomplete), two works which enjoy the highest reputation among bibliophilists. The author, a bookseller of London, became deranged through pecuniary embarrassment, and d. in 1843.

Lowry (Reigart B.), U. S. N., b. in South America July 14, 1826; entered the navy as midshipman Jan. 21, 1840; became passed midshipman in 1846, lieutenant in 1855, commander in 1866, captain in 1871; afterward commodore; was in several engagements on the Potomac River in 1861, and on the coast of Louisiana and Texas in 1862 and 1863; served as executive officer of the U. S. S. Brooklyn at the battle of New Orleans, and is thus spoken of by his commanding officer, Capt. Thomas T. Craven: "I have to congratulate myself on being so ably assisted by my executive officer, Lieut. R. B. Lowry. He was everywhere, inspiring both officers and crew with his own zeal and gallantry." D. in New York Nov. 25, 1880.

Foxhall A. Parker.

Lowth (Robert), D. D., b. Nov. 28, 1710, at Winchester, England, where his father, Rev. William Lowth, a distinguished theologian (1661–1732), was chaplain to the bishop and prebendary in the cathedral; graduated at New College, Oxford, in 1737; took holy orders; in 1741 became professor of poetry at Oxford, and delivered a course of lectures on the *Sacred Poetry of the Hebrews*, the foundation of his later work on the same subject; after filling numerous minor benefices became bishop of St. David's in 1766; was translated to the see of Oxford the same year, and was appointed bishop of London in 1777; declined the archbishopric of Canterbury in 1783. D. at Fulham Palace, London, Nov. 3, 1787. His principal works were *Prælectiones de Sacra Poesi Hebræorum* (1753) and a poetical *Translation of Isaiah* (1778), both much esteemed and frequently reprinted.

Low'ville, cap. of Lewis co., N. Y. (see map of New York, ref. 3–H, for location of county), 1½ miles W. of Black River, on the Utica and Black River R. R., has a noted academy founded in 1808, a foundry, numerous manufactories and mills; was settled in 1797, incorporated in 1847, and is surrounded by a rich agricultural region, producing chiefly butter and cheese. Pop. of tp. in 1870, 2805; in 1880, 3188.

Loxodon'ta [Gr. λοξός, "oblique," and ὀδούς, "tooth"], or **Loxodon,** a genus proposed by F. Cuvier for the African Elephant (which see), and containing also a few fossil Indian and European species. The name has reference to the lozenge-shaped tracts of dentine, enclosed by a ridge

of enamel, upon the grinding surface of the molar teeth, this structure being intermediate between that found in the Indian elephant and the extinct genus *Stegodon*. (See MASTODON.)
O. C. MARSH.

Loxodrom'ic Curve [Gr. λοξός, "oblique," and δρόμος, "running"], a curve traced on the surface of a sphere by a point moving in such a manner as to cut all the meridians at the same angle. In navigation the loxodromic curve is the same as a *rhumb*.

Loyo'la (IGNATIUS), b. in Guipuzcoa, Spain, in 1491, in the castle of Loyola, whence his surname; his original name was INIGO LOPEZ DE RECALDE; was of a noble Spanish family, and the youngest of eleven children; in his youth served as a page in the court of Ferdinand the Catholic; afterwards entered the military service, remaining till his thirtieth year, always giving proof of a valorous, chivalric, and adventurous spirit; having been wounded in the leg at the siege of Pamplona by the French in 1521, and being feeble and suffering, read a life of Christ and various sacred legends (among them probably that of St. Francis d'Assisi, the beginning of whose history is very like that of Loyola), and by degrees the man of the world found himself transformed into the Christian disciple, and, scarcely recovered, divided his goods among the poor, made a pilgrimage to a shrine of the Virgin Mary, to whom he dedicated his armor, declaring himself at the same time *her knight*, and retired to the hospice of Manresa. There, and in the neighboring caves, he so macerated his body that one day he was found insensible. Ten months later he embarked from Barcelona for Palestine, but being maltreated by the guardian of the Sepulchre, the provincial of the Franciscans, he returned in 1524, by way of Venice, to Barcelona, where he applied himself to the study of the Latin grammar. Two years afterwards, having entered the superior schools, he prepared himself for giving popular instruction. Being accused of witchcraft before the Inquisition, he was arrested; on his release, in 1528, he went to Paris to study theology. There in 1534, together with several more, both Frenchmen and Spaniards, such as Laynez, Bobadilla, Rodriguez, Pierre Lefèvre, and others, he formed the project of founding a new Catholic religious order. Some of his companions not having finished their studies, he returned to Spain and waited for them. In 1537 the company met again in Venice, and thence Ignatius made his first journey to Rome to obtain permission to establish the new order and receive a blessing upon it. According to some legends, Ignatius was favored at Storta, near Rome, with a vision, in which Christ, bearing a banner, appeared to him and said, "Fear not! I will befriend thee in Rome." Others state, more simply, that Loyola, as he was drawing near to the Eternal City, and in uncertainty as to the reception that awaited him, felt his heart fail him. Stopping before an old chapel which stood by the wayside, he entered it and implored the Divine protection; after which, full of courage, he said to his companions, "Truly, dear brethren, I know not how God may see fit to dispose of us—whether we shall be hung, tortured, or in any other way suffer martyrdom in Rome—but what I can tell you certainly is, that Christ Jesus will be gracious and merciful to us in whatsoever straits we may be." He and his friends resumed the pilgrim's staff, and with their books of theology on their shoulders and huge rosaries about their necks continued their journey, and finally reached Rome. Pope Paul III., "thinking that the pious zeal of these Fathers for the general good of souls would be of no small advantage and honor to the harassed Church," received them with kindness, and on Sept. 27, 1540, gave to Ignatius and his companions the provisory, and in 1543 the definitive, approbation of the order of Jesuits. Loyola was named first general of the order in 1541, although his fellow-worker, Laynez, had not been less efficient in founding it. The head of the new company soon gave himself to the religious training of the young, and he was very successful in bringing Jews over to the Christian faith and in reforming lost women. He died on the 31st of July, 1556, was beatified in 1599, and canonized by Pope Gregory XV. in 1622. His feast is celebrated by Roman Catholics on the 31st of July, the anniversary of his death. Although Loyola met with much persecution in his own time from bad men whose faith he strove to quicken and whose morals he tried to reform, yet posterity has never questioned the sincerity of his professions nor the purity of his life. Still, it must be admitted that in his doctrine of implicit and unquestioning obedience to the superior, in the *secret* vows which the members of the society were permitted to take, and in the unlimited power granted to it by Pope Paul III. to modify and add to its statutes at its own pleasure and without consulting the head of the Church, lie the fatal germs whence have sprung all the bitter fruits of later Jesuitism. He wrote two small works in Spanish—*The Constitution of the Order of Jesus* and *Spiritual Exercises*. His *Life* has been written many times, but those of Rosweide, Maffei, and Bouhours are specially quoted.
ANGELO DE GUBERNATIS.

Lozère, department of France, comprising an area of 1965 square miles, and consisting mainly of an elevated plateau resting on the Cevennes, whose central mass, the so-called Margaride Mountains, cover the whole southern and western part of the department, and whose highest peak, Mount Lozère, rises 4884 feet. These mountains are rich in iron, lead, silver, copper, and antimony, and their southern slopes are covered by vines, mulberry, and olive trees. But generally the soil is not fertile or suited to tillage; sheep and goats are extensively reared, and large quantities of chestnuts are raised. The general character of the department is pastoral. Only one-fourth of the area is arable land; 91,500 acres are meadow, 155,700 wood, and 90,000 chestnut plantation. The number of sheep amounts to 500,000. Silkworms are reared in the valleys. Pop. in 1881, 143,565. Cap. Meude.

Lozier (CLEMENCE HAMED), M. D. See APPENDIX.

Lubbock (FRANK R.). See APPENDIX.

Lüb'ben, town of Prussia, province of Brandenburg, on an island of the Spree, has some manufactures of cloth, linen, and tobacco. Pop. 5593.

Lubbock (Sir JOHN), BART., M. P., F. R. S., F. S. A., son of Sir John W. Lubbock, b. in London Apr. 30, 1834; educated at Eton; became a banker in London, honorary secretary to the London bankers, and introduced improvements into the system of banking, especially the "country clearing" and the publication of the clearing-house returns; became early interested in ethnology, physics, and natural science: was one of the first scholars who elucidated the significance of the lacustrine dwellings of Switzerland and the "kitchen-middens" of the Danish coast, concerning which he wrote several articles in the reviews about 1860; succeeded to the baronetcy on his father's death in 1865, in which year he published *Pre-historic Times, as Illustrated by Ancient Remains and the Manners and Customs of Modern Savages* (3d ed. revised, 1870), a work which was translated into many languages, republished in America, and which was truly characterized as "epoch-making" in the anthropological sciences. In 1870 he issued the complement of the former work, *The Origin of Civilization and the Primitive Condition of Man*, which had a similar popularity, and made good its author's claims to be regarded as one of the chief exponents of the great modern science of which it treats. It is not alone in anthropology, however, that Sir John Lubbock has rendered distinguished services to science; his *Origin and Metamorphoses of Insects* (1874), *On British Wild Flowers considered in Relation to Insects* (1874), and *Monograph on the Thysanura and Collembola*, and more than 50 memoirs in the *Transactions* of various learned societies, bear witness to the versatility of his researches. He has been president of the Ethnological and Entomological societies, and of the Anthropological Institute, vice-president of the British Association and of the Royal and Linnæan societies, is an active member of the Society of Antiquaries and the Geological Society, and of the commissions on international coinage, public schools, and the advancement of science, and is vice-chancellor of the University of London. In 1865 and 1868 he was an unsuccessful candidate for Parliament in the Liberal interest; was elected for Maidstone in 1870; has spoken on financial and educational topics, and procured the passage of several important acts, one of which, the Bank Holiday bill, added four statute holidays to the two previously existing.—Lady Lubbock (ELLEN FRANCES HORDERN) participated in the scientific tasks of her husband, and wrote admirable articles in the scientific and literary periodicals, especially the *Academy*. She died Oct. 20, 1879.
PORTER C. BLISS.

Lub'bock (Sir JOHN WILLIAM), BART., F. R. S., b. in London Mar. 26, 1803; graduated M. A. at Trinity College, Cambridge, in 1825; became F. R. S. in 1829; came to the baronetcy by inheritance in 1840; was a successful banker and sheriff and lieutenant of Kent, but his principal fame was won by astronomical researches; wrote many valuable papers upon lunar and planetary perturbations, upon tides, eclipses, etc., and also published *Researches on Physical Astronomy* (1830), *Classification of Branches of Human Knowledge* (1838), *Theory of the Moon* (1833), *Treatise on Tides* (1831–37), and other works. D. June 20, 1865.

Lu'beck [Ger. *Lübeck*], a free Hanse-town and an important commercial port of the German empire, is situated on the Trave, 10 miles from its entrance into the Baltic, and has 51,055 inhabitants, according to the census of 1881. It is almost wholly surrounded with water. To the W. and N. the Trave makes a large curve, forming an extensive harbor; to the S. and E. runs the Wakenitz, joining the Trave to the S. of the city. It is still partly surrounded with walls, and contains many old-fashioned houses and churches, which remind one of the Middle Ages. It is egg-shaped in its ground-plan, and divided into four quarters—that of Jacobi to the N. E., of Maria Magdalena to the N. W., of Maria to the S. W., and of Johannis to the S. E. The suburbs, consisting of separate groups of houses, stand on the other side of the rivers. The most important square is the market-place, situated in the centre of the city. Here stands the town-house, a large structure built of red and black glazed brick, with five towers, finished in 1517. This building contains the Hanse-hall, in which in olden times, when Lubeck stood at the head of the Hansa, the representatives from eighty-five German cities held their assemblies, but which is now divided into a number of smaller rooms; and the town-cellar, built in 1443 and stocked with excellent wine. Among the churches (9 Lutheran, 1 Reformed, and 1 Roman Catholic), the Lutheran Marienkirche is the most striking, built between 1286 and 1310, in a grave Gothic style, with three naves and two tall belfries. The whole structure is 354 feet long and 197 feet broad; the middle nave is 134 feet high, the towers 430 feet. It contains a very ingenious clock and several remarkable chapels, one with a *Dance of Death* (1463), and another of black marble (1607). The cathedral, built between 1170 and 1341, the Jacobikirche of the thirteenth century, and the Petrikirche from the beginning of the twelfth, are interesting. The Catharinenkirche, built in the earliest Gothic style, is not used now for worship, but contains a collection of art and antiquities. Noteworthy among the other buildings are the house of the Merchants' Company, with excellent wood-carvings; the hospital of the Holy Ghost, with a beautiful chapel in the earliest Gothic style; the theatre, the lunatic asylum, the Katharineum, an educational institution, the school of navigation, the mercantile academy, etc. The industry is very lively. Breweries, manufactures of tobacco, cloth, linen and cotton, and silk-weaving factories are in operation. Still more important is the commerce, on account of the location of the city, between Hamburg and the Baltic; 2114 vessels, of 307,618 tons burden, entered and cleared the harbor in 1881. The principal items of importation are wool, potash, tar, hemp, copper, and tallow from Russia; timber, iron, copper, and steel from Sweden; corn and spirits from Prussia; wine from France. The wine trade is very important.

Lubeck has a democratic constitution. Its government consists of a senate of 14 members and a municipality of 120. This government rules a territory of 114 square miles, with 63,571 inhabitants, which forms a separate state, an independent member of the German empire. The city of Lubeck has a budget of 2,914,369 marks, and a debt of 23,820,629 marks. It carried on an important commerce as early as the beginning of the twelfth century, and the culmination of its prosperity falls between 1200 and 1500. The emperor Frederick II. made it a free city of the realm in 1226. It waged successful wars against the Danes, and defeated them in 1227, 1234, and 1249. It was the head of the Hansa, and its fleets swept the Baltic during the thirteenth, fourteenth, and fifteenth centuries. But its power decreased with the Hansa. The burgomaster Wullenweber succumbed when he tried in 1530 to restore to Lubeck its old influence in the affairs of the Scandinavian countries. From 1563 to 1570 it waged its last war, against Sweden. The Thirty Years' war almost crushed it. In 1806 the French took it and sacked it. In 1810 it was incorporated with the French department of the Bouches d'Elbe. In 1813 the Russians expelled the French, but the French returned once more, and held it for a short time, until Bernadotte, the crown-prince of Sweden, liberated it. During the period of peace since 1815 its prosperity has developed once more. In 1866 it sided with Prussia, and sent one battalion to the army of the Main. On June 27, 1867, it concluded a military convention with Prussia. May 15, 1868, it entered the Zollverein, and in 1871 the German empire. AUGUST NIEMANN.

Lübke (WILHELM), b. at Dortmund, Westphalia, Jan. 17, 1826; studied at Bonn and Berlin; published in 1853 *Die mittelalterliche Kunst in Westfalen*, and in 1855 *Geschichte der Architektur;* was appointed professor of architecture at the Building Academy of Berlin in 1857; travelled in 1858–60 through Italy, France, and Belgium, and became professor of art-history at Zurich in 1861, and at Stuttgart in 1866. His *Grundriss der Kunstgeschichte* ("Outline of the History of Art") (1861) and *Geschichte der Plastik* (1863) have been often republished, and are very useful handbooks, clear, correct, and comprehensive. His *History of Art* was translated into English by Clarence Cook (New York, 1880), and there is an earlier translation, published in London, which, however, is very mediocre. He also wrote the text to the picture-albums published by G. Schauer at Berlin.

Lu'blin, town of Russia, government of Lublin, on the Bistritza, is an old town, and, next to Warsaw, the handsomest and most important in Poland. Among its buildings are notable the church of St. Nicholas, founded in 986; the Sobieski palace, the cathedral, and the town-hall. A considerable trade in corn and Hungarian wines is carried on, and three annual fairs are kept, each lasting one month. Also some woollens and linens are manufactured. Pop. in 1880, 33,000.

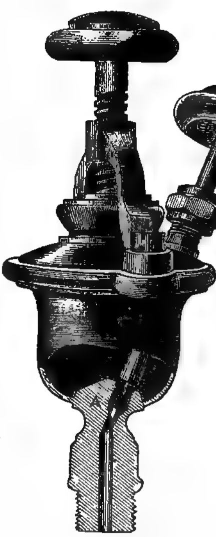
Lu'bricants [Lat. *lubricare*, "to make smooth"], or **Unguents,** are of many kinds. As a solid lubricant, plumbago, graphite, or black lead is the only material in common use. It is carefully prepared for use by the removal of all earthy or other foreign substances, and is usually applied mixed with tallow or oil. It is best adapted for lubrication of bearings moving slowly under very heavy pressures. Tallow alone, or mixed with plumbago or with red or white lead, is an excellent lubricant under similar conditions. Lard is sometimes applied in such cases. All of the animal and vegetable non-drying oils are good unguents. The best of the oils for heavy pressures is summer-strained sperm; winter-strained sperm oil is also a good lubricant. Lard oil, although not capable of withstanding such extreme pressures as the preceding, is excellent for the bearings of machinery, and its comparative cheapness has brought it into common use. Neat's-foot oil is occasionally used as an unguent. Of the vegetable oils, olive is one of the best, and is very extensively used in European countries, and sometimes has been imported into the U. S. for this purpose. Colza and rapeseed oils are good lubricants. The siccative, or drying, oils, of which linseed oil is an example, cannot be used as unguents. Mineral oils are now coming into extensive use as lubricants. They have less "body" than the best vegetable, and particularly than the best animal oils, but have enough for ordinary purposes, and possess the great advantage of neither drying like the siccative vegetable oils, nor absorbing oxygen from the atmosphere and becoming gummy like the other animal as well as vegetable oils. They are now prepared especially for this purpose, and are found exceedingly well adapted to the application. They are frequently mixed with the heavier lubricants, and the resulting compound is often found better adapted than either of its constituents to the use for which it has been prepared, possessing at the same time the required body and the necessary lubricity, and the power of retaining its properties indefinitely in the presence of oxygen. The best mineral lubricating oils are those which, having been subjected to fractional distillation at high temperature, have been freed from all of the more volatile constituents. These are at the same time the safest illuminating oils. Crude petroleum is a good unguent under light pressures. The majority of the lubricating oils sold under trade names or trade-marks are mixtures of oils having a good body with others of less value. A mixture of mineral and lard oils is commonly used, and is a good lubricator. A solid unguent, composed of 3 parts tallow, 3 parts palm oil, ½ pound caustic soda, and a gallon of water, thoroughly mixed at a temperature of 140° F., is recommended for car-axles. A mixture of 2 parts paraffine, 1 of lard, and 3 of lime-water is said to work well under heavy pressures in rolling-mills.

The oils are, by some authorities, distinguished as those fatty bodies which are liquid at ordinary temperatures; concrete oils or butters, as those which are soft at about 85° F., and melt at about 95° F.; and greases and tallows, as those which remain solid up to nearly 100°. Some waxy substances belong to the same class of bodies, and are softened only at about 100° F., and melt at about 150°. The vegetable oils are usually expressed from seeds; animal oils are found most abundantly in cavities in the cellular tissue under the skin, at the surface of the muscles, around the base of the heart, and among the intestines. In the herbivorous animals they are more solid and have less odor than in the carnivorous. Grease from birds is pure, soft, unctuous, and readily melted; in the fishes it is usually almost liquid, and has a strong odor. Fats which are white and abundant in young animals become yellow and less in quantity in old age. Oils are derived from fatty matters by exposing them to sufficient pressure to break up the cellular tissue and set free the liquid grease. Nuts contain one-half their weight of oil; seeds contain from one-fifth to one-half. In expressing both animal and vegetable oils heat is frequently found to assist thorough extraction.

The oils of commerce frequently contain traces of the acids used in their purification. When this is the case, they are likely to injure delicate machinery if applied as a lubricant. They may be purified by chemical treatment, or they may be clarified by placing in the vessel containing them a quantity of rusty iron or of other neutral absorbent of acids. Soap is used as an unguent between surfaces of wood; water may answer a good purpose in dissolving any glutinous or mucilaginous substance, but it is not itself a true unguent. (See METALINE.) R. H. THURSTON.

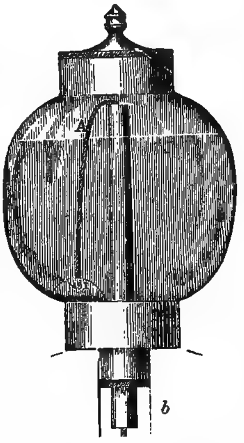
Lu'bricators [Lat. *lubricare*, "to make smooth"], apparatus by means of which lubricating materials are applied to rubbing surfaces in machinery. As lubricants are sometimes solid, sometimes semi-fluid, and sometimes liquid, lubricators are of several kinds. Those intended for applying solid lubricants, such as tallow, lard, or axle-grease, consist frequently of a simple box supported above the part to be lubricated, with a hole of a size which is greater or less according to the greater or less viscosity of the material employed and the freedom with which it is desired to apply it, leading down to the "bearing," through which the lubricant gradually finds its way. With hard tallow it is sometimes found advisable to apply a plate above the mass, which, being pressed down by a spring, forces the lubricant downward more rapidly; as, for example, in the "Weston box." On car-axles, where a peculiar compound of grease and lime-water is used, the latter form is not required. In open boxes the tallow is often laid directly upon the journal, and where care is taken to secure a good quality of hard lubricant this is a moderately economical method of lubricating. It is often practised with the gudgeons of vertical water-wheels. A plain "tallow-box," with a small "oil-hole," answers for an unguent of slight viscosity. Fig. 1 exhibits a simple form of lubricator in which it is intended to use tallow or suet. The cock at A is used as a means of adjusting the rate of supply. This is only used upon steam cylinders, where the heat of the steam melts the unguent.

FIG. 1.



For the animal and vegetable oils, which are the most common lubricating materials, an entirely different style of lubricator is used. For ordinary journal bearings the usual form consists of a brass or glass vessel (Fig. 2) of a capacity varying from less than a gill to sometimes a quart. It is screwed upon the cap of the journal-box or otherwise conveniently attached. At the bottom is a hole of from one-eighth to a quarter of an inch in diameter, into which is secured a vertical tube rising nearly or quite to the top of the "oil-cup." A channel of proper size leads from the cup down to the bearing to be oiled. The cup is filled with oil, and a "leader" (A) made of loosely twisted lampwick is inserted partly in the vertical tube, and the remainder is allowed to fall into the oil within the cup. This wick thus acts as a siphon, drawing the oil up, and leading it then down into the tube, from which it finds its way to the bearing. This is the most generally used form of lubricator. By bending a small bit of wire into the form of a ∩, and lapping the wick around it, a removable siphon is made, which, being taken out when the journal is not moving, permits a considerable saving of oil in many cases, as on marine engines. When about starting these siphons are quickly reinserted.

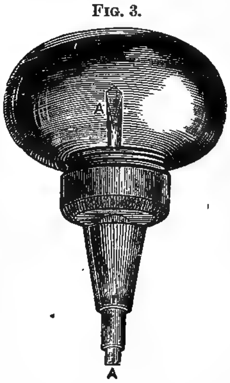
FIG. 2.



Continuous lubrication, by a stream of the unguent flowing over the rubbing surface, is sometimes desired. In such cases, an oil-pump is employed, drawing the oil from a reservoir and forcing it in a continuous stream through the journal. This device was used by Ericsson on the thrust-bearing of the iron-clad Dictator. Other engineers have attached to the revolving shaft a piece of mechanism operated by the movement of the shaft itself, which by means of small spoons dips up the oil and pours it upon the bearing. In both of these arrangements a reservoir is required, from which the oil may be taken, and to which it may return as it drips from the bearing. It is generally thought, however, by engineers, that a current of the lubricant, by keeping the surfaces washed perfectly clean, permits rapid wear, where, with less freedom of supply, the gummy, viscous, and adhesive compound formed by the mixture of the unguent with the impalpable powder worn off the metal not only forms a more perfect lubricant, but protects the surfaces from wear by ensuring a more complete separation; thus, under heavy pressures and with slow motion a limited supply of oil is often found to be more effective in preventing heating than a continuous and rapid flow.

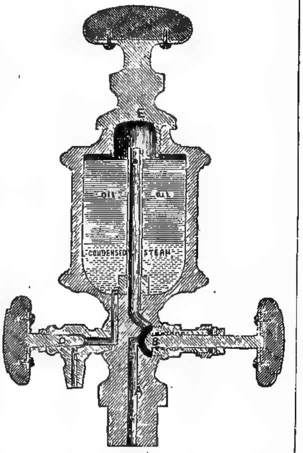
Many ingenious, and some very useful, devices have been invented, having for their object the convenient and economical distribution of the lubricant. In the crank-pin lubricator of Howe the oil-cup is screwed into the strap of the connecting-rod from beneath; a wick is carried up to the surface of the pin, and kept in contact with it by a small wire or stick, around which it is wound, and which is held up against the bearing by a spring. The oil is drawn up by capillary force, and, reaching the bearing, lubricates it freely; the excess flows back into the oil-cup. In the needle oil-cup of Dreyfus (Fig. 3) there is no inner tube, but a small rod or needle (A) is inserted into the hole through which the oil descends, fitting it so closely that no oil can flow past it when at rest. Whenever the machinery is in motion, however, the jar and the friction of the shaft, against which the needle bears at its lower end, causes a slight but a sufficient tremor of the needle, and the oil is fed to the bearing uniformly and unceasingly as long as the machinery continues to move. Whenever the motion of the shaft ceases the vibration of the needle is stopped also, and no oil can then flow. The amount of unguent delivered to the journal is determined by the closeness of the fit of the needle, which is filed away when a more copious supply is required, or a larger one is inserted when the flow is found to be excessive.

FIG. 3.



For lubricating the interior of the cylinders of steam-engines, where the unguent must be forced in against the pressure of the steam, two classes of lubricators are largely used. One consists of a small force-pump, sometimes with, and sometimes without, an attached reservoir. In the first case the pump has sufficient capacity to contain the full charge which it is desired to force into the cylinder at one time; in the other case the pump draws from the reservoir one or more charges as may be required. The pump is always some form of force-pump, but the varieties of style are very numerous. Nearly every large dealer in such "engineers' supplies" has a form peculiar to himself. The second kind of lubricator for steam cylinders consists merely of a reservoir for oil, connected at the top by a small-sized pipe with the steam-pipe, and at the bottom by another pipe with the steam-pipe or the steam-chest below it. Each small pipe is provided with a cock, which may be used to close the communication with the steam-pipe. These cocks being closed, the reservoir is filled with oil, and the cocks are then again opened. Steam pressure then comes upon both top and bottom of the oil in the cup, but no motion of the fluid takes place, as the lower pipe is at its highest point on a level with the surface of the oil. Gradually the steam condenses in the upper part of the reservoir, and, being of greater specific gravity than the oil, it settles to the bottom, displacing it and slowly filling the cup. It raises the oil until the latter flows out at the top of the reservoir through the pipe provided for that purpose, and trickles down into the steam-chest. This is a very simple form of lubricator, and is used extensively. On condensing steam-engines, where there exists alternately an outward and an inward pressure, a cup of convenient size is frequently screwed into the cylinder-head, and being filled with oil or melted tallow, the cock between it and the cylinder is opened at the moment when the piston is making its stroke toward that head, and atmospheric pressure drives the lubricating material out of the cup into the cylinder. Fig. 4 represents a simple form. The channel A leads to the steam-cylinder, and is closed by the plug B when required. The passage C being opened by withdrawing the plug D, the contents of the cup may be drawn off. Closing this channel, the top E of the cup is removed, and it is filled with oil. The top is replaced and the cock B is opened. Steam now rises into the upper portion of the cup, and, condensing, the water settles down beneath the lighter fluid. This process is a very gradual one, and may be checked by the use of the cock B.

Fig. 4.



The amount of lubricant used will evidently depend principally upon the character and adjustment of the lubricator. As the cost of lubricants is usually a very serious item of the expense of maintaining machinery, a good lubricator is a very valuable instrument. As in using all lubricators of the classes above described the oil which has passed through the journal is lost, many attempts have been made to secure economy by using the oil repeatedly until it is entirely unfit for further use. The oil-pump and the mechanism using spoons, already described, illustrate such attempts with large bearings. On shafting "reservoir boxes" are sometimes used. These "self-oiling boxes," as they are also called, have a reservoir formed within the journal-box, in which is placed a considerable quantity of oil. On the shaft is a collar which dips into the oil, and as the shaft turns takes up a portion, and this, trickling back over the shaft, produces a constant lubrication of the rubbing surfaces. These boxes only require filling at long intervals, as the oil is present in considerable quantity, and is used over and over again. It does not follow, however, that they are more economical than carefully managed oil-cups of the ordinary kinds. An exceedingly small quantity of oil may be made to suffice when properly applied. A well-known firm writes: "We have in our machine-shop 565 bearings, oiled twice each week, and 45 fluid ounces are used at each oiling—an average of 17 drops to each bearing. The quantity of oil used in six months is 2340 ounces. If put into a self-oiling box, and expected to last six months, it would be but 4$\frac{1}{10}$ ounces to each journal." This is equal to about a gill of oil, a quantity which would in most cases be insufficient to fill a box. In a French device, the "*Palier Glissant*," the journal is arranged with pipes leading from a force-pump to the surface of contact between the journal and the box. Through this pipe water is forced, and the shaft is borne upon a fluid cushion, revolving without contact and free from friction with the metal of the bearing. In other cases, as where "metaline" is used, the journal is supported upon some peculiar composition, which is so nearly frictionless and so good a conductor of heat that the useless work there converted into heat is not sufficient to produce serious heating of the journal.

Fig. 5.

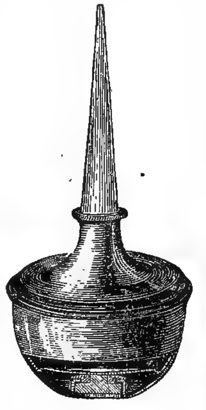
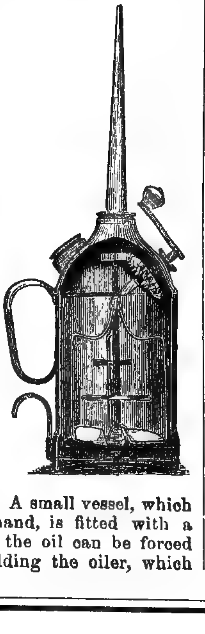


Fig. 6.



Where such lubricators as are above described cannot be conveniently attached, or where they do not supply as much as is needed, oil-cans are used to supply the oil by hand. One of these "spring-oilers" is shown in Fig. 5. A small vessel, which can be conveniently held in one hand, is fitted with a slender conical tube, through which the oil can be forced out by the thumb of the hand holding the oiler, which forces in the thin metal bottom of the cup. This bottom is elastic, and resumes its normal shape when the pressure is removed. The issuing oil spurts in a jet, which is skilfully directed to the spot where the oil is needed. When a journal exhibits a tendency to heat, a mixture of oil and plumbago (black lead) is sometimes used. This mixture separates when left undisturbed, the plumbago settling to the bottom. An oiler like Fig. 6, provided with a set of vanes by means of which the lubricant may be stirred up when needed, is made for this case. R. H. THURSTON.

Lucan (GEORGE CHARLES BINGHAM), G. C. B., THIRD EARL OF, b. in London Apr. 16, 1800; educated at Westminster; entered the army in 1816; accompanied the Russian army as a volunteer in the Turkish war of 1828–29; succeeded to the title and large estates in Ireland in 1839; became a representative peer in 1840; was commander of a cavalry division in the Crimea, and made himself memorable by his connection with the "charge of the light brigade" at Balaklava, Oct. 25, 1854. He became lieutenant-general in 1858 and general in 1865.

Luca'nia, an ancient division of Magna Græcia, extended from the Tarantine Gulf in the E. to the Tyrrhenian Sea in the W. The most remarkable of its cities were Sybaris, Heraclea, and Pæstum. It now corresponds to the provinces of Basilicata and Principato Ultra.

Luca'nus (MARCUS ANNÆUS), b. at Cordova, Spain, in 39 A. D., a nephew of the philosopher Seneca; came early to Rome; received an excellent education; distinguished himself by his poetical talent, and became a favorite with Nero, but happened to excite his jealousy, and was forbidden to recite in public. Thus stopped in the midst of a brilliant career, he joined the conspiracy of Piso, was betrayed, turned informer in order to save his own life, and began by denouncing his own mother; but was nevertheless ordered to be put to death by the emperor, and committed suicide in 65 A. D. Of his works, only *Pharsalia*, a heroic poem in 10 books, is still extant, but it is either unfinished or incomplete; it treats of the civil wars between Cæsar and Pompey, and begins with the passage of the Rubicon, but breaks off abruptly in the midst of the Alexandrian war. The tone is very unequal, first flattering and then reviling the emperor, and the style seems to indicate that it wanted a last revision by the poet. The first book was translated into English by Christopher Marlowe in 1600; the whole by Rowe, in verse, and by Riley in 1853. There are French and German translations in verse and prose, and the poem has found warm admirers. The best edition is that by C. Fr. Weber (Leipsic, 1828–31, 3 vols.).

Lucaris (CYRILLUS), patriarch of Constantinople, b. in Candia in 1568 or 1572, was one of the most energetic and courageous, but also one of the most unfortunate, of the reformers of the Greek Church. He travelled extensively in Western Europe, and at Geneva he became acquainted with the Calvinist faith, which made a deep impression on him. Having been ordained a priest of the Greek Church in 1593, he went as exarch to Poland in 1595, and here his deadly conflict with the Jesuits began, he laboring to draw the Greek Church toward Protestantism, they to draw her toward Romanism. In 1602 he was elected patriarch of Alexandria and in 1623 patriarch of Constantinople. Five times he was deposed by the intrigues of the Jesuits and the French ambassador, and four times he was reinstated by the influence of the English ambassador, but finally he was strangled by order of the sultan, in 1638, he having been accused of conspiracy against the government. His *Confessio* (Geneva, 1629, Greek and Latin) contains several decidedly Calvinistic features. He also translated the New Testament into modern Greek and defended the distribution of it among the congregations.

Lucas (JOHN B. C.), b. in 1762 in Normandy; studied law at the University of Caen; came to the U. S. in 1784, and became a farmer near Pittsburg, Pa., and in 1792 was elected to the legislature; was a judge of the common pleas; a member of Congress 1803–05; in 1805 was appointed judge of the U. S. courts at St. Louis, Mo., and held that office until 1820; was also (1805–12) a commissioner of land-titles. D. near St. Louis Sept., 1842.

Lucas (PAUL), b. at Rouen, France, Aug. 31, 1664, son of a goldsmith; visited Greece, Asia Minor, Syria, and Egypt as a dealer in precious stones; engaged in the naval service of the Venetians; participated in the siege of Negropont 1688; became captain of an armed vessel which cruised against the Turks; returned to France 1696; sold a fine collection of medals and curiosities to the royal cabinet; again visited Egypt, and ascended the Nile 1700; went by sea to Tripoli; joined a caravan which traversed Armenia and Persia; was robbed at Bagdad; taken prisoner by a Dutch privateer; reached Paris 1703; published his adventures under the title *Voyage au Levant* (1704); travelled again in the East, collecting inscriptions and making plans of edifices in Palestine, Syria, Cyprus, Egypt, and the Barbary states; published a second volume of his travels 1714; was sent by the government on new antiquarian expeditions to the East 1714 and 1723; went to Spain 1736; was employed by Philip V. in arranging his cabinet of antiquities, and d. at Madrid May 12, 1737. Besides his principal work he published a *Voyage dans la Grèce, etc.* (1710), a *Voyage dans la Turquie, etc.* (1719), and left a MS. account of his last journey. His works have a considerable value, but are not entirely reliable.

Lucas (Gen. Robert), b. at Shepherdstown, Va., Apr. 1, 1781, a descendant of William Penn; in 1800 went to Ohio; served in the war of 1812–15 as captain, and afterward a lieutenant-colonel U. S. army, and brigadier-general of Ohio militia on the frontier; was president of the convention which nominated Jackson for President in 1832; governor of Ohio 1832–36; governor of Iowa Territory 1838-41. D. at Iowa City, Ia., Feb. 7, 1853.

Lucas (Samuel), b. at Bristol, England, in 1818; graduated at Queen's College, Oxford, in 1842, gaining the Newdegate prize for a poem and the chancellor's prize for an English essay; was called to the bar of the Inner Temple in 1846; became editor of the *Press* in 1853, and literary editor of the *Times* in 1854; republished several volumes of critical essays from the columns of the *Times*—*Eminent Men and Popular Books* (1859), *Biography and Criticism* (1860), and *Mornings of the Recess* (1861–64). He edited *Once a Week* from 1859 to 1865, when he started the *Shilling Magazine*. He edited a volume of *Charters of the Old English Colonies* (1850), and reprinted from the quarterly reviews in 1862 a series of scholarly essays entitled *Secularia, or Surveys on the Main Stream of History*. In politics he acted with the Conservative party, and was the reputed author of several able pamphlets, chiefly on Indian and colonial topics. D. at Eastbourne, Sussex, Nov. 27, 1868.

Luc'ca, formerly a duchy, which at some periods formed an independent republic and at others was given as a kind of pension to royal or semi-royal persons. It is now a province of the kingdom of Italy, comprising an area of 516 square miles, with 280,399 inhabitants, and keeping exactly its old boundaries between Tuscany, Modena, Massa, and the Gulf of Genoa. Its soil is exceedingly fertile, and probably better cultivated than any other part of Italy. The principal products are wine, oil, and silks. Paper, glass, linens, and cottons are extensively manufactured. Cap. Lucca.

Lucca, city of Central Italy, the chief town of the province of Lucca (see Italy), lying on the Serchio, about 15 miles N. E. of Pisa. Lucca is situated in a most fertile plain, surrounded, except on the E., by spurs of the Apennines, and the views from the ramparts of the town are charming. The streets, generally narrow and crooked, are well paved, and the private dwellings are often spacious and elegant. The public buildings, highly interesting in themselves, contain many choice works of art, especially pictures by Fra Bartolomeo and other great masters. The cathedral was erected in the eleventh century, the rich façade having been added in 1204. The town is supplied with water by a superb aqueduct, about 3 miles in length, begun in 1823 and finished in 1834. Lucca, originally Etruscan, passed first to the Ligurians, then to the Romans (about 180 years B. C.); it was governed by a duke under the Lombards, became a free state in 1055, was again under a duke (the renowned Castruccio Castracani) in 1327, and in 1370 once more recovered its liberty. Its territory then embraced a great part of what was the late duchy of Lucca —namely, the very fertile district, abounding in grain, grapes, olives, chestnuts, etc., lying between Modena on the N., Tuscany on the E. and S., and the sea on the W. Though for the most part an independent republic until 1556, the history of Lucca during the Middle Ages is intimately connected with that of Pisa and Florence. In 1805, Napoleon made it a principality for the benefit of his sister Eliza, who had married a Baciocchi, and in 1815 it fell to Maria Theresa of Spain, whose son ceded it to Tuscany. In 1860 it was annexed to Sardinia, and is now one of the fairest portions of the new kingdom of Italy. Silk was manufactured here as early as the latter part of the eleventh century. In 1300 the republic had her emporiums of silken stuffs at Paris, Lyons, Bruges, etc., and somewhat later 30,000 of the inhabitants of Lucca, already known as the *Industriosa*, were said to live by this manufacture. Even to this day the silk and olive oil of Lucca are especially prized. Beautiful villas abound in the neighborhood, and the celebrated Bagni di Lucca, about 15 miles farther up the valley of the Serchio, in the midst of the most picturesque scenery, though no longer much frequented for medicinal purposes, are still a favorite summer resort for foreign residents in Italy. Pop. in 1881, 68,063.

Lucca (Pauline), b. at Vienna Apr. 25, 1842. The original name was Lucas. Her parents were Jews of humble origin and condition. She owed her musical instruction to the kindness of a professional singer; made her first engagement at the Kärnthner Thor Theater, and assisted in the choir at the Karls Kirche. In 1859 she appeared at the Olmütz theatre as Elvira in the opera of *Ernani*, and at once became famous. At Prague she appeared as Norma, and as Valentine in the *Huguenots*. Meyerbeer finding in Lucca an artist competent to fill the part of heroine in *L'Africaine*, she went to Berlin. In 1863 and 1865 she was in London, a star of the first magnitude. In Nov., 1865, she married Baron von Rohden, who was killed in the Franco-Prussian war of 1870, and thenceforth divided her time between London and Berlin. In Sept., 1872, Lucca appeared in New York at the Academy of Music, and continued in the New World the triumphs she had achieved in the Old. O. B. Frothingham.

Luce (Stephen Bleecker), U. S. N., b. at Albany, N. Y., Mar. 25, 1827; entered the navy as midshipman Oct. 19, 1841; became passed midshipman in 1847, lieutenant in 1855, lieutenant-commander in 1862, commander in 1866, captain in 1872; in action several times in 1864 and 1865, while commanding the iron-clad Nantucket and the steamer Pontiac of the South Atlantic blockading squadron, and noted for "the skill with which he manœuvred his vessel;" from Apr. 25, 1881, to June 30, 1884, in command of the U. S. naval training squadron; promoted to commodore Nov. 25, 1881; ordered to command U. S. naval forces on North Atlantic Station, with the brevet rank of rear admiral, July 26, 1884; Sept. 20 ordered to assume the duties of president of the U. S. naval war college, Coaster's Harbor Island, R. I. Became rear-admiral 1885. He is the author of a work on seamanship, which has been adopted as a text-book at the Naval Academy.

Luce'na, city of Spain, in the province of Cordova, is well built and beautifully situated, has manufactures of soap, earthenware, delft, and glass, and trades much in wine, olive oil, and brandy. It is famous for its beautiful horses. Pop. 19,540.

Luce'ra [*Luceria*], a large town of Southern Italy, in the province of Foggia, overlooking the vast and fertile plain of Apulia, with a semicircle of the Apennines dotted with villages on the N. The old walls have been demolished, the Troian gate of the time of the Swabian Frederick II. alone remaining. The public and private buildings are handsome. The cathedral, erected by Charles II. on the ruins of a splendid Saracen mosque, is a fine Byzantine-Gothic church containing rich and rare marbles. Little remains of the mediæval castle built on the foundations of the old Roman fortress, and communicating with the city by a subterranean passage. Ancient mosaics, coins, and inscriptions of interest are often found here, many of which are in the national museum at Naples. Lucera is an industrious and commercial town, the trade in home products being very active. Considerable provision is made for public instruction, and the town possesses a large library containing some rare books. *Luceria* was a town before the Pelasgic immigration. It retained its importance under the Lombards, the Greeks, and the Normans; and under Frederick II., who brought thither the Saracens from Sicily, its population rose to 77,000. It continued to flourish even after Charles I. and II. of Anjou drove out the Saracens, but Charles V. destroyed the prosperity of the town by his cruelty. Pop. 14,014.

Lu'cern [Fr. *luzerne*], or **Purple Medick,** the *Medicago sativa*, a leguminous forage-plant, a native of Europe, where, as in America and other regions, it is extensively sown. It should be planted in drills, and hoed to keep down the weeds. There is considerable care requisite in the early stages of its growth, but when well established, if sown on good but light soil, it will produce a greater amount of green forage than almost any other plant, and the quality is unsurpassed. It is perennial, and cut several times in the season. In California it is known by the Spanish name of *alfalfa*, and is much prized.

Lucerne', canton of Switzerland, situated nearly in the centre, bordering on the Lake of Lucerne and traversed by the Reuss. It comprises an area of 474 square miles, and is covered with mountains, which, however, rise only to the height of 6900 feet. The soil is generally fertile, and much grain and more fruit are produced, but rearing of cattle is the main industry of the inhabitants, and is carried on to a greater extent in this canton than in any other part of Switzerland. Pop. 134,806, most of whom are of German descent and speak the German language; they are Roman Catholics.

Lucerne [Ger. *Luzern* or *Lucern*], city of Switzerland, capital of the canton of the same name, on the Reuss. In the middle of the city rises an old tower which is believed to have been once a lighthouse, *lucerna*, and given name to the town. Remarkable are its churches and the celebrated monument called the lion of Lucerne, carved in the solid rock after a model of Thorwaldsen, in remembrance of the Swiss guard butchered in Paris Aug. 10, 1792. A very brisk transit trade is carried on here. Pop. 17,850.

Lucerne, Lake of [Ger. *Vierwaldstädter See*, "Lake of the Four Forest Cantons"], a lake of Switzerland, enclosed by the cantons of Uri, Unterwalden, Schwytz, and Lucerne. It is 22 miles long, from ½ to 2 miles broad, and perhaps the most beautiful sheet of fresh water in Europe.

Luci'a, St., one of the British West India Islands, of the windward division of the Caribbees, situated between Martinique and St. Vincent. Area, 270 square miles. Pop. 31,811, of whom 911 are white. The island is of volcanic origin, very mountainous, extremely fertile, and presenting a series of landscapes whose brilliancy of color, originality of outlines, and romantic beauty cannot be surpassed. But it is exceedingly unhealthy, and infested with poisonous serpents and insects; it is a common saying among the natives that those who do not die of the fever die of the serpent. The sugar-cane is extensively cultivated. In 1866 were exported 109,427 cwts. of sugar, 147,200 gallons of molasses, and 5981 gallons of rum. Cap. Castries, a town of 3500 inhabitants.

Lu'cian, Saint, b. at Samosata in Upper Syria about 250; became a Christian teacher at Edessa and Antioch, inculcating a doctrine similar to that afterwards known as Arianism; was three times excommunicated as a heretic; ultimately retracted his heterodox doctrines, and d. a martyr at Nicomedia in the persecution of Maximin, about 310. He was the author of a revision of the Septuagint much valued by the Eastern churches.

Lucia'nus, a Greek humorist (or rather satirist) of first rank, b. at Samosata in Syria in the first half of the second century of our era. The exact dates and circumstances of his life are not known, but from his own writings can be gleaned that he was first apprenticed as a sculptor, but left his profession in order to devote himself to literature, philosophy, and rhetoric; that he travelled through Asia Minor, Greece, Italy, and Gaul, studying and teaching, and afterwards settled in his native city, where he wrote those works which have made him one of the most celebrated authors of the later Greek literature. In his old age he received a lucrative position as procurator of a part of Egypt from the emperor Commodus, which he probably held to his death. His works, although several of them have been lost, are still very numerous, and of a miscellaneous character, poetical, critical, biographical, rhetorical, etc. The most remarkable are his dialogues, treating, generally in a satirical though sometimes in a serious way, subjects of mythology, philosophy, and life; as the most striking examples may be mentioned *Deorum Dialogi*, *Vitarum Auctio*, and *Timon*. Collected editions of his works have been given by Hemsterhuis and Reitz (Amst., 1743, 4 vols. 4to), by W. Dindorf (1840), and by Fr. W. Fritzsche (1865). There is an excellent translation into German by Wieland, and into English by Thomas Francklin (1781).

Luc'ifer [Lat. "light-bearer"], primarily signifies the planet Venus, as the morning star. By an error of the commentators the name has been often applied to Satan. The prophet Isaiah (xiv. 12) addresses the Babylonian king as the morning star, and commiserates him on his fall. Some of the early Christian writers imagined that reference was had to the fall of Satan, whence the error.

Lucifer, bishop of Cagliari, Sardinia, appeared at the Council of Milan in 354 as the legate of Pope Liberius, but opposed the Arians in so violent a manner that the emperor Constantius, much offended, threw him into prison and carried him from place to place for several years. After the death of Constantius he was liberated, and took up his residence in Syria, but here too he deepened, instead of healing, the controversy which took place in the Church of Antioch between the Roman Catholic Church and the Arians. Disapproved by his own former friends, he left Antioch and retired to Sardinia, where he founded the sect of the Luciferians, and d. about 370. He held, in opposition to the Synod of Alexandria (352), that no bishop who had in any way yielded to the Arians could enter the bosom of the Church without forfeiting his ecclesiastical rank, even though he repented and confessed his errors; and that all who admitted the claims of such persons to a full restoration of their privileges became themselves tainted and outcasts. The Luciferians, never numerous, died out soon.

Lucifer Matches. See Matches.

Lucil'ius (Caius), b. at Suessa of the Aurunci in 148 B. C.; served in the Numantine war under Scipio; lived on familiar terms with Africanus and Lælius, and d. at Naples in 103 B. C. He was the founder, if not the inventor, of the *satira*, that peculiarly Roman form of poetry, in which Horace, Persius, and Juvenal excelled, and was highly appreciated in olden times; but of his 30 books of *Satiræ* only 800 small fragments, mostly consisting of single lines, have come down to us. They were collected by the Stephenses in 1564, in *Fragmenta Poetarum Veterum Latinorum*.

Luci'na, the goddess of light, hence by a special metaphorical application the goddess of childbirth, was generally identified either with Juno or Diana. Her festival was celebrated on March 1 by the matrons adorning her temples with flowers and offering up prayers for a numerous and prosperous posterity. The festival was connected with mysterious ceremonies of great holiness.

Lucin'idæ [from *Lucina* and *-idæ*], a family of lamellibranchiate Mollusca, represented by *Lucina* as the typical existing genus, and found in almost all seas and at all depths. Fossils of this family are met with in Palæozoic strata.

Lück'e (Gottfried Christian Friedrich), D. D., b. at Egeln, near Magdeburg, in the Prussian province of Saxony, Aug. 23, 1791; studied theology at Halle and Göttingen, and became professor at Bonn in 1818, and in 1827 at Göttingen, where he d. Feb. 14, 1855. His most prominent works are *Grundriss einer neutestamentlichen Hermeneutik* (1817) and *Commentar über die Schriften des Evangelisten Johannes* (4 vols., 1820–32), which latter work has been translated into English under the title *Commentary on the Epistles of St. John* (Edinburgh, 1837). His fine theological library was purchased for Harvard College.

Luckenwal'de, town of Prussia, in the province of Brandenburg, on the Nuthe, has some manufactures of paper, cloth, and linens. Pop. 14,706.

Luck'ner (Nicolaus), b. in 1722 at Kampen, Bavaria; adopted very early a military career, and served first in the Bavarian army, then in the Prussian army, distinguishing himself very much in the Seven Years' war, especially in the battle of Rossbach, and at last in the French, which he entered in 1763 as a lieutenant-general; in 1791 was made a marshal of France, and in Feb., 1792, was appointed commander, first of the army of Alsace, then of that of the north. In June he took Menin and Courtray, but retired then suddenly to Lille, none understood why. In July he was appointed commander-in-chief of the corps of Biron and La Fayette, and fought successfully against the Austrians at Longwy (Aug. 19), but a few days afterwards he was replaced by Kellermann, for reasons unknown, and called before the bar of the Convention, because he had not punished General Jarry, who, when evacuating Courtray, had set fire to the city. He was ordered not to leave the city, and lived quietly for some time, but in Sept., 1793, the payment of his pension of 36,000 francs was suspended, and when he made inopportune demands for his money, he was dragged before the revolutionary tribunal, convicted, and guillotined, Jan. 3, 1794.

Luck'now [Hind. *Laksmanavate*], city of British India, the capital of the province of Oude, is situated in lat. 26° 53′ N., lon. 80° 58′ E., on the Goomty, an affluent of the Ganges, 610 miles from Calcutta, at an elevation of 360 feet above the sea. At some distance the city presents a magnificent aspect, but it disappoints on a nearer approach. The whole central part of it consists of narrow and crooked streets, sunk several feet into the ground, and lined with huts of mud or bamboo, thatched with straw or palm-leaves. The commercial part of the city along the river, which here is 100 yards wide, navigable for large boats, and crossed by three bridges, is better built; it has brick houses surrounded with gardens. In the east quarters are several mosques and palaces, among which the Imambara is the most remarkable; it is an extensive structure, containing a mosque, the sepulchre of Asof-ud-Dowla, a college, etc.; but several parts of it are of a most beautiful architecture. The buildings erected under the auspices of Claude Martin, a Frenchman who came to India as a poor soldier, but arose to great power in the former kingdom of Oude, such as the Constantia, Martinière, etc., are very gorgeous. From 1775, and to the incorporation of the kingdom of Oude with the British dominions, Lucknow was the capital of the country. The mutiny of 1857 broke out at Lucknow early in May, and from the 1st of July to Sept. 25 the feeble garrison of European forces under Sir Henry Lawrence withstood the large besieging party of mutineers, during which time Sir Henry was killed. On the latter date they were relieved by the forces under Gens. Outram and Havelock, who cut their way in, but were in turn themselves besieged by the still greatly superior force of the natives; and it was not until Nov. 17

that Sir Colin Campbell arrived to their relief with reinforcements. The city, however, could not be held, and was secretly evacuated on the 22d. Three days later Gen. Havelock died of dysentery. It was not until Mar. 19, 1858, and after much hard fighting, that the city, which had been fortified by the insurgents, was repossessed by the British. Pop. 1881, 261,485.

Lu'çon, town of France, department of Vendée, is connected by a navigable canal with the Bay of Aiguillon, and has a theological seminary, a communal college, and manufactures of porcelain. Pop. 6339.

Lucre'tia, a daughter of Spurius Lucretius Tricipitinus, and the wife of Lucius Tarquinius Collatinus, was celebrated as much for her virtue as for her beauty. Sextus Tarquinius, a son of Tarquinius Superbus, the king of Rome, and a kinsman of her husband, became passionately enamored of her, and once, having been hospitably received in her house during the absence of Collatinus, he entered her bedchamber in the night with a drawn sword, threatened to lay a slave with his throat cut beside her, and say that he had killed him in order to avenge her husband's honor, and thus he forced her to yield to his wishes. But as soon as he had departed she sent for her father and husband, told them what had happened, made them swear to avenge her, and then stabbed herself. When the infamous deed became known it aroused the indignation of the whole people, and Lucretia's funeral became the occasion of a general revolution, by which the Tarquins were expelled from Rome and the republic was established.

Lucre'tius (Titus Lucretius Carus), b., according to Jerome (in the *Eusebian Chronicle*), in the year 95 B. C., and d., according to Donatus, 55 B. C., or, according to others, 52 B. C. His death seems to have been sudden, and is supposed to have been by suicide, through derangement occasioned by the effects of a philter administered to him. (For the current theory on the motives of this, see Tennyson's poem, *Lucretius*.) Very little is known in regard to his education, career, residence, or fortunes. He was a Roman citizen of noble extraction, and probably studied at Athens, and obtained there his intimate acquaintance with the Greek poets and philosophers. His poem, *De Rerum Naturâ*, which received Cicero's revision, has come down to us entire, although apparently unfinished by its author. It has been called the greatest of didactic poems, on account of the scientific precision and clearness of its statements, and the grandeur and beauty of its poetic dress. The poem contains six books, with upwards of 7000 lines in all, and is dedicated to C. Memmius, prætor 58 B. C., as a personal friend of the author. It is regarded as the completest exposition of the physical system of Epicurus, and embodies the theories of Democritus, together with the hedonic doctrine of Aristippus. Lucretius was the representative apostle of *éclaircissement* in the ancient world, and he has remained the favorite poet of rationalism to this day. His great object was to free mankind from the fear of death, arising, as he thought, from superstition inherent in the popular religion. He fills with poetic fire the dry atomistic physics of his master, and quite naturally there arises an inconsistency between his scientific conviction and the form of his exposition. This has been pointed out by Bayle, Montaigne, and others. He denies all design in nature, and accounts for the universal prevalence of law and arrangement in the universe through the so-called "theory of natural selection": "Atoms wrought on by impulse and gravity, and excited in every mode to cohere, and having been tried in all possible aggregations, motions, and relations, *fell at last into those that could endure.*" His sublime poetic feeling, however, led him on from the use of trope and metaphor to the employment of mythological machinery and allegory. He apostrophizes Venus as the personification of nature, but does not forget her mythological relation to the Roman people. He also recognizes the other gods as existing, although different from the popular representation of them. The following brief analysis of his poem will indicate to the reader his chief views: Book I. opens with an invocation of Venus, and is followed by an invective against superstition; the logical consequence of his doctrine is the destruction of mythology and allegory—in fact, of all sensuous embodiment of ideas. The principles of his cosmogony are (*a*) nothing comes from nothing; (*b*) matter is eternal; (*c*) its elements are the atom and the void; he repudiates Heraclitus with his doctrine of fire, and also Empedocles and Anaxagoras. Book II. treats of atoms, their form, number, and development into life and generation, growth and decay. Book III. treats of the soul, making it to be identical with the body, explicitly denying immortality, and offering his consolations thereon. Book IV. treats of sensations and perceptions, explaining their origin in physical emanations from bodies, causing images to arise in the sensory of the one who perceives; sleep, dreams, and love are explained. Book V. gives his views of the origin of the world, and of the rise of the institutions of human civilization: (*a*) marriage and the family, (*b*) society, (*c*) the state, (*d*) religion, (*e*) music and poetry. This book is the most impressive part of his poem, inasmuch as it deals with human relations. Book VI. treats of meteorology, phenomena attributed directly to the agency of the gods being shown to have a natural cause; *e. g.* thunderbolts, instead of being the weapons of Jove, are developed by the friction of clouds, and the thunder is the noise occasioned by their (*i. e.* the clouds') flapping together, etc. A poetical rendering of the story of the plague at Athens, as told by Thucydides, closes his work. Lucretius was greatly admired in the fifteenth and sixteenth centuries, and traces of his influence are found in the works of the best English poets; for example, Spenser in the fourth book of his *Faerie Queene* paraphrases the address to Venus already mentioned. His influence upon Giordano Bruno was extraordinary; also upon Immanuel Kant, notwithstanding the contrast between the ethical theory of Kant and that of Epicurus. The edition of this poem with notes by H. A. J. Munro is to be mentioned. Among English translations may be named those of John Mason Good, and of J. S. Watson, published in "Bohn's Library;" that of Thomas Busby, and that of Charles Frederick Johnson (New York, 1872). William T. Harris.

Lucul'lus, the surname of a plebeian family of the gens Licinia, which first appears in history at the close of the Second Punic war. The most famous member of this family was Lucius Licinius Lucullus, the conqueror of Mithridates. The exact dates of his birth and death are not known, but he was quite a young man when he distinguished himself in the Social war and gained the favor of Sulla, whom he accompanied as quæstor to Greece and Asia on the breaking out of the First Mithridatic war, in 88 B. C. In this war Fimbria, a partisan of Marius, succeeded in expelling Mithridates from Pergamus, and shut him up in Pitane, where he would have been compelled to surrender himself if Lucullus had supported Fimbria with his fleet; but Lucullus preferred the party interests of Sulla to the welfare of his country, refused to co-operate with the Marian general, and Mithridates escaped. Years afterwards his own brilliant career came to an unsatisfactory end, and another man gathered the fruits of his talents and exertions by a similar base party manœuvre. After being consul in 74 B. C., together with Cotta, Lucullus received Cilicia as his province, and Cotta received Bithynia. Mithridates invaded Bithynia, defeated Cotta, and besieged him at Chalcedon; but Lucullus, who in an astonishingly short time had reorganized and thoroughly disciplined his army, hastened to the support of his colleague, threw Mithridates back into Pontus, routed his army at Cabira in 72 B. C., and his fleet at Tenedos in 71 B. C., took Eupatoria, Amisus, and Sinope, compelled the king to seek refuge with his son-in-law, Tigranes, king of Armenia, and brought his country under Roman authority. But the reforms which he now introduced in the administration of Asia came into collision with the interests of the Roman nobility. The revenues of the provinces were generally farmed out, and the measures of Lucullus were intended for the defence of the taxpayers against the extortions of the farmers. But tax-farming and extortion were to many aristocratic families in Rome the only source of their wealth, and at the head of the aristocratic party stood at this time a man, Pompey, who bore a personal hatred to Lucullus, on account of the preference which Sulla always had shown him. The intrigues against Lucullus began. Emissaries from Rome appeared in his army. The bond between the soldiers and their general was loosened. After the great victory in 68 B. C. over Mithridates and Tigranes at the river Arsanias, the legions declined to follow Lucullus farther, and he had to lead them into winter quarters in Mesopotamia. Next year Mithridates reopened the war with some successes over Triarius, the Roman legate in Pontus, but when Lucullus wished to lead his army against him, the soldiers, seduced by Glabrio, deserted him, and Pompey earned the glory of having brought the Mithridatic wars to a final close. Disgusted, Lucullus returned to Rome, retired into private life, and spent his time in luxurious indolence. He was enormously rich, and the magnificence of his dinners became proverbial. D. about 57 B. C.

Clemens Petersen.

Lu'den (Heinrich), b. at Loxstedt, near Bremen, Apr. 10, 1780; studied theology, philosophy, and history at Göttingen, and was appointed professor of history in 1806 at Jena, where he d. May 23, 1847. His *Ansichten des Rheinbunds* (1808) attracted much attention, and exercised some influence on public opinion in Germany concerning Napoleon's policy. His later and larger works, *Allgemeine Geschichte des Alterthums* (1814), *Allgemeine Geschichte des Mittelalters* (1821–22), and *Geschichte des* *deutschen Volks* (12 vols., 1825–37, reaching only to 1237), have also not been without influence, though the views which they propound have led to much controversy.

Lü′denscheid, town of Prussia, in the province of Westphalia, is noted for its manufactures of jewelry and galvano-plastic goods, and has rich calamine-mines in the vicinity. Pop. 11,024.

Lü′ders (ALEXANDER NICOLAJEVICH), COUNT, b. in 1790 of a German family settled in Russia; entered the Russian army in 1807; was made a brigadier-general in 1826; distinguished himself in 1831 at the storming of Warsaw; fought in the Caucasus from 1843 to 1845 against Schamyl, and took Dargo; put down the revolution in Roumania in 1848; fought in Hungary in 1849, and won a complete victory over Bem, which rapidly led to the pacification of the country; was commander-in-chief in the Crimea when Sevastopol was taken, and was appointed lieutenant-general of Poland in 1861, but was recalled in 1862, on account of his too severe disposition. Before he left Poland an attempt was made to assassinate him, but he only received a severe wound. He retired from service, was made a count, and d. at St. Petersburg Feb. 13, 1874.

Lu′dewig (HERMANN ERNST), b. at Dresden, Saxony, Oct. 14, 1809; received a careful education; came to the U. S. in 1842; practised law in New York; printed for private distribution *The Literature of American Local History* (1846), and a supplement relating entirely to the State of New York (1848); wrote several erudite articles on American history, philology, libraries, and bibliography for French and German magazines, and prepared a valuable work, *Bibliotheca Glottica, or Literature of American Aboriginal Languages* (1856), which appeared in London a few days after his death at Brooklyn, N. Y., Dec. 12, 1856.

Lu′dington, city, cap. of Mason co., Mich. (see map of Michigan, ref. 5–H, for location of county), on Lake Michigan, at outlet of Père Marquette Lake and River, is the western terminus of the Flint and Père Marquette R. R., 84 miles from Milwaukee, with which it is connected by steamers; has a fine harbor on the lake, several saw-mills, a shingle and a planing mill, a foundry and machine-shop, and carriage and other shops. Pop. in 1880, 4190; in 1884, 5433.

Lud′low, town of England, in the county of Salop, at the confluence of the Corve and Teme. Its castle, formerly an important stronghold against the Welsh, was the residence of Henry VII. (1485–1509), and of Mary Tudor before her accession to the throne, and is still more memorable as the scene of the representation of Milton's *Comus*. It was held for Charles I. (1646), but surrendered to the Parliamentary forces, soon after fell into decay, and is now a ruin. Pop. 5035.

Ludlow, Windsor co., Vt. (see map of Vermont, ref. 7–C, for location of county), in the Black River Valley, on the Rutland division of the Central Vermont R. R., 25 miles E. of Rutland, has an academy, woollen mills, a tannery, toy, carriage, harness, and scythe-stone manufactories, machine-shops, and a foundry. Pop. of tp. in 1870, 1827; in 1880, 2005, including 1179 in v.

Ludlow (Gen. EDMUND), b. at Maiden-Bradley, Wiltshire, England, in 1620; educated at Oxford; entered the Parliamentary army as a volunteer on the outbreak of the civil war; became a colonel of cavalry; was one of the members of the high court which condemned Charles I.; protested against Cromwell's assumption of the protectorate, and agitated against him in favor of a republic; retired to Switzerland at the approach of the Restoration, and spent the remainder of his life there, only returning to England for a brief period in 1688; resided at Vevay, where he wrote his valuable *Memoirs* (3 vols., 1698–99), and d. in 1693.

Ludlow (FITZHUGH), b. at Poughkeepsie, N. Y., in 1837; commenced writing for the New York press in 1855; wrote in 1857 *The Hasheesh Eater,* describing the pleasures and pains attending the use of that drug, to which he had been addicted; published in *Harper's Magazine* a series of short stories which enjoyed popularity, and were reprinted under the title of *Little Brother and Other Tales;* subsequently wrote *The Heart of the Continent,* a record of Western travels, and *The Opium Habit,* giving his personal experience with opium. D. in Switzerland Sept. 13, 1870.

Ludlow (ROGER), b. in the W. of England, of good family; settled at Dorchester, Mass., 1630; was assistant governor of the colony 1630–34; went to Connecticut 1635, where he was for nineteen years a magistrate or deputy governor, and was appointed one of the commissioners of the United Colonies; settled at Fairfield 1639. Ludlow was a brother-in-law of Gov. John Endicott, author of the Connecticut code of laws (first printed 1672). He removed to Virginia with his family 1654. The place and time of his death are unknown.

Ludol′phus (JOB), b. Jan. 15, 1624, at Erfurt, in the Prussian province of Saxony; studied languages in his native place and at Leyden; travelled in 1647 in France and England; accompanied Queen Christina of Sweden in 1649 to Rome, where he made the acquaintance of some Abyssinians, by whose aid he studied the Ethiopic language; visited Sweden and Denmark; settled in 1652 in Gotha, and d. Apr. 8, 1704, at Frankfort. He wrote a *Historia Æthiopica,* gave grammars and dictionaries of the Ethiopian and Amharic languages, and was the founder of the study of Ethiopic in Europe.

Lud′wig II., king of Bavaria, b. Aug. 25, 1845, succeeded his father, King Maximilian II., Mar. 10, 1864. He is a man of genius, of romantic nature, an artist, with very fantastic ideas of his personal dignity as a king, and rather capricious opinions concerning political questions. In the affairs of Germany, however, he has played an important and noble part. At the outbreak of the Franco-German war in 1870 he sided immediately with Prussia, and during the negotiations concerning the new organization of Germany he spoke with enthusiasm for the establishment of the German imperial throne. Also in the internal Bavarian politics he has shown himself master of the situation. He looks through the plans of the different parties, and suffers himself to be governed by none of them. But he dislikes to devote himself steadily and with consistency to the daily business of governing. He interferes from momentary impulses. He shows himself very seldom to his people, and public festivities are disagreeable to him. He lives mostly in solitude in his magnificent palaces, of which he seems to prefer Hohenschwangau, situated amidst beautiful mountain-scenery: and here he busies himself with art, especially with music. On account of this passion for music the composer Richard Wagner gained a considerable influence over him during the first years of his reign, but the result was that there broke out among the people frequent riots against Wagner, and in 1866 the king was compelled to send the composer from the court. Another peculiarity is his enthusiasm for Louis XIV. After the war with France he visited Paris and Versailles in order to study their works of art, and especially the remembrances they contain of Louis XIV. He also sometimes arranges great theatrical performances in the most expensive style, at which he himself is the sole spectator.

AUGUST NIEMANN.

Ludwig (KARL FRIEDRICH WILHELM), b. at Witzenhausen, in Hesse, Dec. 23, 1816; studied medicine at Marburg and Erlangen, and was appointed professor of comparative anatomy at Marburg in 1846, and of physiology at Zurich in 1849, at Vienna in 1855, at Leipsic in 1865. His *Lehrbuch der Physiologie des Menschen* (2 vols., 1852–56) and his numerous minor essays in scientific periodicals, among which is *Bemerkungen über den Stoss und den ersten Ton des Herzens* (1869), contain many original and comprehensive physiological researches.

Ludwig (OTTO), b. at Eisfeld, in the principality of Saxe-Meiningen, Germany, Feb. 11, 1813; studied music at Leipsic under Mendelssohn-Bartholdy, but was compelled by ill-health to give up his career; devoted himself to literature, and settled in 1855 at Dresden, where he d. Feb. 25, 1865. His tragedies, *Der Erbförster* (1853), *Die Makkabæer* (1854), and *Agnes Bernauer* (1857), were well received; also his tales, *Zwischen Himmel und Erde,* etc., but he belongs to that class of authors, very common in modern German literature, which mistakes training for talent, philosophical speculations for poetical intuitions, and imagination for inspiration. CLEMENS PETERSEN.

Lud′wigsburg, town of Würtemberg, 8 miles from Stuttgart, with an immense palace, beautiful parks and promenades, a military academy, and barracks. It is the second royal residence of Würtemberg, and was founded in the beginning of the eighteenth century, as a rival to Stuttgart, by Duke Eberhard Ludwig. It was greatly enlarged by his successor, Duke Charles, who resided there from 1764 to 1785, but it never acquired very great importance beyond that of being a royal residence and a military dépôt. Some manufactures, however, of woollen and linen cloth, of japanned tin-ware, picture-frames, organs, etc., are carried on. Pop. 16,087. It was the birthplace of David Strauss.

Lud′wigshafen, town of Germany, in Rhenish Bavaria, on the left bank of the Rhine, opposite Mannheim, was founded in 1843 by Louis I. of Bavaria; has direct railway communication with Paris, Mentz, and Frankfort. In 1802 it was simply the *tête-du-pont* of Mannheim and grew up very slowly. In 1843 it received its present name, and in 1859 it was made a town. It is now a rapidly-growing manufacturing and commercial place, producing aniline dyes, soda, tartaric acid, alum, artificial manures, and lime. Pop. 15,012.

Lud'wigslust, town of Germany, in the grand duchy of Mecklenberg-Schwerin, has an elegant palace with a beautiful park, some breweries, distilleries, and manufactures of tobacco and straw plaitings. Pop. 6269.

Luga'no, town of Switzerland, in the canton of Ticino, on the northern shore of the Lake of Lugano, whose southern part stretches into Italy, is one of the three alternating capitals of the canton, and carries on a considerable transit-trade between Switzerland and Italy. The inhabitants, numbering 6129, are Italian by descent, in features, and in character, and Italian is the language exclusively spoken in the town. During the Italian struggle for independence (1848–66) Lugano was the head-quarters of Mazzini, and enormous quantities of books and tracts intended to be distributed throughout Italy for the furtherance of the cause were produced there, and safely brought across the Italian frontier, in spite of the vigilance of the Austrian police.

Lugano, Lake of, situated on the frontier between Switzerland and Italy, and between Lago Maggiore and Lago di Como. It is of a very irregular shape, 20 miles long, but nowhere more than 1½ miles broad. The surrounding scenery is grand and wild, but of a somewhat gloomy character. Through the river Tresa it sends its waters into Lago Maggiore, which lies 200 feet lower, and it is fed by a number of short torrents which issue from the glens of the surrounding mountains.

Lugan'skoe, or **Looganskoe,** town of Russia, in the government of Yekaterinoslav, with large coal and iron mines in its vicinity. Pop. 10,059.

Lugard (Sir Edward), b. 1810; educated at Sandhurst (England) Military College; appointed an ensign in the army 1828; served for many years with distinction in India—in the Afghan war of 1842, in the campaign on the Sutlej as assistant adjutant-general, as adjutant-general of the queen's forces in India from the battle of Sobroan to the end of the campaign, and throughout the Punjaub campaign 1848–49; as chief of staff of the Persian expedition in 1857 (K. C. B.), and for services at the capture of Lucknow, where he commanded a division, was promoted to be major-general; became lieutenant-general 1865, general 1872; colonel 31st Foot June, 1862; permanent under-secretary of war 1861–71; president of the army purchase commission Sept., 1871; G. C. B. 1867, and in 1871 member of the privy council.

Lug'ger, a lug-rigged sailing vessel. The lug sail is square or quadrilateral, and attached above to a yard so slung that two-thirds of its length is on the leeward side of the mast. A lugger can sail well close to the wind, and is easily handled, but the rig is not adapted to large vessels.

Lu'go, town of Italy, in the province of Ravenna, about 14 miles W. of the city of Ravenna. It lies in a very fertile plain between the Senio and the Santerno, and good roads connect it with the chief towns of the Romagna. It is tolerably well built, and the great square of the Padiglione presents a very lively appearance during the annual September fair, when dealers from every part of the Romagna gather here to trade in grain, wine, cattle, hemp, silk, etc. In 1867 a mutual aid society was organized here, also a savings bank, and the town library, partly composed of books from the suppressed convents, now has 14,000 volumes. Public schools are multiplying, and it is to be hoped that this town and neighborhood will soon have a better reputation as to security of life and property than it hitherto has possessed. Pop. in 1880, 25,650.

Lugo, province of Spain, bordering N. on the Atlantic, comprises an area of 3787 square miles, with 410,810 inhabitants. The northern part is mountainous, rich in iron and lead, and covered with forests; the southern part is a large and fertile plain, producing wheat, wine, fruits, etc.

Lugo, city of Spain, the capital of the province of Lugo, on the Miño, is an old but regularly and substantially built town, with a fine cathedral of the twelfth century, and celebrated sulphur springs. Pop. 18,909.

Lugol's Solution. See Iodine.

Lu'gos, town of Hungary, on the Temes, has a well-frequented weekly fair and considerable trade in wine. Pop. 11,287, of whom one-fifth are Germans.

Lui'ni, or **Lovini** (Bernardino), b. at Luino on Lago Maggiore, some say in 1460, others say later. Nearly everything concerning this artist has been in dispute—the time of his birth, the time of his death, his relation to Leonardo da Vinci, the genuineness of his works. Of late it has been customary to ascribe more merit to him than formerly. Out of Italy his pictures had been attributed to Leonardo; but the *Christ disputing with the Doctors* in the British National Gallery, formerly assigned to Leonardo, is now given to Luini. The same is the case with the *Herodias* in Florence, the *Infant Baptist* in the Ambrosian Gallery at Milan, a *Madonna* in the Esterbazy Gallery in Vienna, and *Vanity* and *Modesty* in the National Gallery, London. His finest work, both in oil and fresco, is in Milan, Saronno, Como, and Lugano. O. B. Frothingham.

Luitprand. See Liudprand and Lombards.

Luke, Saint. *Life.*—Only one author of Gentile descent has had the honor of taking part in the composition of Holy Scripture—namely, Luke. In the Epistle to the Colossians (iv. 10–14) Paul distinguishes him, together with Epaphras and Demas, from all his assistants of Jewish descent, Aristarchus, Marcus, and Justus. An old tradition, stated by Eusebius and Jerome, maintains that he was from Antioch, the capital of Syria, where for the first time Christianity took root in a heathen country, and which became the cradle of the mission to the Gentiles. It has been assumed, though unjustly, that this tradition was only a misunderstanding of Acts xiii. 1, in which a certain *Lucius*, with whom Luke might have been confounded, is mentioned as one of the prophets and teachers of Antioch. But Eusebius and Jerome must have written rather carelessly in order to confound the name of Luke (Lucas, abridged from *Lucanus*) with that of Lucius (derived from *lux*), and still more so in order to conclude from a passage in which Lucius is mentioned as descending from *Cyrene*, that Luke was from Antioch. The narrative of the foundation of the church of Antioch (Acts xi. 19–26) is written with so much vividness and freshness that we seem to recognize the emotion of a personal remembrance; and it is quite remarkable that in a work of the second century, which probably still contains some authentic traditions, "The most excellent Theophilus," to whom the two writings of Luke are dedicated, is mentioned as a man living in Antioch: "Thus Theophilus, the most powerful man of the city, consecrated to the worship and under the name of a church the palace which he inhabited." Paul calls Luke (Col. iv. 14) "the beloved physician." This expression is not without importance. It proves that Luke belonged to the lettered class of the people, and was possessed of a certain amount of scientific knowledge. It is, indeed, certain that at this epoch there existed in the empire a medical superintendence quite severe. A supreme authority, *collegium archiatrorum*, awarded the diploma of medicine, and examined in every city those who exercised the medical art. The cures were rigorously scrutinized, and grave mistakes were punished by the loss of the right of practising. Of all Paul's companions, Luke was probably the only one who was possessed of a scientific and literary education.

At what period ought we to place his conversion? Some old writers maintain that he had been a disciple of Jesus, and was one of the seventy disciples whom the Lord sent to the places of Galilee in order to prepare for his own visit (Luke x. 1 *seq.*). But the introduction to the Gospel is not in favor of this supposition. In i. 2 Luke ranks himself among those who owe their knowledge of the gospel history to the teachings of eye-witnesses; which proves that he was not an eye-witness himself. But it is not impossible that, in accordance with an old supposition, he was one of the two disciples whom Jesus accompanied to Emmaus on the day of his resurrection. The one of them is mentioned by name, Cleopas. The anonymity of the other may indicate that he is the author himself; and this circumstance would correspond well with the dramatic character of the whole narrative, and especially with the following words, which seem to refer to a personal experience: "Did not our heart burn within us, while he talked with us by the way, and while he opened to us the Scriptures?" (Luke xxiv. 32). If, as the whole tradition testifies, Luke is the author of the Acts, and if he always speaks of himself in this book when he says "we," we meet him for the first time at the moment when Paul, having arrived at Troas on his second missionary voyage, prepares himself to cross over to Europe and undertake a missionary travel through Greece, beginning with Macedonia (Acts xvi. 10): "And after he had seen the vision, immediately we endeavored to go into Macedonia." It has been found improbable that Luke thus should have placed himself as immediately co-operating with the mission from the very beginning, and the supposition has been made that the author of the Acts here inserts a fragment of a journal of one of the companions of Paul; as, for instance, Timotheus or Silas. But is it probable that the author of the Acts, who shows himself an able writer in both his books, should have committed such an awkwardness as to insert in his own work a passage from a foreign work in this way, though it would be so very easy for him to change the "we" to "they"? No: he who speaks thus in this passage is evidently the same as he who calls himself "I" in the first words of the book: "The former treatise have

I made, O Theophilus" . . . . (Acts i. 1). And the objection raised falls by itself if we admit that Luke was originally from Antioch, a member of the church of that city and long acquainted with St. Paul. It seems as if, after the foundation of the church in Philippi, Luke remained in that city, probably in order to take care of the young church, while Paul, Silas, and Timotheus continued their journey; for the "we" disappears in the narrative of the mission from this moment, and until the epoch when towards the end of his third journey St. Paul passed once more through Philippi on his way to Jerusalem. At this point it reappears. "These going before," it reads in the Acts xx. 5, with reference to the deputies of the churches of Greece and Asia who accompanied Paul to Jerusalem, "tarried for *us* at Troas." The "we" then continues until the arrival at Jerusalem; and as it recommences at the moment when Paul, after two years' imprisonment at Cæsarea, departs for Rome, it is natural to conclude that Luke remained with him during the two years of his captivity. And it was during this time that he gathered on the very theatre of the evangelical history the information and the materials of which he composed his two works. He alludes himself to this information in his Gospel (i. 1–4). After these two years he went with Paul to Rome, and participated in the shipwreck, which he has described in a most graphic manner in Acts xxvii.; he arrived at Rome with the apostle in the spring of 62. In the Epistles to the Colossians and to Philemon, which probably are the first letters written by Paul from Rome, he addresses salutations which prove that Luke lived with him during the first period of that captivity, with which the book of the Acts ends. The Epistle to the Philippians, written towards the close of these two years, contains no salutation from Luke to this church, with which he was so closely connected; from which circumstance we must infer that he had left Paul and returned, for the time being, to the Orient. We find him once more in company with Paul and as a prisoner in the Second Epistle to Timothy (iv. 11), where the apostle says of him, "Only Luke is with me." The second captivity is probably here referred to, which Paul suffered in the year 66 or 67, having been liberated in the beginning of 64, and which terminated with his martyrdom. According to a tradition stated by Jerome, Luke preached the gospel in Achaia and Bœotia. Gregory Nazianzen speaks first of his martyrdom, and Nicephorus Callistus in the fourteenth century tells that he was hung on an olive tree in Greece at the age of eighty years. From the testimony of Jerome it seems certain that his ashes, as well as those of Andrew, were brought from Achaia to Constantinople by orders of Constantius in 356. Thus we can consider Luke as an educated Greek, and as one of St. Paul's most faithful assistants among the Gentiles of Greek nationality.

Works.—Two books are ascribed to Luke by Christian antiquity—the third of the canonical Gospels and the Acts of the Apostles. As these writings have never borne the name of any other author than that indicated by the title given them by the primitive Church, there is no reason for doubting the tradition. As Luke is one of the most conspicuous and most frequently mentioned of Paul's companions, one might perhaps think that on this point the Church has proceeded by way of supposition. This is not so, however; even the obscurity of the name of Luke in the writings of the New Testament speaks in favor of the truth of the tradition. It is equally incontestable that the author of the third Gospel and the Acts must be sought among the assistants of St. Paul. To prove this the striking analogy suffices between the form of the institution of the Lord's Supper in Luke and in Paul (1 Cor. xi.). There is furthermore the closest relation between the enumeration of the appearances of Jesus after the resurrection in Luke (xxiv.) and in Paul (1 Cor. xv.). And the whole history of Jesus by Luke, what is it but a demonstration of the reality of those two great principles which form the basis for all St. Paul's preaching—namely, the universality of the salvation and its entire gratuity? That is the reason why Luke traces the genealogy of Jesus to Adam, the father of mankind, and not only to Abraham, the father of the Jews, as Matthew does; why he loves to tell the parables of grace (ch. xv., the lost sheep; the piece of silver; the prodigal son) and other narratives of a similar bearing, as, for instance, the forgiven sinner (ch. vii.) and the Pharisee and the publican (ch. xviii.); why, furthermore, he has completed the narrative of the Gospel by a picture of the foundation of the Church by the apostles, especially by St. Paul, whose grand missionary labor among the Gentiles he follows until his arrival at Rome, the centre of the empire. From the fact that the writings of Luke enforce the ideas of Paul it has been inferred that in several points he has perverted history in favor of his particular views. But that is to lower the intention of the sacred writer in a strange manner. In his two writings he defends a cause much higher than that of St. Paul: he pleads the cause of God himself. In chs. ix. and xi. of the Epistle to the Romans we are told that the Jews even claimed that God had not the right to withdraw the salvation from them and give it to the Gentiles, since he had bound himself to them by inviolable promises. The aim of the whole work of Luke is to demonstrate that God has accomplished faithfully his promises, by the apostles preaching first to the Jews and then to the Gentiles, and that, consequently, it is not God who has broken his engagements with his people, but the people who have rejected their God.

Among all the assistants of St. Paul, Luke the physician was probably the only one who was able to write such a work. The introduction, contained in the four first verses of ch. i., presents a striking analogy to the introductions of the great Greek historians; as, for instance, Herodotus and Thucydides. The style of these verses is classical. But from verse 5 Arameanisms abound, which show from this point that the author is reproducing certain documents in that language, and reproducing them with scrupulous exactness. The personal style of the author does not reappear until the second part of the book of the Acts, where it comes in quite naturally, as at this point he begins to narrate what he has seen and heard himself. All these traits correspond perfectly with the character designated by tradition—a friend of Paul, a Greek, and a Greek of classical education. The period at which Luke composed this work cannot be far from the time when St. Paul preached, as it was intended as an auxiliary to the preaching. This circumstance also proves the purity of the traditions which are given here, and which in no point resemble those legends which we meet even in the Fathers from the beginning of the second century; as, for instance, in Papias. Most admirable is the manner in which Luke knows how to place the words of Jesus so as to make them strike—a quality which proves the exactness of the information he had gathered concerning the circumstances under which the words were spoken. Clemens of Alexandria places the composition of the Gospel of Luke even before that of the Gospel of Mark, according to a tradition due to the ancient presbyters. With respect to the locality in which the composition took place, we have only a tradition stated by Jerome, according to which it was in the countries of Achaia and Bœotia. But this tradition has nothing certain; Macedonia or Antioch would be as probable a supposition, as Greek literature and language reigned in both countries. The question has often been raised why Luke ends the book of the Acts with the two years' captivity of St. Paul in Rome. Why did he not relate the martyrdom of the apostle if thus his captivity terminated, or if not, then his liberation? To these questions it has been answered that he may have treated this subject in a third book, which has not come down to us, or that he died himself before finishing his work. More generally it has been supposed that the reason why he did not continue his narrative further was that he finished his book just at the same time as the imprisonment of the apostle terminated. This supposition is the least improbable. It is nevertheless not certain. The idea of the book of the Acts is by no means to give the biography of Peter or Paul, or any other man. Like the whole Scripture, the book refers to the great subject of the *reign of God.* It contains the history of the apostolical foundations—the foundation of the Church among the Jews by St. Peter (i.–v.); the providential preparation for the preaching among the Gentiles (vi.–xii.); the foundation of the Church among the Gentiles by St. Paul (xiii.–xxviii.); and these foundations were no doubt accomplished at the end of St. Paul's first captivity, with which the Acts end. Thus, the plan of the two works is—from Nazareth to Capernaum; from Capernaum to Jerusalem; from Jerusalem to Antioch; and from Antioch to Rome. And as a true historian Luke traces the progress of the faith in Christ from the individual to the Church, and from the Church to the centre of the world's scene. FREDERIC GODET.

Lukis (WILLIAM COLLINGS). See APPENDIX.

Luling, Tex. See APPENDIX.

Lull (EDWARD P.), U. S. N., b. in Vermont Feb. 23, 1836; graduated at the U. S. Naval Academy in 1855; became a master 1858, a lieut. 1860, a lieut.-commander 1862, a commander 1870, a capt. 1881; served on board the Brooklyn at the battle of Mobile Bay, Aug. 5, 1864, and is thus honorably mentioned in the official report of his commanding officer, Capt. James Alden: "To my executive officer, Lieut.-Com. E. P. Lull, my thanks are especially due, not only for his cool, steady bearing in the fight, but also for the efficient training of the crew." In 1872–74 he commanded expedition which surveyed a route for a ship-canal across Isthmus of Nicaragua. F. A. PARKER.

Lull (Ramon), Latinized Raimundus Lullius, b. at Palma in Majorca, or, as Amat thinks, more probably at Barcelona, in 1235; d. at Bougiah in Algeria in 1315. Lull's early education was neglected, and he led a dissolute life till the age of thirty, when he suddenly renounced the world, bestowed his goods upon the poor, and thenceforth devoted himself to philosophy and religion. Most authorities say that he became a minor brother of the Franciscan order, but the grand inquisitor Eymeric, who, as himself a Catalan born soon after the death of Lull, was probably well informed on this point, expressly says that he was a *mercator laicus*. After many distant pilgrimages, Lull established himself in a hermitage on Mount Roda, near Barcelona, and spent nine years in repairing the deficiencies of his education by diligent study of the Latin and Arabic languages and literature, and apparently of Hebrew and Chaldee also, as well as of theology and philosophy. In this retreat he formed his system of religious and philosophical belief, and produced his first literary compositions, though no doubt most of his numerous writings in Latin, Arabic, and Catalan were composed at a later period. Many of his Latin works were collected and printed at Mentz, in 10 vols. fol., in 1721–42, but whether the seventh and eighth volumes were ever actually published is disputed. His works in Catalan are very voluminous, but we do not know that any of them have ever been printed, except a few minor poetical compositions and a curious apologue, *Reynard the Fox*, designed for the political instruction of rulers, but wholly different from the Dutch and French fables with the same title. This is extracted from an immense volume, containing 365 fables, and entitled *Libre de Maravelles*, of which the Royal Library at Munich possesses two copies. The tale of *Reynard* covers about forty quarto pages, and was published by Konrad Hofmann at Munich in 1872. The religious romance or allegory, *Evast and Blanquerna*, printed at Barcelona in the fifteenth century, was written in Latin, and the Catalan translation is not by Lull himself. Critics divide Lull's Latin works into four parts: those composing or expounding his philosophical system, *Ars Magna* or *Lulliana*, and which form an encyclopædia of the knowledge of the age; those relating to religion; polemical treatises against Averrhoes and his followers; and writings of a more or less autobiographical character. The great influence of Lull on his own age was perhaps due rather to his fervent zeal and indefatigable activity in the propagation of his opinions, by personal instruction and public lectures at Paris and other seats of mediæval learning, than to the circulation of his writings. He seems to have passed the latter half of his life as an itinerant apostle of philosophical and religious truth. He even made several voyages to Moorish Africa, where he convoked the leading Moslem doctors, and exposed in public discourses the fallacies of Averrhoes and the hollowness of the pretensions of Mohammed. In the last of these missions, while he was on his return from a pilgrimage to Jerusalem and Egypt, at the age of eighty, he was put to death at Bougiah by a mob as an enemy to the religion of the Prophet, though on former occasions he had been treated with respect by the Mohammedan priesthood. Lull's cardinal principle, the unity of all knowledge or the supremacy of reason, permeates all his writings, and he aimed to show not only that Christian doctrine was not irreconcilable with philosophy, but might be demonstrated by it. Hence, he was a true reformer, and it is to be regretted that his works have fallen into unmerited obscurity. He was also enlightened in his views of education, and labored zealously for the introduction of the study of Hebrew, Chaldee, and Arabic into the university courses of instruction.

It is not strange that such disorganizing doctrines as these should have excited the hostility of the ferocious bigot, Eymeric. The inquisitor's opinion of the literary character of Lull, whom he characterizes as *phantasticus, imperitus, qui quamplures libros ediderat in vulgari Catalanico quia totaliter grammaticam ignorabat*, and which has not been cited by any of Lull's biographers whom the present writer has been able to consult, is one of the most remarkable passages in that astounding volume, the *Directorium Inquisitorum*. Eymeric boasts that he examined the works of Lull with great labor, and presented to Pope Gregory twenty volumes in which he pointed out 500 errors. These, upon the report of more than twenty doctors in theology, were condemned by the pope as heretical. Eymeric specifies 100 of the condemned propositions *in extenso*. The character of Lull's philosophico-religious heresies may be inferred from the second in Eymeric's list: *In divinis essentia non est otiosa et natura naturificat, bonitas bonificat, et infinitas infinitificat, et æternitas æternificat.* The 77th heresy, found in Lull's essay on the education of children, might very naturally be unacceptable to an inquisitor: *Quod sine charitate non possumus habere aliquam virtutem, sicut sine oculis non possumus videre;* but Lull's most pestilent theological errors are those numbered 96, 97, and 98, teaching that the articles of faith, the sacraments of the Church, and the power (*potestas*) of the pope are all matters of proof *per rationes demonstrativas;* that though the uncultivated and ignorant must accept religious doctrines *per fidem*, the *homo subtilis* is to be convinced of them rather by reason than by faith; and finally that faith may err, while reason is infallible. *Fides*, as used by Lull, often means submission to human authority, or, in other words, the authority of the Church. Of course, if the dogmas of the Church are dependent upon logical proof, they may be susceptible of logical disproof, and the infallibility of reason being proclaimed, the spiritual authority of the papacy falls to the ground. Most of the summaries of the papal dogmatic definitions—as, for example, Denzinger's—omit all Lull's heresies except the three just cited, and the others are not readily found except in Eymeric. (See *Biographie Générale* (Hoefer), article Lulle or Lull; Helfferich *Raymond Lull und die Anfänge der Catalonischen Literatur* (Berlin, 1858); Nicolai Eymerici, *Directorium Inquisitorum* (Romæ, 1578, pp. 190 *seq.*).) The manuscript autobiography of Lull said to exist in the library of the Sapienza at Rome is not now to be found in that collection.—Ramon Lull, the author of a number of works on alchemy, often confounded with the theologian, is a different person, of whose biography little is known. George P. Marsh.

Lully' (Jean Baptiste), b. at Florence in 1633; went early to Paris as scullion in the household of the princess of Montpensier; made himself noticed by his skill on the violin; received some regular instruction by the aid of the princess, and obtained a place in the orchestra of Louis XIV., the famous *bande de vingt-quatre*. Having gained the favor of the king by some airs he composed, a new orchestra, *les petits violons*, was organized and placed under his direction, and he managed it so well that it soon entirely eclipsed its elder rival. He was made director of music at the court, composed all the ballets, a sort of entertainment for which Molière often wrote the text, and in which the king himself often performed, and gained such an ascendency over the taste of the king that no other music was heard at the court than his. In 1672 he obtained the privilege of opening an opera theatre at Paris, Académie Royale de Musique, and by the success of this enterprise he became the founder of the French opera. He wrote nineteen large operas, to which Quinault generally furnished the text, and for nearly a century—that is, up to the time of Gluck—he was considered the greatest opera composer. At present, however, his music is seldom heard—not because it lacks genuine musical inspiration, but because the technics of the art have developed so much since the days of Lully that his manner of instrumentation, harmonizing, etc. would now appear awkward. His *Miserere*, written for the funeral of Seguier, his *Bisogna morire, peccatore*, and some minor pieces of sacred composition, are still heard now and then. D. at Paris Mar. 22, 1687, leaving an immense fortune.

Lum'bago [Lat.], or **Crick in the Back,** is a term in medicine applied to a very painful ailment, a kind of subacute rheumatism, often very severe, and seated in the lumbar region. Strong liniments, rubbing with the band, the application of the electrical brush, and cupping are all useful. A mild diaphoretic often affords relief.

Lum'berton, cap. of Robeson co., N. C. (see map of North Carolina, ref. 4–G, for location of county), 65 miles W. of Wilmington, 80 miles S. of Fayetteville, and 150 miles E. of Charlotte, on Lumber River and on the Carolina Central R. R. Principal business, farming, turpentine, tar, and timber. Pop. of v. in 1870, 615; in 1880, 533.

Lum'ber Trade, the commerce in timber, especially in that which is sawed for market, including in its widest sense laths, shingles, shooks, pickets, clapboards, railroad ties, ship-timber, deals, planks, scantling, etc. It is one of the most important industries of the U. S. Among foreign countries, Norway, Russia, and North Germany are extensively engaged in this business, Riga, Memel, Dantzic, and the fiords of Norway being the principal lumber-ports. France grows and cuts considerable fine timber. The tropical countries supply great quantities of dyewoods, veneer-stuff, etc. Such timber as mahogany, locust, lance-wood, green-heart, snake-wood, and the like comes from the West Indies. India exports much teak and other ship-timber. Australia, New Zealand, etc. furnish spars and other timber to British commerce. But the Ottawa region, New Brunswick, and British Columbia are far more productive lumber-regions than any of the foregoing. In the U. S., Maine, Northern New York, Michigan, Illinois, Minnesota, Wisconsin, Indiana, Pennsylvania, North and South Carolina, Georgia, Florida, the southern parts of Alabama and Mississippi, the S. E. of Texas, the "cross-timbers" of Northern Texas, Northern California, Western Oregon, and the Puget Sound region, are among the most important lumber tracts; but nearly all the other States have important lumber interests. Chicago, and the other lake ports, Albany, Bangor, Boston, Wilmington, Savannah, Brunswick, Ga., and Pensacola are important centres of the lumber-trade. The Puget Sound lumber-trade has increased rapidly of late. According to the U. S. census of 1880, the States employing the most capital and men in this industry were (in the order of the relative value of the products) Michigan, Pennsylvania, Wisconsin, Indiana, New York, each producing over $9,000,000 worth of sawed lumber annually. The number of establishments in the U. S. (including saw and planing mills) was 26,911; number of hands employed, 163,245; capital, $198,799,045; wages paid, $37,736,698: and the total value of products was put at $270,072,085. The saw-mill industry of the U. S. appears in every State and Territory. The aggregate product by census of 1880 was $233,268,729, of which $52,449,928 was from Michigan. The great lumber counties of that State are Muskegon, Bay, Saginaw, and Montcalm. In this vast product almost all parts of the world finally share. Even the tropical regions, which often have abundant timber supplies of their own, import largely from us, because their scanty capital is generally invested in agricultural pursuits. The consequence is, that the U. S. are rapidly becoming disforested for the benefit of other nations. (For a fuller consideration of the important question of the effect of this state of things upon the climate of the country, see ARBORICULTURE. The different kinds of timber and their uses will be discussed under TIMBER and TIMBER TREES.)

Lump-Fish, or **Lump Sucker** (*Cyclopterus lumpus*), also called the **Sea-Owl** or **Cock-Paddle,** on account of the elevated ridge along the back, which is covered with a notched and tuberculated skin not unlike the comb of a cock, is a marine fish of North American and North European seas, of clumsy shape, and having its ventral fins formed into a sucker, by means of which it can cling to any solid substance so firmly that it can with difficulty be removed. Its flesh is edible at certain seasons, and in England is esteemed by some. It is asserted by fishermen that the lump-fish makes a kind of home, clearing out a hollow in the stony bottom, in which it deposits its eggs, and that it remains hovering about the spot until the eggs are hatched, for the purpose of guarding them against enemies. When thus engaged, it becomes brave and combative, permitting no other fish to pass within a certain distance of its charge, and in cases of necessity biting fiercely with its short but sharp teeth. If this is true, it is an interesting fact that the allied gobies—or, at least, some of them—care for their progeny in a similar way. When freshly taken from the sea, the colors of the lump-fish are truly magnificent, and even after being suspended for twenty-four hours in the fish-monger's shop its brilliant hues never fail to excite wonder and admiration.

Lumpkin, cap. of Stewart co., Ga. (see map of Georgia, ref. 5-F, for location of county), 36 miles S. of Columbus, has a fine court-house, a Masonic female college, and a male academy. Pop. in 1870, 778; in 1880, 747.

Lumpkin (JOHN H.), son of Wilson, b. in Oglethorpe co., Ga., June 13, 1812: educated partly at the State University; graduated at Yale College in 1832; studied law, and was admitted to the bar in 1834, locating at Rome, Ga.; became a member of the State legislature in 1835; in 1838 was elected solicitor-general of his judicial circuit; was a member of Congress 1843–51, then went upon the circuit court bench. D. at Rome, Ga., in 1860. A. H. STEPHENS.

Lumpkin (JOSEPH HENRY), LL.D., b. in Oglethorpe co., Ga., Dec. 23, 1799; educated partly at the State University, but graduated at Princeton with high honor in 1819; studied law; was admitted to the bar in Oct., 1820, and opened an office in Lexington, Ga.; in 1825 was a member of the legislature in the heat of the controversy between Gov. Troup and the Federal authorities growing out of the conflicts between the "old" and the "new" treaty, as they were termed, with the Creek Indians. With eloquence unusual in legislative halls he sustained the governor and maintained the rights of Georgia. Having become a member of the Presbyterian Church in 1826, he frequently made public addresses upon temperance, Sunday schools, and Bible societies while on the circuit, and even in his speeches before juries and judges he never omitted a proper occasion for illustrating and enforcing great moral truths. His career as a lawyer and orator from 1820 to 1843 was never equalled by that of any other Georgian. His health now failing, he went to Europe, and returned in 1845, greatly improved, and without his solicitation or knowledge was elected chief-justice of the State supreme court, which then for the first time organized. The term of office was six years, but receiving three successive re-elections without opposition, he continued to hold this position as long as he lived. He was for many years a trustee of the State University, and organized the Phi-Kappa, a literary society which is attached to the institution. He also founded the Lumpkin Law School, connected with the university. In 1860 he was elected chancellor of the university, but declined this position from his strong attachment to the supreme court, over which he had so long presided. In personal appearance Judge Lumpkin was one of the finest specimens of his race. His eye, brow, and his entire facial features, with his general physique, were all of the most striking and impressive character. No one ever graced the bench with greater dignity. His voice was clear, full, and sonorous. His decisions, delivered orally from the bench, were always distinct, methodical, and eloquent. D. at Athens, Ga., June 4, 1867. A. H. STEPHENS.

Lumpkin (WILSON), brother of Joseph Henry, b. in Pittsylvania co., Va., Jan. 14, 1783. His father moved to Oglethorpe co., Ga., soon after; when a little over twenty-one years of age was elected to the State legislature, and re-elected several times; he was a member of Congress from 1815 to 1817, and again from 1827 to 1831; in 1823 was a U. S. commissioner to mark the boundary-line between Georgia and Florida; in 1831 was elected governor of Georgia, and re-elected in 1833; was U. S. Senator from 1838 to 1841, and was for many years one of the trustees of the State University. D. at Athens, Ga., Dec. 28, 1870. A. H. STEPHENS.

Lums'den (MATTHEW), b. at Clora, Aberdeenshire, Scotland, in 1777; went to Calcutta in 1794; was employed in the administration of criminal justice; became professor of Persian and Arabic at the College of Fort William (1805), Persian translator to the East India Company, superintendent of the Mohammedan college at Calcutta, and director of the *Gazette*. He published esteemed grammars of Persian (1810) and Arabic (1813), and editions or translations of several Oriental works. D. in London in Mar., 1835.

Lu'na, the Latin name for the moon, and in the Roman mythology the goddess of the moon. Her worship is said to have been introduced in Rome in the time of Romulus, but although she had several sanctuaries in the city—among others a temple on the Palatine, which was lighted up every night—she was never reckoned among the great deities. (See SELENE.)

Lunacy. See INSANITY, by W. A. HAMMOND, M. D.

Luna, de (ALVARO), b. in Spain about 1390; was educated with the infant king, John II., with whom he escaped from the custody of the infante of Aragon in 1418; headed a successful revolution in behalf of the rights of the Crown; was made constable of Castile 1423; received ample endowments, and became the favorite minister of the king; was temporarily driven from court in 1426, and again in 1439, by the efforts of his enemies; was victorious in a war against the infantes of Aragon 1445, and was rewarded with the grand-mastership of Santiago, which he held in addition to the dukedom of Truxillo and the lordship of sixty towns and fortresses. The powerful favorite was at last overthrown by means of intrigue, condemned to death, and executed at Valladolid in June, 1453. He was a patron of letters, and wrote poetry and plays. (See his history by an anonymous writer, *La Cronica del Condestable Don Alvaro de Luna*, 1546.)

Luna, de (PEDRO), antipope. See BENEDICT XIII.

Lunalil'o, cousin to Kamehameha IV. and V. (their mothers having been half-sisters), was unanimously elected sovereign of the Hawaiian Islands Jan. 8, 1873, by the legislative assembly, as provided in the constitution of the kingdom. He had been educated in the same school with his cousins, and had shown fair abilities, but soon after leaving school became dissipated to that degree that his cousins could not place him in offices of trust and honor; and hence he came to the throne comparatively ignorant of business and political affairs. But for his unfortunate habits, his predecessor, Kamehameha V., would have appointed and proclaimed him as his successor, because he was his nearest male relation of suitable rank. He was fine-looking, kind-hearted, and anxious to be popular. In political affairs he was timid and vacillating, and in all business matters disposed to procrastinate. His tendencies were to great liberality in government—greater than the intelligence and general condition of his people fitted them for. Soon after the establishment of his administration his health failed, and he became indisposed to give much attention to important business. He was popular with his people, and desired to be a kind and paternal king. D. Feb. 3, 1874, at the age of 39 years, without an heir and without appointing a successor. CHARLES R. BISHOP.

Lunar Caustic. See Nitrate of Silver.

Lunar Cycle. See Calendar, by F. A. P. Barnard.

Lund, city of Sweden, province of Gothland, has a fine cathedral of the eleventh century, and a university attended by about 500 students. Pop. 14,304.

Lun'dy (Benjamin), b. in Hardwich, Sussex co., N. J., Jan. 4, 1789. His parents, as also their ancestors, were members of the Society of Friends, and came originally from England and Wales. His mother died when he was in early childhood, but his father two years afterward married again. A limited period was allowed for his scholastic education, which comprised only reading, writing, and a smattering of arithmetic; but he had an unquenchable thirst for knowledge, which stimulated him to the acquisition of every kind of intelligence that might prove useful to himself or serviceable to others. He served an apprenticeship at the saddler's trade in Wheeling, Va., then a thoroughfare for the traffickers in human flesh; and it was the frequent spectacle of slave-coffles driven through the place that impelled him to consecrate his life to the work of abolishing chattel slavery throughout the land. After his marriage at Mount Pleasant, O., to Esther, the eldest daughter of Henry Lewis, he settled in St. Clairsville, O., where he pursued his trade as a saddler for a little more than four years, accumulating a competency for his growing family (ultimately numbering five children), and with bright pecuniary prospects. But the wrongs of the hapless bondmen at the South continued to destroy his peace of mind, and powerfully impressed upon him the duty of consecrating his powers more directly for their deliverance. He accordingly formed, with the assistance of five others, a "Union Humane Society," which in a few months enrolled nearly 500 members. This was followed by an appeal from his pen to the philanthropists of the U. S. on the subject of slavery, recommending the formation of kindred societies for mutual conference and action; and it elicited a favorable response in various quarters. Soon afterward he became a contributor of original and selected anti-slavery articles to a paper published at Mount Pleasant entitled *The Philanthropist*. In the fall of 1819 he took his entire business-stock to St. Louis, Mo., that by its sale he might give himself to the humane cause which he had so disinterestedly espoused, but he lost by the venture nearly all the property he had accumulated. It was at that time that the famous "Missouri question" was agitating the nation, and he devoted himself to an exposition, in the newspapers of Missouri and Illinois, of the evils of slavery, in order to avert the impending calamity. Returning to St. Clairsville, he removed to Mount Pleasant, and there commenced a monthly publication, *The Genius of Universal Emancipation* (Jan., 1821), then the only anti-slavery periodical in the country. It was afterward transferred to Jonesborough, Tenn., and thence (in 1824) to Baltimore, Md., assuming a weekly form. In the latter part of 1825, Mr. Lundy visited Hayti to make arrangements with the Haytian government for the settlement of such manumitted slaves as might be sent thither. In 1828 he made a pedestrian tour to the Middle and Eastern States, partly to increase his subscription-list, and especially by lecturing to awaken an interest in behalf of the oppressed. In the winter of 1828–29 he was brutally assaulted and nearly killed in Baltimore by one Austin Woolfolk, a notorious slave-dealer, for an editorial reproof of his conduct. In the spring of 1829 he went a second time to Hayti, taking with him a number of slaves emancipated for that purpose. On his return he invited William Lloyd Garrison to act in a joint-editorship of the *Genius*, but the ensuing spring the latter was incarcerated in the city jail for denouncing the domestic slave-trade and its abettors; and as it was found impracticable to continue the weekly issue of the paper, the connection was dissolved and Mr. Lundy restored the *Genius* to its monthly form, making Washington, D. C., the nominal place of its publication, but printing it as opportunity presented in divers places while travelling. The next winter he visited the Wilberforce colony of fugitive slaves in Canada, and then went to Texas to provide a similar asylum under the Mexican flag, renewing his visit in 1833; but he was baffled by the events that led to the annexation of Texas. In 1836 he started a weekly anti-slavery journal in Philadelphia entitled *The National Enquirer*. In 1837 he relinquished the charge of the *Enquirer*, intending to go West; but previous to his leaving Philadelphia all his papers, books, clothes, etc., deposited in one of the rooms of Pennsylvania Hall, were destroyed by the burning of that building—an act of pro-slavery incendiarism. In a letter written to a friend the next morning, he said: "Well! my papers, books, clothes, everything of value except my journal in Mexico, etc., are all, all gone—a total sacrifice on the altar of universal emancipation. They have not yet got my conscience, they have not taken my heart; and until they rob me of these they cannot prevent me from pleading the cause of the suffering slave.

> The tyrant may hold the body bound,
> But knows not what a range the spirit takes.'

I am not disheartened, though everything of earthly value in the shape of property is lost. Let us persevere in the good cause. We shall assuredly triumph yet." In the winter of 1838–39 he removed to Lowell, La Salle co., Ill., intending to publish the *Genius* in that locality, but on the 22d of the ensuing October his versatile and eventful life was suddenly terminated by death. The world was thus deprived of one of its most intrepid, devoted, self-sacrificing philanthropists, who deserves to be ranked among the most distinguished advocates of negro emancipation on either side of the Atlantic. In the truest sense he remembered those in bonds as bound with them, and was ready at all times to run any risk for their liberation; yet he strongly discountenanced every insurrectionary attempt on their part, not merely on account of his peace principles as a Quaker, but with reference to the disastrous consequences that would inevitably follow. Alluding to the Nat Turner outbreak in Southampton co., Va., he wrote: "Nothing can be more fatal to our hopes, nothing better calculated to retard our philanthropic operations, than such frenzied proceedings. We have stated, over and over, that the work of emancipation must be conducted in this country entirely on moral, pacific principles. In this way it can be effected, and in no other."

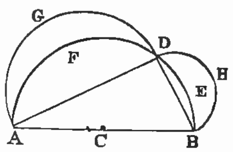
His moral courage and persistence rose with the perils which encompassed him. When threatened with an indictment by a Washington grand jury, he wrote: "I shall not slacken my exertions for the moral and political salvation of my country, and the freedom and safety of every class of its inhabitants, while the vital spark shall animate this bosom; and if I must submit even to martyrdom in the cause of freedom and justice, it will be some consolation to lay down my life beside the tomb of Washington. The thoughtless creatures who call me a fanatic I despise—the tyrants who persecute me I scorn and detest. To *the people* I look for protection, for the cause I advocate is theirs. . . . If they are, notwithstanding, disposed to sacrifice me on the altar of prejudice, ignorance, and tyranny under the shining rays of their Christian profession and beneath the gilded dôme of their republican edifice, they may prepare the pile and the fagots. I shall be ready for them."

Benjamin Lundy was as modest concerning what he had been called to endure and the arduous labors he had performed for the slave's sake as he was dauntless in confronting whatever dangers might lie in his pathway. But it sometimes falls to the lot of the reformer to say with an apostle, "If I have boasted anything, I am not ashamed; but as we spoke all things to you in truth, even so our boasting is found a truth." So on one occasion this unassuming philanthropist alluded to himself as follows: "I do not wish to speak boastingly of what I have done, or essayed to do, in advocating the question of African emancipation, and I detest the idea of making a cringing appeal to the public for aid in my undertakings. I am willing to work, and can support myself and family by my own labors. But after a ten years' struggle to promote the cause to the best of my humble abilities and in every possible manner, it may not be amiss to inform those who take an interest in this publication (*The Genius of Universal Emancipation*) that I have (within the period above mentioned) sacrificed several thousand dollars of my own hard earnings; have travelled upward of 5000 miles on foot, and more than 20,000 in other ways; have visited nineteen States of this Union and held more than 200 public meetings with the view of making known our object; and in addition to this, have performed two voyages to the West Indies, by which means the liberation of a considerable number of slaves has been effected, and I hope the way paved for the enlargement of many more. What effect this work has had in turning public attention to the subject of the abolition of slavery it would not become me to say. . . . But I am fully persuaded that something of this kind is greatly needed, and may be instrumental in doing much good; and, viewing the matter in this light, I shall persevere in my efforts while the means of doing it are afforded, or until more efficient advocates of the cause shall make themselves known. I will neither be cajoled by the smiles nor awed by the frowns of any to a dereliction of principle or an abandonment of the cause. My humble exertions shall be directed to the one great end; my whole self shall be devoted to the holy work; my march shall be steadily onward; nor shall persecution from 'the powers that be,' or that may be, turn me to the right hand or to the left." This extract will suffice to reveal the whole man in his quenchless zeal, his sublime courage, his unfaltering determination, his martyr spirit; but it utterly fails to convey an idea of the far-reaching influence he exerted in the tremendous and long-protracted struggle to "break every yoke and let the oppressed go free." To him belongs, primarily, the credit of setting in motion all the instrumentalities subsequently brought into use to this beneficent end, whether of a religious, moral, or political nature. Ten weary years he stood conspicuously alone in his persistent endeavors to "create a soul under the ribs of death," and arouse the nation to a sense of its guilt; ridiculed and scorned as a fanatic; subjected to privations and hardships; in perils in the city, in the wilderness, in the sea, among false brethren, and by his own countrymen; maintaining his post against fearful odds on slaveholding soil; and deriving strength and comfort mainly from a good conscience and an unshaken faith in an overruling Power. He lived to witness a mighty change in public sentiment, but died in the midst of the conflict, true and fearless to the end.

WM. LLOYD GARRISON.

Lundy's Lane, Battle of. About noon of July 25, 1814, intelligence reached Gen. Brown, commanding the American forces then encamped at Chippewa, that the British general, Drummond, had reached Fort George the night previous with reinforcements, and that a movement was being undertaken against our dépôt of supplies at Fort Schlosser. In order to divert the enemy from his purpose, Gen. Scott, with his brigade and Towson's artillery, was ordered to advance upon the enemy's posts at Queenstown. In pursuance of this plan, Scott had advanced some two miles when he observed a small party of the enemy, which, however, retired on his approach. Continuing his advance, Scott learned that in rear of a narrow belt of woods which faced him the enemy, under Gen. Rial, were posted in strong force upon an eminence near Lundy's lane, supported by a battery of nine guns. Sending back information to this effect to head-quarters, and detaching Maj. Jesup with the 25th regiment to operate on the left flank of the enemy, Scott advanced through the woods; a severe struggle, lasting upwards of an hour, ensuing, in which both sides suffered considerably. Meantime, Jesup had discovered an unoccupied road, by which he advanced to a position from which he turned the left of the enemy's line, capturing some prisoners, and, continuing to occupy the road, Gen. Rial and his staff were soon added to his list of captives. Continuing to move cautiously in the increasing darkness, he succeeded in placing himself on the right of Ripley's brigade, which, with Hindman's artillery and Porter's volunteers, had now arrived, with Gen. Brown in command in person. Drummond had also arrived with reinforcements to the enemy, who still maintained a galling fire upon Scott's brigade. It was finally determined to dislodge the enemy from his strong position if possible, and an assault was ordered, which, led by the 21st regiment, supported by the 23d, drove the British from their guns, which were now turned against them, and the hill occupied in force and held against three desperate attempts of the enemy to regain their lost pieces and ground. The struggle was finally terminated at midnight by the withdrawal of the British, their leader, Gen. Drummond, being wounded. During these desperate charges Gens. Brown and Scott had both received severe wounds, and the command devolved upon Gen. Ripley, who at once withdrew the army to its old encampment on the Chippewa. But the Americans were forced to abandon the trophies of their valor for lack of means of transportation, and thus the dearly-captured cannon were soon again in possession of the British. The battle is also known as that of Bridgewater and of Niagara.

Lune [Lat. *luna*], in spherical geometry, the portion of a spherical surface included between two great semicircles. The two semicircles are the sides of the lune, and the angle of the lune is the angle between the planes of its sides. This angle may have any value between 0° and 360°. In plane geometry a lune is the portion of a plane included between the arcs of two circles that intersect. The lune of Hippocrates is famous as being the first curvilinear space whose area was exactly determined. The construction of the lune of Hippocrates is as follows: On a line AB as a diameter describe a semicircle ADB, and in it inscribe a right angle ADB; then on the sides AD and DB as diameters describe the semicircles AGD and DHB. The two figures AGFD and DHBE are lunes, and the sum of their areas is equal to the area of the triangle ADB. For the areas of any two semicircles are to each other as the squares of their diameters, and from the right-angled triangle ADB we have $\overline{AB}^2 = \overline{AD}^2 + \overline{DB}^2$; hence, the sum of the semicircles on AD and DB is equal to the semicircle on AB; diminishing both members of this equality by the sum of the segments AFD and DEB, we have the sum of the lunes equal to the triangle. If we make AD = DB, the lunes will be equal to each other, and the triangle will be equal to half the square on either.



W. G. PECK.

Lü'neburg, town of Prussia, Hanover, on the left bank of the Ilmenau, 14 miles from its confluence with the Elbe, and at the foot of a small hill called the Kalkberg, is an old town surrounded with walls and containing many characteristic buildings, and was once an important member of the Hanseatic League. It still has a considerable trade. The Kalkberg is remarkable on account of its large gypsum and lime quarries, and still more on account of the salt-springs at its base, from the waters of which 300,000 cwts. of salt are yearly manufactured. Pop. 19,334.

Lunel', town of France, in the department of Hérault, on the Vidourle, has a brisk trade in muscatel wine and raisins, and large distilleries. Pop. in 1881, 6487.

LunenburgCourt-House (called also **Lewiston**), cap. of Lunenburg co., Va. (see map of Virginia, ref. 7-G, for location of county), 90 miles S. W. of Richmond. Pop. in 1880, 87.

Lu'néville, town of France, in the department of Meurthe, at the confluence of the Vezouse and the Meurthe, is one of the largest cavalry stations of France; the former palace of the dukes of Lorraine has been transformed into cavalry barracks. It is historically notable from the Peace of Lunéville (Feb. 8, 1801), by which the Rhine became the frontier of France. It has an extensive trade in corn, wine, brandy, and hemp. Pop. in 1881, 18,136.

Lung Fever. See PNEUMONIA.

Lungri'o [anc. *Ungarum* or *Lungrium*], town of Southern Italy, province of Cosenza, beautifully and healthfully situated on a mountain-slope in a very fertile district, with a salt-mine in its neighborhood. Pop. 5724.

Lungs [Ang.-Sax. *lunge*], the organs by which, in air-breathing vertebrate animals, the blood is aërated and certain gaseous impurities are removed from it. In the Invertebrata and fishes and the larvæ of Batrachia the lungs are functionally represented by GILLS (which see) and by other analogous organs. In many fishes there is in addition to the gills a "swim-bladder," which structurally represents the lungs, and which, in a few species, appears to share in the function of the true respiratory organs. In the perennibranchiate batrachians we find both gills and lungs. The true reptiles all have sacculated lungs, and many of them breathe by gulping down a large quantity of air by a kind of swallowing process not much like the breathing of mammals. The left lung of serpents is either wanting or very rudimentary. In birds the respiratory function appears to be shared by the lining membranes of the extensive air-chambers in the bones, etc. The lungs of all the Mammalia are in plan much like those of man. The human lungs (*pulmones, pneumones*) are two, one being placed in each of the lateral cavities of the thorax, and they are separated from each other by the mediastinum and its contents. The apex of each lung extends above the first rib. The right lung is larger, broader, and shorter than the left. It has three lobes—the left but two. The blood-vessels, air-tubes (bronchi), nerves, lymphatics, etc. enter each lung at a point called the *hilum;* and these structures, with the connective tissue, constitute what is called the *root* of the lung, a part of the mediastinum. The lungs are of light, spongy texture. The *outer* covering is a reflection of the pleura, and is a *serous* membrane. The *inner* membrane of the air-passages and cells is embryologically derived from the alimentary canal, and hence is a *mucous* membrane. The substance of the lungs is composed of a parenchyma consisting of lobules, each containing a branch of the bronchial tube and a cluster of air-vesicles or *alveoli*. The function and minute structure of the lungs are further illustrated in the article RESPIRATION (which see).

Lung'wort (*Pulmonaria officinalis*), or **Oak Lungs,** a lichen found chiefly in Europe, and growing on trunks of trees in mountainous regions, sometimes almost entirely covering them with its shaggy, leathery, spreading thallus, which when fresh has an olive-green color, but becomes brown when dry. It derives its name from a fancied resemblance of the spotted leaves to diseased lungs, for which reason, upon the doctrine of signatures, they were formerly employed as a remedy in pulmonary diseases. It is nutritious, and when properly prepared affords a light diet capable of being used as a substitute for Icelandic moss; yet it is bitter enough to be used as a substitute for hops. There is another plant with the name "lungwort," a perennial herb of the borage family, also found in the northern parts of Europe, where it is used as a pot-herb. It is cultivated in gardens, has a creeping root and rose-colored flowers changing to blue. It is mucilaginous and slightly emollient. It contains nitre in considerable abundance. It too was at one time extensively used as a remedy in pulmonary diseases.

Lunt (George), b. at Newburyport, Mass., Dec. 31, 1803; graduated at Harvard University in 1824; studied law in Boston, and practised at the bar in his native town. He was several times elected to both branches of the State legislature, and was from 1849 to 1853 U. S. district attorney for Massachusetts. He published a small volume of poems in 1839, and other volumes in 1843, 1851, and 1854. In 1857 he became editor of the Boston *Courier*, a Democratic paper, which he directed until the war ended. Besides two novels, he has written *Three Eras of New England* (1857), *Radicalism in Religion, Philosophy, and Social Life* (1858), and *Origin of the Late War* (1866).

Lunt (William Parsons), D. D., b. in Newburyport, Mass., Apr. 21, 1805; was educated in Boston; graduated at Harvard College in 1823; taught school for a year at Plymouth; studied law a short time in Boston; entered Cambridge Divinity School in 1825; was ordained in 1828 pastor of the Second Congregational Unitarian society of New York; became associate pastor of the Unitarian church in Quincy, Mass., in 1835, and there remained till his death, which occurred on a visit to the Holy Land, at Akabah, on the Red Sea, Mar. 20, 1857. Dr. Lunt was author of biographical and historical discourses, pamphlet sermons, reviews, and articles in various periodicals, hymns, poems, and odes for public occasions. He compiled a book of hymns, *The Christian Psalter*. A small volume of his writings, entitled *Gleanings*, has been edited by his daughter and published by his son. Dr. Lunt was much esteemed as a writer and preacher. O. B. Frothingham.

Luperca'lia [Lat.], a great festival anciently held in Rome and other Italian towns on the 15th of February, in honor of the god Lupercus. At Rome the Lupercalia were celebrated at a place called the Lupercal. The original design was to propitiate the god and secure fertility to the flocks and fields. The festivities had an indecent, rude, and savage character.

Lu'pine [Lat. *lupinus*, from *lupus*, a "wolf"; Ger. *Wolfsbohne*, "wolf-bean"], a name given to the herbs and shrubs constituting the large genus *Lupinus* of the order Leguminosæ. The U. S. have very numerous species, chiefly found W. of the Rocky Mountains. These species are mostly prized in cultivation for their handsome papilionaceous flowers. Many of the Old-World species are cultivated as forage-plants, and their seeds are used as food for man. The cultivation of the lupine in Portugal (*Lupinus albus*) has proved a national blessing, and regenerated great tracts of worn-out land. It is fed to cattle, and also ploughed into the ground as a fertilizer.

Lupuline, or **Lupulite.** See Hops.

Lu'pus [Lat. "wolf"], a disease of the human subject, most commonly attacking the face, and beginning in nodules in the skin. Sometimes this disease is observed in syphilitic or scrofulous patients, but in many cases no predisposing diathesis can be found. It usually attacks the young after puberty, and is rare after the age of forty. It is roughly divided into *lupus exedens*, or devouring lupus, and *lupus non exedens*, in which there is no ulceration; but in this last form there are sometimes neoplastic growths in the integument, which degenerate and shrink away, horribly distorting the face. There are many minor varieties known to the surgeon. True lupus, if neglected, becomes one of the most dreadful of diseases, destroying the tissues as completely, and often far more rapidly, than cancer. Happily, it is commonly a much less painful disease, and it is so far local that if thoroughly destroyed by caustics there is room for hope of permanent recovery. If the disease should return, the application of the caustic must be repeated. Cod-liver oil, iodine applications, and general tonics are often useful.

Lupus (Servatus), b. about 805, was educated in the monastery of Ferrières, in the diocese of Sens, and studied afterward in Fulda under Rabanus Maurus. For some time he lived at the court of Louis the Pious, and in 842 he was made abbot of Ferrières by Charles the Bald. D. after 862. He played quite a prominent part in the ecclesiastical history of his time. In the controversy between Gottschalck and Hincmar he sided with the former and defended him both by his words in the synods and by his pen: *Detribus quæstionibus* and *Collectaneum*. His works, which also comprise a number of very interesting letters, are found in *Migne, Patrol. Lat. XIX*. (See Nicolas, *Études sur les lettres de Servat-Loup*, Paris, 1861.)

Luray, on R. R., cap. of Page co., Va. (see map of Virginia, ref. 4–G, for location of county), in a rich and picturesque valley 136 miles N. W. of Richmond and 15 miles E. of New Market. It has a female seminary and a male academy. About a mile to the W. is a remarkable cavern from 3 to 5 miles long, containing curious stalactites, etc. (See Luray Cavern, in Appendix.) Pop. in 1880, 632.

Lurch'er [Welsh, *llerch*, "lurking"], a variety of dog, chiefly bred in Europe for the service of poachers. It is strongly marked with greyhound characters, but has far greater sagacity and far better scent than any greyhound, and is distinguished by great fidelity. It is very swift, and is voiceless when coursing.

Lur'gan, town of Ireland, county of Armagh, is a neatly built town, with extensive manufactures of linens, muslins, and damasks. Pop. 10,184.

Lu'satia [Ger. *Lausitz*; Fr. *Lusace*], an ancient territory of Germany, bounded by Bohemia, Saxony, Brandenburg, and Silesia. Originally it formed two independent margraviates, Upper and Lower Lusatia, which in 1635 came into the possession of Saxony, but by the Congress of Vienna in 1815 the greatest part of the territory was transferred to Prussia, Saxony retaining only the portion which forms the present circle of Bautzen.

Lush'ington (Stephen), D. C. L., b. in London, England, Jan. 16, 1782; was second son of Sir Stephen Lushington, Bart.; educated at Eton and Oxford; called to the bar at the Inner Temple in 1806; admitted advocate at Doctors' Commons in 1808; appointed judge of the consistory court in 1828, and of the high court of admiralty in 1838. He sat in Parliament many years between 1807 and 1841, in the liberal interest; was counsel for Queen Caroline in 1820, and legal adviser of Lady Byron on the occasion of her separation from her husband the poet. He retired from the bench in 1867, and d. Jan. 20, 1873. He is not to be confounded with his relative, Stephen Rumbold Lushington, D. C. L., governor of Madras, b. 1775, d. Aug. 5, 1868.

Lusita'nia, the name of the south-westernmost of the three provinces into which the Iberian peninsula was divided by the Romans, comprising the present Portugal S. of the Douro and large parts of the adjacent provinces of Spain. It derived its name from the Lusitani, who dwelt between the Tagus and the Douro, and were a fierce, turbulent, and warlike people. The most remarkable of its cities were Olisipo, the modern Lisbon, and Emerita Augusta, the modern Merida.

Lustra'tion [Lat. *lustratio*], in ancient Greece, and more especially in ancient Rome, a ceremonial purification by water, fire, or the blood of sacrificial victims. Among the Romans and Italians, towns, cities, fields, flocks, armies, navies, temples, altars, private persons, and even the whole people, were the frequent subjects of lustration. The people underwent a great lustration at the end of every *lustrum*, when the censor laid down his office in the Campus Martius. There were yearly lustrations in February and April. Every army underwent lustration before a battle. The fields were lustrated after sowing, and again before reaping. The sheep were lustrated in April at the *Pâlilia*, and the whole city and people also were purified at the same time. Special lustrations also followed every great public calamity.

Lus'tre [Lat. *lucere*, "to be light"]. The property of reflecting light, as displayed by minerals, is described by mineralogists, with regard to the *manner* in which it is reflected, under the head of kinds of lustre, and with regard to the amount of light reflected or the degrees of lustre. Six kinds of lustre are recognized by mineralogists: metallic (*e. g.* steel), vitreous or glassy (quartz), pearly (talc), silky (asbestos), resinous (amber), and adamantine (diamond). The degrees are four: splendent, if a perfect image is given; shining, if the image is indistinct; glistening, when there is a general reflection of light, but insufficient to give an image; glimmering, when the reflection appears to be limited to points on the surface.

Edward C. H. Day.

Lus'trum, a religious ceremony for the purification of the whole people of ancient Rome, performed upon the Campus Martius once every five years by one of the censors. Hence the period of five years is often called a *lustrum*. The lustrum took place after the general census. In Vespasian's time the last lustrum was performed in 74 A. D.

Lute [It. *liuto*, from Arab. *al ûd*], an ancient instrument consisting of a table, a body, a neck (for fingering) with frets, a head with screws for tuning, and a bridge on which ran the strings, from six to twenty-four in number. The frets were touched with the left hand, the strings with the right. It was long a favorite instrument in nearly all parts of Europe.

Lutes [Lat. *luto*, to "daub;" *lutum*, "clay"]. This term applies to a class of compositions used for two purposes—the one being the making gas-tight or vapor-tight joints in apparatus used for holding or conveying gases or vapors, as in processes of distillation; and the other the coating externally of fragile vessels that are to be exposed to high heats. For the first use modern chemists are enabled to substitute almost altogether tubes, bands, and sheets of india-rubber, so that luting compositions are seldom used. There is one highly important case, however, in the arts in which they are still employed. This is for the lids of gas-retorts. (See GAS-LIGHTING.) In the laboratory, in cases in which the heat to be applied is below 400° or 500° F., *linseed meal* is much used; with water it makes a very plastic adhesive mass; with *glycerine*, instead of water, this mass will not dry and crack. If pressure is to be resisted, the composition may be applied in some mass to the joint, a band of cotton cloth rolled around it, and the whole then bound around with twine. Clay and glycerine make a useful lute also. Great numbers of similar compositions are known in the laboratory, which would occupy too much space. (We may refer to the *U. S. Dispensatory* of Wood and Bache, pp. 928, 929, for comprehensive and reliable information on this head.) H. WURTZ.

Lu'ther (MARTIN), b. Nov. 10, 1483, at Eisleben, d. there Feb. 18, 1546, lies buried in the church of the castle of Wittenberg. The best biographies of him are those by Köstlin (*Leben und Scriften*, 1875, 2 vols., and *Leben*, 1882, 1 vol.), published at the occasion of the tercentenary of his birthday, and immediately translated into English. We shall offer here only an outline of his life and character. His parents, a mining family in humble circumstances, removed shortly after his birth to Mansfeld. The father was a man with a very warm heart, but of somewhat harsh ideas; in bad weather he would carry the boy to school in his arms, but for the least inadvertency he would whip him till the blood came. The mother was a woman of great virtue and loveliness, and the education at home early imbued the soul of the boy with that veracity and uprightness which in after years, when stormy events gathered around him, gave his character its heroic cast, and kept his mind sound, though so many turbulent passions and gnawing anxieties passed through it. In 1497 he went to Magdeburg, and next year to Eisenach, in order to frequent a Latin school, making his way in these places—as poor men's sons used to do at those times—by begging his meals in rich people's houses, and earning a little money for lodging and clothes by singing in the choir of the cathedral. In 1501 he entered the University of Erfurt. His plan was to study law, but first he had to go through a course of *literæ humaniores*, to which also belonged scholastic philosophy and theology. In 1503 he graduated as a master of arts, and next year began to give lectures on the physics and ethics of Aristotle. But a violent sickness which befell him, the death of his friend Alexius, and, more than anything else, the incidental acquaintance he made with the Bible, of which he found an unabridged copy in the library, threw his mind into such anxieties concerning sin and punishment that on July 17, 1505, he retired to the Augustine convent of Erfurt, and became a monk. The heaviest penance, however, and the severest asceticism brought his soul no comfort, and he found consolation only when another brother of the order called his attention to what the Bible says of forgiveness of sin by God's grace through faith in Christ—a doctrine which was almost entirely forgotten in the Roman Catholic Church. Restored to peace with himself, he continued his theological studies, reading the Bible, Augustine, and the Fathers, Tauler and the mystics, and on May 2, 1507, received the consecration as priest. Next year (1508) he was appointed professor of philosophy at the University of Wittenberg, and in 1510 he made a pilgrimage to Rome. He was at that time, as he calls himself, "a most insane papist." Although he saw in Rome the depravity and vices of the Roman Catholic clergy, he never doubted either the authority of the pope or the doctrines of the Church. On Oct. 19, 1512, he took the degree of doctor of divinity, and in 1516 was appointed preacher at the town church of Wittenberg. In both positions, as professor and preacher, he attracted great attention and made a deep impression. Large audiences gathered to hear him, and all felt that a new spiritual source was opened. His words had a most wonderful vitality, and his ideas soon became visible in the lives of his hearers. But as yet nobody suspected, least of all did he himself, that there was a difference between him and the established Church which one day would produce a most fatal rupture. His ideas of salvation by the grace of God were not heretic by themselves; they only became so by a close application of them to the practice of the Roman Catholic clergy. His warnings against the abuse of "indulgences" referred to the frailty of the congregation rather than to any fault of the Church. The whole difference, as far as it was felt, seemed to be one of talent only, or, in the highest, of method. The scholastic philosophy had become dead and empty to the eyes of Luther, and what polemics this earlier part of his life contains was directed against Thomas Aquinas, Petrus Lombardus, Bonaventura, etc., and not against the pope or the Church. In 1517 the situation entirely changed when the Dominican friar John Tetzel approached the Saxon boundary, selling indulgences. The pope, Leo X., was much in need of money for the erection of St. Peter's church in Rome, and emissaries were sent out in the most shameless manner through all Roman Catholic countries to gather it by selling indulgences. Like other mountebanks, they established their shops in the marketplaces, and for eggs, butter, corn, or cash people bought forgiveness, not only for sins they had committed, but also for sins they would like to commit. Against this scandal Luther drew up his ninety-five theses, the pith of which is that the pope has no power at all to forgive sin, and nailed them (Oct. 31, 1517) on the church-door in Wittenberg. The sensation which this proceeding caused was immense. Tetzel had to flee, and the commotion spread with incredible rapidity over all Germany. Luther was summoned to Rome, but refused to go. Cardinal Cajetan arrived in Germany and demanded that he should retract, but this, too, he refused. Meanwhile, the papal envoy to the Saxon court, Miltitz, succeeded in persuading him to be silent about the matter for the future, and a reconciliation seemed possible, when the famous disputation between Karlstadt and Eck, held in Leipsic from June 27 to July 16, 1519, once more drew Luther into the conflict. The pope sent a bull of anathema against him June 15, 1520, but the professors and students of the University of Wittenberg burnt the bull outside the Elster gate; and now followed, in the same year, his two celebrated writings—*Address to the Christian Nobles of Germany* and *Præludium de Captivitate Babylonica Ecclesiæ*—in which he openly and with great precision defined his position both to the Church and to its doctrines. On Apr. 5, 1521, Charles V. opened at Worms the first diet which he held in Germany, and Luther was ordered to attend. All his friends endeavored to persuade him from going, but in spite of the imminent danger connected with such a step he determined to obey the order, and on Apr. 17 he appeared before the diet. The impression which he produced was most powerful, and it became evident to his adversaries that "this man must perish or the Roman Catholic Church will be lost in Germany." In order to withdraw him from the violence of his enemies, a troop of soldiers belonging to the elector of Saxony took him prisoner on his return from Worms, and brought him to the castle of Wartburg, where he spent nearly a year (from May 4, 1521, to Mar. 7, 1522) in concealment. During his residence here he accomplished a work of paramount importance for the success of the Reformation—namely, the translation of the Bible, of which the New Testament appeared in 1522. But when he heard of the excitement which reigned in Wittenberg, and the disturbances which took place there under the leadership of Karlstadt, he immediately left his place of safety and repaired thither. Karlstadt was a man of talent and integrity, but he was hot-tempered and entertained very radical ideas. Under his hands the Reformation fell into extravagances, and it needed all Luther's patience and energy to control the commotion. He preached a whole week daily, almost without interruption, and at last succeeded in calming down the excitement. He now developed a most astonishing practical activity, reorganizing the Saxon Church, laying out a new liturgy, providing new books for the schools, both for the teacher and the pupils (the Great and the Little Catechism), preaching several times each week, and all the while keeping up a most extensive correspondence both in Latin and German with the scholars and princes of his country about the most important subjects. But in all this business he appears everywhere great. His views are broad and lofty; his sympathy is quick, and still quicker is his eye; in the most delicate or entangled affairs he always knows where to find the right issue. No less pleasant is the impression which his private life makes, such as it appears in his *Table-talk*. On June 13, 1525, he married Catharina von Bora, a nun, and the marriage proved exceedingly happy; they had six children. He was a kind and careful husband and father, and in every-day life was a man of humor—a little coarse, perhaps—and with a taste for poetry and music; some of his hymns are among the most beautiful, at once the most sublime and the most touching which Christianity has called forth, Quite otherwise he appears in his polemics. He is violent, harsh, not always consistent, and sometimes unjust. But the explanation of this singular fact seems to be this: he was an eminently practical man, not only in his talent as a reformer, but in the whole cast of his mind. He appreciated an idea only through its reflex in reality, and only with its evil consequences in the real world he understood how to grapple. The theoretical idea he was afraid of, and with respect to all religious views which had no palpable, practical bearing he occupied a most conservative position. CLEMENS PETERSEN.

Lutheran Church (LUTHERANISM). I. *Definition and Name.*—The result of the union of the conservative with the progressive in reformation, as distinct from revolution, was the Lutheran Church, whose essential characteristics constitute *Lutheranism.* Lutheranism is the system of faith and life taught in God's word and confessed in the Augsburg Confession and in the creeds consonant with it. The Lutheran Church has been distinctively called Protestant and Evangelical, and (in the *Formula of Concord*) "Reformed." In the *Book of Concord* the title of the confessors is "electors, princes, and states of the *Augsburg Confession.*" It has never by any general official act taken the name Lutheran. Art, history, and popular usage have practically determined its title as "the Evangelical Lutheran Church." "If," said the marquis of Brandenburg when ridiculed as a Lutheran—"If I be asked whether with heart and lip I confess that faith which God has restored to us by Luther as His instrument, I have no scruple, nor do I feel a disposition to shrink from the name Lutheran. Thus understood, I am, and shall to my dying hour remain, a Lutheran." This is the only sense in which any Lutheran tolerates the name.

II. *Distinctive Characteristics of Lutheranism and of the Lutheran Church.*—The distinctive characteristics of Lutheranism, as over against the Church of Rome, belong to PROTESTANTISM (which see). A searching analysis of the elements which characterize it over against the Reformed or Calvinistic portions of Protestantism has been made by both friend and foe in recent times, in consequence of the reconciling spirit of the age and the efforts of various governments to unite the two communions in one state Church.

The points of distinctive character leading to diversity may, for the sake of convenience, be stated and numbered thus:

1. The material principle or foundation of the matter of Lutheran Protestantism is the saving truth of Christianity as it lies centred in the doctrine of justification for Christ's sake alone (*propter . . . um willen*), by faith alone (*per . . . durch*).

2. The formal principle, that which prescribes the form in accordance with which the material is shaped, is the sole authority of Holy Scripture as the rule of faith and guide of life.

3. The Lutheran method of using the rule of faith is historical. The pure Church catholic, or Christian Church, is the living witness of the truth.

4. The doctrines of God's word, the means of establishing which Holy Scripture contains within itself, and of which the Church is witness, shape the individual assurance of faith and the confession of the Church, and originate and develop her polity, worship, and practical life.

5. The Protestantism of the Reformed or Calvinistic churches, on the other hand, has laid as its fundamental doctrine the absolute and sole primary causality of God. In it there is but one real cause of whatsoever comes to pass, the foreordination of God. All other causes are also effects, and no more than phenomena of the final cause. As the pantheism of substance makes the seeming substances no more than phenomena of the one sole substance, so Calvinism, as the pantheism of the divine will, makes all finite volitions but phenomena, at last, of the one sole free-will. Election is therefore the material principle, and justification is secondary and dependent. "The Lutheran doctrine," says Schneider, "comes, through the gospel, to God—the Reformed, through God to the gospel."

6. While Calvinistic Protestantism holds with the Lutheran Church that Holy Scripture is normative, it has yet isolated the Scriptures from the historic development of the Church, and subjected its interpretation far more to an undefined subjectivism and rationalizing tendency. "The German Reformation is more objective and historical, the Swiss more subjective and radical; the one springs from the heart, the other from the understanding. The Lutheran Reformation will, with freedom—and almost more than freedom itself—have unity; Zwinglianism tolerates variety, and strives by pre-eminence for freedom; the one is more compact, the other more varied in forms." (Ullmann (mediating Lutheran) epitomized in Weber, *Lehrb. d. Weltgesch.*, 1859, § 472.)

7. "In Reformed Protestantism the formal principle is controlling—in Lutheranism, the material. In the Reformed system Scripture is regarded more as the exclusive source of doctrine—in the Lutheran system, as the norm of the doctrine, which grows out of the analogy of faith. In consequence of this, a pure tradition" (involving the handing down of truth in the Church) "possesses in Lutheranism a greater validity." (Goebel (Reformed), *Die relig. Eigenthümlichkeit*, 1837; Nitzsch (Consensus), *Prakt. Theolog.*, 1847, i. § 74 *seq.*; Heppe (Melanchthonian Reformed), in *Studien u. Kritiken*, 1853, 3.)

8. "Lutheran Protestantism is the antithesis to the Judaism of the Roman Church, and thereby the doctrine obtained a Gnosticizing character; the Reformed is the antithesis to the paganism of the Romish Church, and thus the doctrine received a Judaizing ethical character." (Herzog (Reformed).)

9. "Reformed Protestantism is the protestation against all deification of the creature. Hence it emphasizes the absoluteness of God and the exclusiveness of His will—its material principle—with which coheres the exclusive emphasizing of Scripture as the positive normal principle." (Schweizer (Mediating Reformed), *Glaubenslehre*, 1844.)

10. "The material principle of Zwingli is the glory of God; his formal principle is the Scripture, yet in such sense that he explains that the internal word is independent of the external, and denies all creaturely causality on the part of the creature in salvation." (Dorner (Mediating Lutheran), *Prinzip.*, 1841; *History of Protestant Theology*, 1867.)

11. "The Reformed system begins at the top, and goes downward; the Lutheran begins below, and ascends." "The ground of the diverging tendencies lay far deeper than in the diverse apprehension of the doctrine of the sacraments. . . . The centre of gravity in the one was the objective, in the other the subjective. . . . Calvinism is the proper Protestant counterpart of Catholicism. The whole system of the dependence of the individual on a power which absolutely determines him in his willing and doing, the system which is set up by Catholicism in its doctrine of the Church, is bound up by Calvinism in its absolute decree. In the one everything saving and salutary lies in the Church; in the other, it lies in the decree. The Lutheran system, with its faith reposing on the historical fact of the redemption, holds the mean between Calvinism and Romanism—between the transcendent idealism of the one, the external realism of the other" (*Baur, F. C.*).

12. "The distinction between the systems consists not in the predominance of theology or of anthropology, of the absolute idea of God or of the subjective consciousness of salvation, but in the diverse form of the consciousness itself, of salvation, as the result of which the Reformed theology goes back to the eternal decree; the Lutheran is satisfied with justification by faith." (*Schneckenburger*, (Mediating Reformed).)

13. Stahl (Lutheran), approximating to the view of Schweizer, finds in the "sole causality" which is the notion of Godhead, the controlling principle of the Reformed doctrine, and its character he finds in "modes of thinking averse to mysteries." "The whole Reformed Church structure is on the one side determined by this motive of opposition to mysteries, which tends to a denial of all instrumental distribution of grace—and this it derives from Zwingli—and on the other side it is distinguished by the evangelical theocratical motive, the glorifying of God in the Church; and this it derives from Calvin. (Stahl, *Lutherische Kirche u. d. Union*, 2d ed., 1860; answered by Thomas, 1860, Schenkel, and others.)

14. "All these diverse presentations," says Luthardt, "have as their basis the common supposition that the difference is not merely an external one, is not one which turns merely on particular doctrines—as, for example, the Lord's Supper—but pervades the systems and is a difference in principle. The essential part of the difference hinges upon the elements of the Reformed doctrine, which reciprocally condition each other: the absolute causality and the sole primary causality of God, which excludes means of grace in the strict sense, on the one side, and on the other side an assurance of a state of salvation, grounded in an inscrutable decree—an assurance reached by the individual actual life as the result of the divine operation." (Hundeshagen, *Der Deutsche Protestantismus*, 1847; 3d ed., 1850; Lücke (*On the True Formulating of the Distinction and Union of the Lutheran and of the Reformed Churches*), *Deutsche Zeitschr.*, 1853, 22–53; Schneckenburger, *Vergleich. Darstell. d. Luther. u. reformirt. Lehrbeg.* (Güder), 1855; Baur, F. C., *Lehrb. d. Dogmengesch.*, 2d ed., 1858, § 92, 284; Seiss, *Ecclesia Lutherana*, 1868; Krauth, *Conservat. Reform.*, 1871, 122–128; Luthardt, *Komp. d. Dogmat.*, 4th ed., 1873, § 11; Kurtz, *Lehrb. d. K. G.*, 7th ed., 1874, § 140; Kahnis, *Innere Gang d. Deutsch. Protestant-*

ism., 3d ed., 1874, i. 26–39; Do., *Principien*, 1865; Do., *Christenthum u. Lutherthum*, 1871.)

III. *Rise and Early History of the Lutheran Church.*—The beginning of the struggle of the religious life of the Germanic races against Romish corruption was the birth-throes of the Reformation, whose history is the history of the rise of the Lutheran Church. Her earliest annals are interwoven with the personal and official history of Luther. His internal conflicts, his theses, the meetings with Cajetan and Miltitz, the Leipsic disputation, the attraction of Melanchthon into his mighty orbit, his era of storm and pressure (1520–21), the bull, the efforts of Charles V. at repression, the Diet of Worms, the hiding at the Wartburg, the outbreak of radicalism at Wittenberg under Karlstadt (1522–25), the Peasant war and Anabaptist sedition (1529), the controversies with Henry VIII. and Erasmus (1523–26),—all had within them potencies for the future of the Church, on which Luther's name, in the face of his protest, was to be fixed by malice, till in the light of history it became a crown of glory. The Lutheran Reformation showed its unfolding strength in the empire at the Diet of Nuremberg (1522–23); in the extension of the evangelical doctrine (1522–24); at the second Diet of Nuremberg (Jan. 14, 1524); at the convention of Ratisbon (1524), called to resist it; in the growing decision of the evangelical states (1524); in the Torgau confederacy (1526). With the year 1526 the estates began to use the right, successfully claimed at the Diet of Spires, to regulate ecclesiastical matters in their own territories. In the years following (1526–29) a number of the Lutheran state churches began to be established and organized. Electoral Saxony, by Luther's advice, began with a thorough visitation of the churches. The church constitution and Luther's two catechisms (1529), which grew out of this visitation, became guides in the organization and training of other state churches. The Church of Hesse was organized 1526–28, under Lambert. The organization of the Church in Prussia and in other parts of Germany, and in the cities of Lower Germany, took place between 1524 and 1531. Nor was the blood of martyrs wanting to hallow the work of brave confession (1523–29). The first martyrs were two young Augustinian monks of Antwerp (1523), whose memory is kept green by Luther's hymn. The pure faith reached the palace as well as the humble home, and asserted its power by the very side of persecutors. Elizabeth of Brandenburg (1527), in terror of the threats of her husband, fled, disguised as a peasant-woman, to the protection of her kinsman, the elector of Saxony.

Luther labored with every energy of his nature for the great work of the period. The impress of his character on the Lutheran Church is so mighty that we cannot understand the Church without understanding him. No man of our time has been so much quoted against Luther and the Lutheran Church as the great Catholic scholar Döllinger, who in his *History of the Reformation in the Circuit of the Lutheran Confession* (1846; 2d ed. 1852) has indulged in the most unsparing severity. But twenty years later, in his riper time of reflection, when he had come to know Luther better by knowing Rome better, he spoke of Luther as "the mightiest man, the most completely popular character, whom Germany ever possessed;" and expanding at a later day (1871) on this theme, he says: "It was Luther's overpowering greatness of spirit and amazing many-sidedness which made him the man of his time and of his people. It may be said with truth, Germany never had a man who so profoundly understood his people, and who was so completely comprehended, so absolutely absorbed, if we may use that term, by the nation, as this Augustinian monk of Wittenberg. He controlled the heart and mind of the Germanic race as the hand of the musician wakes at will the strings of his lyre. No other man in the whole Christian era has given to his race as much as Luther gave to his—language, a manual of faith for the people (the Catechism), the Bible, the hymns; and everything which his adversaries tried to put in conflict or in rivalry with him seemed flat and weak and pallid by the side of that eloquence with which he entranced men. His adversaries stammered, Luther spoke. He alone has left the ineffaceable stamp of his own spirit alike upon the German tongue and the German mind. The very men among the Germans who from the depths of their soul abhor him as the terrible heresiarch and the betrayer of religion, are forced to speak in his words and think in his thoughts." (Kurtz, *Lehrb. d. K. G.*, 1874, § 129, 2.)

IV. *Early Ecclesiastical Conflicts.*—The Reformation in German Switzerland, under the leadership of Zwingli, had been advancing with many elements of generic affinity with the work of Luther, and with no few marks of specific diversity from it. It was not the purely personal peculiarities of the two leaders, but the origin and internal tendencies of their systems, which led to the sacramental controversy (1525–29). The Lutheran doctrine of the Lord's Supper is one which depends upon methods of interpretation with whose validity the whole distinctively Lutheran system, and indeed the entire biblical churchly system, stands or falls. The Catholic party hoped at the Diet of Spires (1529) to regain what they had lost three years before. The bitter anger which had been aroused by the affair of Pack (1527–28), the excitement of their fears by the rapid progress of the Reformation, the stimulation of their hopes by the improved political prospects of the emperor—which he largely owed to the Lutherans, to whom he was about to show himself so ungrateful—encouraged them to revoke the decision of the Diet of 1526, and to roll back the wave of Reformation as completely as the new decision of a diet could do it. Against this the evangelical (Lutheran) princes made their solemn protestation (Apr. 19, 1529), which gave them the name of *Protestants*, and appealed to the emperor, to a free council, and an assembly of the German nation. It was signed by the elector of Saxony, the landgrave of Hesse, the margrave George of Brandenburg, the two dukes of Luneburg, and Prince Wolfgang of Anhalt—the names which a year later were subscribed to the Augsburg Confession—and by fourteen of the Oberland cities.

V. *The Augsburg Confession; Prologue and Epilogue.*—Philip of Hesse—an uncongenial element all through—not at all believing that "with might of ours is nothing done," in hope of forming a political coalition, endeavored to bring about an accord between the Zwinglian and the Lutheran theologians by a colloquium held at his castle at Marburg Oct. 1–3, 1529. Fourteen articles stated the agreement of the parties. In the fifteenth the Zwinglians conceded that the body and blood of Christ are in the sacrament, but denied the objective character of the presence. The truth is, the fifteen articles stand or fall together by a common principle of interpretation. The tendency which in its feeble beginnings at Marburg denied one, has, where its logic has been ripe and consistent, ended with denying them all. A convention was held at Schwabach later in the same month, at which Luther presented a confession in seventeen articles, based upon the fifteen of Marburg. Charles V., after his coronation, came to Augsburg, whither he had summoned a diet, and there (June 25) was presented the Augsburg Confession, the first and greatest of the distinctive confessions of the Lutheran Church. To the names of the princes which were attached to the protestation at Spires are added the names of the cities of Nuremberg and Reutlingen. A confutation of the Confession was presented Aug. 3. The defence of the Confession against this paper, the Apology by Melanchthon, is the second of the Lutheran symbols.

VI. *Political and State Movements* (1530–55).—The Protestants now formed a defensive alliance at Schmalkald (1530) to last six years. This aided in bringing about the religious Peace of Nuremberg (July 23, 1532). Würtemberg became Lutheran 1534–35. The Reformation was carried through in Anhalt, Pomerania, and Westphalia in 1532–34. The Schmalkald League was enlarged so as to embrace the new Lutheran states; subscription to the Augsburg Confession was the indispensable condition of reception into the league. Bucer brought the Oberland cities to subscribe. The way for this had been prepared by the Wittenberg Concord (May 25, 1536). Paul III. (1534–49) professed to call that general free council which had been so ardently desired. It was convoked for May 23, 1537, at Mantua. In anticipation of the possibility of a council there or elsewhere, Luther, by order of the elector, drew up certain articles of the points which were not or were to be held above all concession—the Lutheran ultimatum. These were considered at Schmalkald, and take their name from it (Feb., 1537). The Schmalkald Articles form the third of the distinctive confessions of the Lutheran Church. The council was never held, and was never meant to be held. The Nuremberg "Holy League" (July 10) of the Catholic princes might have brought on a bloody war, had not the political difficulties of the emperor made it absolutely necessary that he should conciliate the Protestants. There is no denying that the Turk, who threatened Christendom, was often the best friend Protestantism had on earth. All processes against the Protestants were arrested for eighteen months by the Frankfort Suspension (1539). A profound confidence in the ability of Protestantism to maintain itself began to fill the minds of men. The Reformation in Albertine Saxony had been violently held in check by Duke George (1500–39). On his death without issue, his brother Henry was received with jubilation, and the Reformation swept all before it. The March of Brandenburg and several of the neighboring territories received the Reformation 1539.

All hope of a better understanding, of a possible union between the conflicting parties, had not yet vanished.

Many colloquies were held (Worms 1540, Ratisbon 1541), but they served only to show more clearly the invincible character of the cause of separation. Politically, the prospects of the Lutheran states were very brilliant (1539), but the guilty passions and follies of some of the princes were preparing the way for their own humiliation and for deadly injuries to the cause of truth. Under the lowering of the great storm which was coming Luther d. Feb. 18, 1546. The pope had finally consented to call a general council in Trent, a German city, but as little German as possible. The emperor was earnestly desirous of a Reformation in some important particulars, but was determined that it should be in accordance with his own ideas. He used the rivalry and unholy ambition of some of the Protestant princes to separate them from the Schmalkald confederacy. The power which would have been ample to overthrow him was divided. The war of Schmalkald was sprung upon the Protestants. The campaign on the Donau (1546) left the emperor master of all South Germany. Hermann of Cologne was deposed, and the country of the Rhine was lost (1547). The campaign of the Elbe (1547) ended in the overthrow and imprisonment of John Frederick and the landgrave Philip. Then came the imposition of the humiliating and distracting Interim (1548), and the political prospects of the Lutheran Church in Germany reached their hour of profoundest darkness. At this hopeless crisis deliverance came from the man who more than any other was responsible for the evil. In the heart of the elector Maurice, the betrayer for a time of the Reformation, the slumbering sense of honor was aroused. The German and Protestant feelings to which he had been so treacherous again asserted themselves. He was indignant at the continued confinement of his father-in-law. Breaking from the bonds of the emperor, who had used him as his right hand in the repression of Protestantism, he turned fiercely upon him. Like a hunted fox the emperor fled for his life, in darkness, through drifting rain, on the snow-covered mountains. The treaty of Passau (1552) guarantied the Lutheran states equal rights with the Catholic till a new council should be convened. The religious Peace of Augsburg (Sept. 25, 1555) withdrew the limitation as to time. The Lutheran Reformation had proved itself incapable of repression alike by the arts and arms of Rome, by the sagacity of its foe, and the follies of its friends. (Walch, C. G. F., *Geschichte* (*History of the Ev. Luth. Religion as a Proof that it is the True Religion*), 1753; Koecher, *Wahrheit*, chap. xix., xx. (*Truth and Perfection of the Ev. Luth. Religion*), 1755; Ranke, *Deutsche Geschichte im Zeitalter d. Reformation*, 4th ed., 1867–68, 6 vols. 8vo; Weber, *Das Zeitalter der Reformation*, 1873.)

VII. *The Lutheran Reformation Outside of Germany.*—Had the conflict been one of purely moral means, the Reformation would have triumphed throughout Europe. But even the resources of courts and the terrors of persecution could not prevent its wide acceptance. In Northern Europe, the Lutheran Confession found a home among the Scandinavian races. In Eastern Europe, Lutheranism and Calvinism reached the Slavic and Magyar races together. The causes of the preference for the one or the other type of reformation were partly personal and local, but were far more associated with national, race, and political characteristics, which corresponded with the more radical tendency of Calvinism on the one side, the more conservative character of Lutheranism on the other. The Lutheran Reformation was triumphant in Sweden (1527) under the influence of Gustavus Vasa. In Denmark and Norway the Lutheran organization was confirmed by the Diet of Odense (1539), and by the middle of the century the lands of the Baltic coast and Courland, Livonia, and Esthonia were embraced in the great Lutheran family. (Münter, *Kirchengeschichte v. Dänemark u. Norwegen*, 1834; Fryxell, *Gustav Wasas Leben*, 1831; Weber, *Zeitalter d. Ref.*, 530–573.)

VIII. *Doctrinal Controversies in the Lutheran Church in the Sixteenth Century.*—(See articles ADIAPHORITES, ANTINOMIANS, FORMULA OF CONCORD, CRYPTO-CALVINISTS, KARG, MAJORISTS, OSIANDER, PHILIPPISTS, PREDESTINATION, SAXONY VISITATION (ARTICLES OF).) For literature see Kurtz, *K. G.*, 1874, § 141, and see the works of Dorner (1867), Frank (1862–63), Heppe (1852 s.), Planck (1791–98), Loescher (1722–24), Thomasius (1848), Walch (1730–39), Krauth, *C. Ref.* 147.) The internal questions which agitated the Lutheran Church were determined in the FORMULA OF CONCORD (1577), which closes the collection of the confessions which appeared under the title of BOOK OF CONCORD (1580). (See both these articles.) "There have been those who lamented that it was not conceded to Philippism to speak the final word. But before tendency can impart character it must have character; and this was wanting to Philippism. Nothing but a positive Lutheranism had the theological potencies, the firmness and definiteness of doctrine, the sharpness of boundary, the impress of the consciousness that it is a right in that in which it is distinctive, the energy of witness, the principles on which established churches alone can rest, which was the problem to be solved." (Kahnis, *Innere Gang*, i. 54, 55.)

IX. *Church Polity.*—In her ecclesiastical constitution the aim of the Lutheran Church was to avoid the hierarchical subjection of the State to the Church, and the Cæsareo-papal lording of the State over the Church. The former, which depended on herself, she perfectly secured; in the latter, which was influenced by state plans, she was not always so happy, and in various ways the political complications of the time embarrassed the practical application of her principles. (See CONSISTORY, EPISCOPAL SYSTEM, POLITY (ECCLESIASTICAL).) (See *Die Kirchenordnung* (*The Church Order of the Ev. Lutheran Church of Germany in its First Century*), 1824; Richter, *Geschichte* (*History of the Evangelical Church Polity in Germany*, Leipsic, 1851.)

X. *Worship and Art.*—The worship and the range of art in the Church were meant to meet the wants both of the judgment and of the emotions. A perfect freedom was claimed for the Church in all the purely human regulations of worship. She could add, drop, or change, prudently and in love, according to her judgment of what was best. Her essential unity was that of faith, not of forms. But the spirit of her faith pervaded all her forms. A thorough conservatism was observed. The legitimate results of the historical growth of the Church were treasured. The expressive ornaments of the altar and the innocent usages dear to the people were retained. The Romish perversion of the mass, all rites that taught or insinuated unsound doctrine, were thrown out, and the evangelical mass, the pure communion service, remained. The pulpit became a power. The people took part everywhere in worship, which as of old was responsive. They heard God's word and uttered his praises in their own tongue. The biblical festivals of the Church year were retained. Painting (Cranach, the Holbeins, Dürer) and statuary hallowed their gifts for the sanctuary. (See Jacoby, *Liturgik. d. Reformation*, 1871; Kliefoth, *Ursprüngl. Gottesdienstordnungen in l. K.*, 1847; *Liturg. Abhandlungen*, 1854 *seq.*; Schöberlein, *Ausbau*, 1859; Krauth, *Evangelical Mass and Romish Mass; Sunday Services according to the Liturgies of the Churches of the Reformation; Jubilee Service*, 1867.)

XI. *Hymns.*—The hymns for the people were one of the grandest achievements of the Lutheran Reformation. They are full of simplicity, unction, and divine objectivity. Holy song was as widereaching, as incapable of exclusion, as soft and wooing, as mighty and irresistible, as the air on whose pulsations it spoke heart to heart. Among the greatest hymn-writers are Luther; Speratus, d. 1554; Decius; Eber, d. 1569; Spengler, d. 1534; Mathesius, d. 1565; Alber, d. 1553; Weisse, d. 1540, of the first half of the century; in the latter half we have Ringwaldt, d. 1597; Selnecker, d. 1592; Herberger, d. 1627; Nicolai, d. 1608. "In worship the austere Old Testament psalmody of the Reformed presents a striking contrast with the cordial internality of the Lutheran Church song, gushing from the living spring of the spirit of poesy." (*Baur.*) Koch, *Geschichte* (*History of Hymns and Church Song, especially in the Evangelical Church*), 3d ed., 7 vols., 1866 *seq.*; Wackernagel, *German Hymns from Luther to Hermann*, 1841; *From the most Ancient Times to the Beginning of the Seventeenth Century*, 1867 *seq.*; Mützell, 1855; Palmer, 1865; Kübler, *Historical Notes to the Lyra Germanica*, 1865; Miller, *Singers and Songs of the Church*, 2d ed., 1869.

XII. *Church Music.*—The congregational singing was a revival of the Ambrosian choral over against the priestly Gregorian chant. It was choral, for the people and the choir blended into one in this noble form of song. Among the composers of this era are Luther and his familiar friends Rhaw and Walter. Eccart (d. 1611) did much for church music.

XIII. *Practical Life.*—The Christian life was one of humble, joyous assurance. The clergy were marked by devotion to the pastoral work, and by fidelity in the pulpit and in the religious instruction of the young. Without a severe church discipline they trained the people in the fear of God, in personal honor, and in the domestic and civil virtues. "In the administration of church discipline the Lutheran Church is beyond dispute very much behind the Reformed; on the other hand, the moral life in the Lutheran Church has a character of greater freedom, of more heart and soul, resting more on internal motives." (*Baur.*) That there were painful exceptions is not only the necessary general result of the common infirmities of human nature, but is connected with this fixed law, that the times following great struggles, warfare, and change, even of the most hallowed character, are times of reaction and relaxation. The immediate sequence of a successful war for truth and virtue is a revival of the potency of many elements of falsehood and vice. The storms that give a long purity may work temporary devastation.

When the calm with its happy results had been finally reached, "there came in domestic life a solidity—nay, a hallowing unction—such as had never been before." (F. R. Hasse, *Kirchengesch.*, 1872, 619.)

XIV. *Theological Science.*—The nature of the times gave great prominence to polemic theology. Whatever part of theology was taken up was handled with special reference to its availableness as a means of defence or enlargement of the restored truth. The ploughshares were beaten into swords. Luther, Melanchthon, Flacius, Brentius, Chemnitz, and the co-workers in the *Magdeburg Centuries* are still unforgotten names. The centres of theological culture were the great universities of Wittenberg, Tübingen, Strasbourg, Marburg (1527), and Jena (1557). (See Dorner, Frank, Gass, Heppe.)

XV. *Transitions of Lutheran Established Churches in the Sixteenth Century.*—The Crypto-Calvinistic designs had contemplated a general removal of the Lutheran Church from its first foundations. Crypto-Calvinism was concerned mainly with the sacramental doctrines. It was really farther from what is now considered as by pre-eminence Calvinism than Lutheranism itself had been. It was unionism deriving its special features from the times. Its designs were thwarted, yet the Palatinate under Frederick III. (1560), Bremen (1562), and Anhalt (1597) were transferred by their civil rulers to the Calvinistic communion.

XVI. *The Lutheran Church in the Seventeenth Century.*—1. Hesse Cassel (1604), the earldom of Lippe (1602), the court (but not the people) of the electoral house of Brandenburg (1613), became Calvinistic. Various attempts at union (Leipsic, 1631; Thorn, 1645; Cassel, 1661) accomplished nothing. The ardor for union was so great that its representatives drove Paul Gerhardt and others from their flocks into poverty and exile for declining to treat the distinctive faith of the Lutheran Church as a thing indifferent.

2. The peril of peace is the peril of stagnation. The Lutheran Church had undergone the ordeal of a war of polemics; she was to undergo the trial of a comparative internal repose. She now reached her mediæval period, rich in construction, comparatively poor in origination, not by declension, but by the ordinary law of historic progress. "That it was not an age of spiritual death which succeeded the Reformation has been abundantly shown by Tholuck in his *Evidences of Life in the Lutheran Church.* The great dogmatic works of the Lutheran Church may be regarded, both for their accurate delineation and subtle elaboration of notions, as works of art and models. The one-sidedness into which the Evangelical Church fell was contrary to its own nature. Hence, a reaction could not fail to take place within the Church itself. Among Lutherans it was found on the part of the *intelligence* of the Church, in Calixtus and the Syncretistic controversies, on the part of the religiously inclined *will* in Spener, or the part of *religious feeling* in mysticism and Zinzendorf." (*Dorner.*) Within the determined orthodoxy rose various questions, but in many of them the interest was confined to theologians. The controversy on syncretism originated in the views of George Calixtus. With pietism in its early stages are associated the names of Spener and Francke. "Compared with the Reformed, the Lutheran Church was the subject of a slower, but also of a more united and more consecutive, development. This development was moreover less disturbed by schisms. The dissensions which arose remained within the same ecclesiastical community, hence they were of necessity more thoroughly investigated and understood—a fact which in many instances resulted in the combination of the lawful elements found in opposing parties." (*Dorner.*) "In the Lutheran Church it is the doctrine to the development of which the whole activity is directed; in the Reformed it is the polity, the form of the Church as a communion. In the one the centre is philosophy and speculation; in the other, it is direct reference to practical life. In the one philosophico-theological systems rise and crowd each other out of the way; in the other, it is not systems, but sects, which take shape and struggle for the ground." (*Baur.*)

3. In theological literature are found among the names still treasured, Glassius, Pfeiffer, the Schmidts (Erasmus and Sebastian), Geier, Calovius, Hutter, Gerhard, Quenstedt, Hunnius, and Musæus.

4. The age is brightened also by the works of many of the noblest representatives of a living, internal Christianity. Among them are Arndt (*True Christianity*), Gerhard (*Meditations* and *Schola Pietatis*), Heinrich Müller, Scriver, and Andreæ. The lovers of mysticism and theosophy treasure Jakob Böhme and Gottfried Arnold.

5. The century was rich in hymn-writers. Those of the earlier part were marked by the old objectivity—those of the later, by the growing tendency to subjectivity. There was an intermediate school, whose greatest representative, Paul Gerhardt, harmonizes both tendencies. Church music was nobly represented by the great composers Crüger, d. 1662; Rosenmüller, d. 1686; Hammerschmidt; Ahle, d. 1673.

XVII. *The Lutheran Church in the Eighteenth Century.*—1. *Before "the Illumination."* After the death of Spener (1705) and Francke (1727) pietism degenerated very rapidly. That this mischievous extreme was not the absolute necessary outgrowth of the principles of the great leaders in the pietistic movement is shown by the fact that out of Halle also went forth forces into the Church the beneficence of which is beyond all dispute. There arose a generation of Lutheran divines as pious as the pietists, as orthodox as their opponents—who neither arrayed piety against orthodoxy nor orthodoxy against piety, but showed by pen and life that true piety is orthodox, and that true orthodoxy is pious. "From Calixtus they had learned mildness and equity toward the Reformed and Catholic churches; from Spener they had drawn the impulses to a heart-deep piety, through which streamed the fresh and fructifying life of theological science. Even the one-sidedness of Arnold had taught them that truth is to be followed, though it may take from heretics and sectaries mistaken and distorted shapes. From Calovius and Loescher they inherited a devotion to pure doctrine." (Heinrich Kurtz, *K. G.*, § 166.) Of this school, though not in equal degrees, may be named Hollazius, Starck, Buddeus, Cyprian, J. C. Wolff, Weismann, Deyling, J. G. Carpzov, J. H. and C. B. Michaelis, J. G. Walch, Pfaff, Mosheim, Bengel, and C. A. Crusius. Of the philosophical Leibnitzo-Wolfian school were S. J. Baumgarten, Reinbeck, and Carpov.

2. *Church Polity.*—The (politico-) episcopal system of polity had claimed at first to be simply a necessity. This transmuted itself into the assertion of a principle (Carpzov, 1645). It was supplanted by the territorial system (Thomasius and Böhmer, beginning of the eighteenth century). A third system, the collegial, detached from the political abuse of it, is more in accordance with the original position of the Lutheran Church. It was in its new shape the outgrowth of Spener's views, and found an able exponent in Pfaff (1719). (See POLITY, ECCLESIASTICAL.) (Richter, *Gesch. d. ev. Kirchenfass.*, 1851, 208; Lechler, *Gesch. d. Presbyt. und Synod. Verfassung.*, 1854, 228.)

3. *Worship.*—The hymn-writers of this era show the influence of the spirit of Spener in the earnest piety which is their strength, and in the individualism which is their weakness. The early hymns were hymns for men to sing together—the later hymns were hymns to be sung by men in separateness, and sometimes of the sort that men are not likely to sing at all. The degenerating pietism corrupted the music of the Church. This tendency was met by John Sebastian Bach, who in many of the highest attributes of his art was "the greatest master of all times," the lover and the glorifier of the ancient choral. Handel (d. 1759) gave his ripest years to oratorio, and in his *Messiah* reached by the inspiration of music what Milton had failed to attain in *Paradise Regained.*

4. *Missions.*—The new life of the purer pietism showed itself in establishing missions among the heathen. At the Danish mission at Tranquebar (1704) labored Zeigenbalg (d. 1719). From Halle went forth Schwarz (d. 1790). Callenberg founded at Halle (1728) an institution for the conversion of the Jews. Hans Egede (1721) went to Greenland, and when in 1736 he returned to Denmark and established a mission-seminary for Greenland, his son Paul took his place. (On Lutheran missions see Francke, *Berichte d. dän. Miss. in Ostind.*, 1708–72; Egede, *Descript. of Greenland*, transl. from the Danish, Lond., 1745. Wiggers, *Gesch. d. evang. Miss.*, 2 v., 1845; do., *Statistik*, 2 v., 1842–43; Plitt, *Kurze Gesch. d. luth. Miss.*, 1871; Shoberl, *Present State of Christianity and of the Missionary Establishment*, 2d ed., 1829; Aikman, *Cyclopædia of Christian Missions*, 1860; Newcomb, do., 1860; Brown, Wm., *Propagation of Christianity among the Heathen since the Reformation*, 3d ed., 1864.)

5. *The Rationalistic "Illumination."*—From the middle of this century rationalism, claiming the title of "Illumination," or enlightenment, made rapid progress. Rationalism having its root in the general infirmity and corruption of human reason, abusing the freedom of investigation which is demanded by the nature of Christianity, and is enunciated as a vital principle by Protestantism, has co-existed in some shape with the Church from its first hour to the present. In the eighteenth century it was intensified by causes of wide extent and great potency, and revealed itself in every great communion of Western Christendom. Lutheranism had been charged by Rome with giving undue weight to human reason—not indeed as over against the Word, but as against church authority—and Rome was as-

sailed through the whole Reformation, by both the great Protestant parties, as rationalistic and Pelagian in many of her doctrines. The great leader in the rationalistic criticism of the eighteenth century was the Roman Catholic Oratorian, Simon, who died 1712, nearly ten years before Semler, the father of rationalism in the Lutheran Church, was born. The Reformed tendency was resisted by Lutheranism as unconsciously rationalizing. But the unequivocal tendency had been shown first in Socinianism, and afterwards in the advanced Pelagianism of Arminians of the school of Le Clerc (d. 1736). England contributed her deistic writers. In France, naturalism and atheism became fashionable, and Frederick the Great helped to domesticate them in Germany. Freemasonry as it had been transferred from England in 1733, the Wolfian philosophy, and the perversions of philosophy in general, the later pietism, and the separatism it engendered, aided in the work of mischief. Rationalism is infidelity in various degrees, under the forms of Christianity. The supranaturalism which met it was more or less under the latent influence of the thing it combated, as the English apologetics of the century showed tinges of the deism with which it fought. The higher philosophy and national literature, though in seeming affinity with rationalism on the surface, were yet in their antagonism to its prosy doctrines, its plausible shallowness, emptiness, and self-sufficiency its invincible foes in their deepest and final workings. (See RATIONALISM, SUPRANATURALISM, PHILOSOPHY (GERMAN).)

6. *Opponents of Rationalism.*—In the darkest time some were among the unfaithful faithful found. Imperfect as was the work of the supranaturalists, the best of them did noble provisional service. They at least kept a polar twilight where there might have been a midnight. Outside of the ranks of the theologians, Claudius, Hamann, and Oberlin, the pastor of the Ban de la Roche, are among the unforgotten names. Under a common pressure the faithful hearts of the separate communions were drawn closer to each other.

7. *Influence of Rationalism.*—Under the baleful influence of rationalism every sacred interest declined. The pulpit lost its power; no living hymns were produced, and the old were unsung. In music the ancient beauty and glory of the choral vanished; men sought the concert-room and the theatre, for which the music of the time was better suited than for the church. The oratorio gave way to the opera. The conservatism of Rome itself yielded, and Palestrina's noble school sank before the self-sufficiency of operatic organists and choirs. The liturgies which were offered, too frequently with success, for the historical services of the Church, are beneath the ludicrous. They are too dreary to awaken the smile which their absurdity seems to challenge. Rationalism had shown that its problem is not as between forms of religion, but as between religion and irreligion. (See Walch, C. W. F., *Neueste Religions-Geschichte*, 1771–93; Tittmann, 1824; Pusey, Saintes (transl. 1849), Kahnis, *Innere Gang*, 3d ed., 1874; Tholuck, *Verm. Schr.*, ii., 1839; Gass, vol. iv., 1868; Hurst.)

XVIII. *The Lutheran Church in the Nineteenth Century.* —1. *Reaction of Church Life.*—The revolutionary excesses of France, and the awe-inspiring providences growing out of them by development or counteraction, which marked the fifteen opening years of the nineteenth century, had tended to sober men, to turn their eyes to God, and to show them how poor are the substitutes which had been offered for the simple, deep, and earnest faith of the olden times. All deep thinking tends as a finality against skepticism. Reason is the cure of unreason. Kant, Fries, the Fichtes, Schelling, Hegel, Herbert, Schopenhauer, Ulrici, Lotze, Von Hartmann, in simple virtue of helping to earnest thinking, work in one school. The strata of the extinct help to finish the world. Superficiality is the only incurable vice of mind. The earnest thinking instantly showed itself as a better thinking. Pietism renewed its better youth. The ninety-five theses of Claude Harms (1817, the close of the third centenary of the Lutheran Church) recalled the Reformation to the minds of all, to the hearts of many.

2. *Union and Separation.*—Frederick William III. began in 1817 the movements looking to the union in one state Church of the Lutheran and Reformed. Strong opposition rose on the side of many earnest Lutherans. Among them may be mentioned Scheibel (d. in exile 1843), H. Steffens (1831), Kellner, whose church was opened by military force for the Agenda (1834), Guericke (1835). Frederick William IV. released the clergymen who were imprisoned, and a free Lutheran Church was organized 1841, and received the royal concession 1845. Separation also arose within the separated, on questions affecting the constitution of the Church, in which the distinguished jurist Huschke represented the conservative, Diedrich the radical view. A decision of the general synod of 1859 adverse to the view of Diedrich led to his separation from the synod (1861). A free Lutheran conference of the friends of separation from the unionistic state churches was held Oct. 28, 1874, at Eisenach, the object of which was to promote a better understanding and a more perfect sympathy and mutual support. In the discussion of the questions raised by the union, see Rudelbach, *Reformat. Luth. u. Union*, 1839; Müller, Jul., *Evang. Union*, 1854; Nitzsch, *Urkundenbuch*, 1853; Stier, *Unlutherische Thesen*, 1854; Schenkel, *Unionsberuf*, 1855; Schulz, K., *Die Union*, 1868. See citations under § II. of this article.

3. *Confederations.*—Various confederations attempted to co-operate with or supplement the union, so as to bring into practical co-working the elements which had been joined but not united in it. Among them are the Gustavus Adolphus Association (Oct. 31, 1841), the Evangelical Church Diet (1848), at whose meeting in Berlin (1853) the Augsburg Confession received a qualified recognition as the common confession of Protestant Germany; the Eisenach Conference (1846, 1852).

4. *Distinctive Lutheranism within and without the Union.* —Within the union distinctive Lutheranism still remained a great and active power. Many Lutherans remained within the union to fight the battle for truth there, and to obtain, if possible, a restoration of the solemnly guarantied rights of the Church. The chief organs of this position were Hengstenberg's *Kirchenzeitung* and the *Volksblatt* of Nathusius (d. 1872). Lutheranism outside of the union was represented in the general Lutheran conference (1866, 1868, 1870, 1872), among whose distinguished names are Harless, Kliefoth, and Luthardt. Its organs are the Erlangen *Zeitschrift* (1838) and Luthardt's *Kirchenzeitung* (1868).

5. *Hymns and Music.*—The awaking consciousness of the Church led to noble and successful efforts to correct the wretched state into which the rationalistic Vandalism had brought the hymns, the music (the choral has been the pulse of the Church), the service, and the popular religious literature. Moritz Arndt, Von Raumer, Bunsen, Stier, A. Knapp, Daniel, Layritz, the Eisenach Conference (1853), and Wackernagel have labored in the revival of hymnology. Natorp, Thibaut, Grüneisen (1843), Winterfeld (1843), and V. Tucher (1848) have done valuable service in the restoration of the choral.

6. *The Theology of the Nineteenth Century* could only have risen in a land which had received the ineffaceable impression of Lutheran life and thought. The grandeur of the wildest perversions of this theology and the ruins of its most unsparing destructiveness were only possible on the presupposition of eras of gigantic building. The ancient Lutheran theology, after the storm of war had swept over it, stood like Tadmor in the wilderness. Its ruthless foes could not build, and could only destroy because the greater generations had builded; but they could not perfectly destroy—they could only dismantle what was too massive to be overthrown. The Protestant theology of Germany is represented (1) in the older and in the historico-critical rationalism; (2) in the old supranaturalistic schools, embracing rational supranaturalism, the stricter or suprarational supranaturalism, and the pietistic supranaturalism; (3) the mediating theology whose father is Schleiermacher. Among its representatives from the Lutheran side are Lücke, Bleek, Nitzsch, Jul. Müller, Ullmann, Twesten, Dorner, Liebner, Martensen, Ehrenfeuchter, Beyschlag, and Köstlin; (4) *Lutheran Theologians of the Confession.* The patriarch among these was Claude Harms (d. 1855). Among its representatives in what might be called a first generation are Sartorius (d. 1859), Rudelbach of Denmark (d. 1862), and Guericke. The divines of a second generation show certain divergencies of view on parts of the theory of the ministerial office and of the Church, and on the construction, spiritualistic or realistic, of prophecy, especially on the parts in which Chiliasm is involved. In a first group may be placed Harless, Höfling (d. 1853), Thomasius, Keil, Caspari, Krabbe (d. 1873), Philippi, Dieckhoff, Zöckler, Wuttke (d. 1870), Harnack, Oettingen, and Frank. In a second group, distinguished by its strong views of the Church and ministry, are Löhe (d. 1872), Vilmar (d. 1868), Kliefoth, and Zezschwitz. In a third group, distinguished by its realistic tendency in the interpretation of prophecy, are placed C. K. v. Hofmann, Drechsler (d. 1849), Delitzsch, Luthardt, M. Baumgarten, and Oehler (d. 1872). In their earlier position Kahnis and Thiersch were strictly confessional.

The great jurists Göschel (d. 1862) and Stahl (d. 1861) were also theologians of the Lutheran Confession. The works of the great writers on church polity, Eichhorn (d. 1854), Jakobson, Puchta, Richter (d. 1864), Dove, Bickell, and others, are of great importance in many of the discussions which have been specially characteristic of the Lutheran Church in this century—whose problem is the embodiment of the soul of her doctrine in a sound polity, a constitution which shall as adequately conform to her common life as her confessions conform to her common faith. (See Baur (1863), Nippold (1867), Kahnis (4th ed., 1874), Hagenbach, *Kirchengeschichte des 18. und 19. Jahrhunderts* (4th ed., 1870–71); Schwarz, *Zur Geschichte der Neuesten Theologie* (3d ed., 1864); Mücke (1867); Lichtenberger, *Histoire des Idées religieuses en Allemagne depuis le milieu de XVIII^e Siècle jusqu'à nos Jours* (Paris, 3 vols., 8vo, 1873); Kurtz, *Lehrbuch* (7th ed., 1874, § 183).)

7. *Practical Life.*—With the reviving doctrinal life came the spirit of missions. The outgrowths of the life of inner missions are so numerous that their names would fill pages. Wichern founded the Rauhe Haus 1833, the institute for girls at Berlin 1858, and has been the father of a great number of beneficent institutions and reforms. With the deaconess institutions are associated the names of Fliedner and Löhe. Among the associations and schools for foreign missions may be mentioned the Society of the Rhein (1829), the North German (1836), Jänekes (1800), and Gossner's, all of which have a predominantly Lutheran character. The Dresden Missionary Society has a positive Lutheran character (1836). It transferred its seminary in 1848 to Leipsic, to give its pupils the advantages of the university. It has taken up again the ancient mission-work of the Lutheran Church in India. All the Lutheran lands have mission societies. The Hermannsburg Mission Institute, under the direction of Louis Harms (d. 1865), has developed an energy almost unexampled. (See Missions, Foreign.)

8. *Statistics.*—The total number of Lutherans is probably about forty millions, including the Lutherans in the union churches. The purely *local history* and *statistics* of the Lutheran Church properly belong to the different countries and states in which the Church exists—America (North and South), Anhalt, Austria, Baden, Bavaria, Belgium, Bohemia, Bremen, Brunswick, Carinthia, Carniola, Darmstadt, Denmark, England, France, Hamburg, Hanover, Hesse-Cassel, Holland, Hungary, Iceland, Lippe, Lubeck, Moravia, Mecklenburg, Norway, Oldenburg, Poland, Prussia, Russia, Saxony, Styria, Silesia, Sweden, Thuringia, Transylvania, Westphalia, Würtemberg. In all these the Lutheran Church has a historical record. (For confessions, see Concord, Book of, and the creeds there enumerated. For special doctrines and controversies see Concomitance, Consubstantiation, Lord's Supper, Sacrament, Syncretism, Synergism, etc. See also Polemics, Polity (Ecclesiastical), Protestantism, Reformation. For the most recent special history, see Separate Lutherans of Prussia, Union, Evangelical. For divines, see Chemnitz, Luther, Melanchthon, Mosheim, etc.; statesmen, Ernest the Pious, Gustavus Adolphus, etc.; philanthropists, Fliedner, Francke, Harms, Oberlin. See also Education, Universities, etc. The literature will be found in this article classified at its several places.) C. P. Krauth.

Lutheran Church in the U. S. I. *The Era of Beginnings and Dependence.*—1. The first Lutheran immigration into America was from Holland, and may have been hastened by the troubles, religious and civil, connected with the struggles between the Calvinists and Arminians (1610–19). A little band of Dutch Lutherans came (1621–26) to what was then called New Amsterdam, and is now New York. In 1644 a number of North Germans were added to them, but their worship was conducted in private houses. Strong efforts were made to lead them to conform to the Calvinistic Church of Holland. Stuyvesant forbade their meetings, and fines and imprisonment were imposed for their refusal to obey. They petitioned the Directory of Holland for permission to call a preacher and have public service, but in vain (1653). Götwater was sent by the Lutheran Consistory as pastor (1657), but was not allowed to preach, and, with a promptness checked only by his sickness, was sent back to Holland. The English took the city in 1664, and freedom of religion was accorded the Lutherans. Fabricius, their first pastor, began his labors 1669. A small church was built in 1671, removed by the Dutch in 1673, but another church was built on the same site in 1703. In the same year Falkner became their pastor. Berkemeyer succeeded him in 1725–32 (d. 1751), and Knoll, who resigned in 1750.

2. *The Swedish Lutherans* came next. Gustavus Adolphus had designed to open in America a place of refuge for the persecuted Protestants of Europe, and Oxenstiern attempted after the death of the king to carry out his plan. Fifty Swedish immigrants, with their preacher, landed (1636–37) on Delaware Bay, and bought land of the Indians. Minneuit, the leader of the expedition, who built Fort Christina, died in 1641; Torkillus, the first pastor, died in 1643. Campanius, their next minister, led in the great work of missions among the Indians, and translated into the language of the Virginia Indians Luther's *Catechism.* Stuyvesant seized the colony, then numbering about 1000 souls, and brought it under the Dutch rule. The church at Wicaco was built 1669, and Fabricius, the first pastor of the Dutch Lutherans, took charge of it in 1677 (d. 1692). The appeal in 1693 for preachers from their native land was successful. A church was built in Christina in 1699, and a second one in Wicaco in 1700, in a substantial style which attested the earnestness and liberality of the builders. In our own day a new and immense influx of the Scandinavian nationalities has taken place, making now a population of about a million and a half in our land.

3. *The German Lutherans*, last in coming, were destined to be the mightiest element of the future growth of the Church. *a. In the North.*—They began to settle in Pennsylvania in 1680, soon after the grant of the province to Penn. Emigration began on a large scale in 1710, when between 3000 and 4000 Germans from the Palatinate and Suabia came to New York with Brigadier Hunter. Some of them went to Germantown at once. In 1723 the large body of those who had remained went to Pennsylvania. The congregations in Philadelphia, Providence, and New Hanover sent a deputation in 1733 to beg for ministers and other aid. The petition was regarded with special interest by Ziegenhagen, the Lutheran court-preacher in London, and by C. A. Francke, who ought not to be confounded, as he constantly is, with his illustrious father. The younger Francke, to whom our Western World owes a debt of gratitude it can never pay, sent a man destined to become the patriarch of the Lutheran Church in America, Henry Melchior Muhlenberg (which see). First visiting Georgia, he came in 1742 to Philadelphia. Strong in the faith of the Lutheran Church, and full of the earnest piety of the true school of Spener and Francke, he abounded in wise energy which was divinely blessed. In 1744, Brunnholz, Kurtz, and Schaum came from Halle, and in 1748 Handschuh and Hartwig (founder of the seminary), in 1758 Bager, in 1769 Helmuth and Schmidt, in 1770 Kunze. *b. In the South.*—The Salzburgers were driven from their homes in the dead of winter (1731–32) by the Romish archbishop Count Firmian. Aided by English Christians, forty-two families of them came to Georgia with their preachers, Bolzius and Gronau. They gave the name of Ebenezer to the colony they established. Their number was enlarged in 1735. The Salzburger orphan-house was founded in 1738. In 1741 the number of Lutherans in Georgia had reached 1200. Gronau died 1745; Lemke was sent from Halle as his successor. Rabenhorst came with a new band in 1752, and established the first Lutheran congregation in Charleston, S. C. In the early part of the eighteenth century many Germans went from Pennsylvania and other parts of the colonies to North Carolina. In 1730 the Lutheran Church was established in Frederick, Md. In 1735 a settlement of Lutherans was formed in Madison co., Va., where the congregation still continues. The Lutheran church in Winchester, Va., was received into connection with the synod of Pennsylvania in 1762. Immense immigrations in the later era have come from Germany. The German population of this country may be safely estimated at 7,000,000, and the Lutheran is the largest of the religious bodies among which they are divided.

II. *Era of Synodical Organization.*—The labors of Muhlenberg and of his noble co-workers were soon felt, and the Lutheran Church began to come to a consciousness that she was to be a distinct and independent power in the New World. The German Evangelical Lutheran Ministerium of Pennsylvania and adjacent colonies was organized Aug. 14, 1748. With the Pennsylvania ministers at the first meeting were present Hartwig from Rheinbeck, N. Y., and the Swedish pastors, the provosts Sandin and Näsmann. The dates of the formation of the earlier synods are as follows: Synod of New York, 1785; South Carolina, Corpus Evangelicum, 1787; North Carolina, 1803; Ohio and adjacent States, 1818; Maryland and Virginia, 1820; Tennessee, 1820; S. W. Pennsylvania, 1825; Virginia, 1830; Hartwick, 1830; Synod of the West, 1835; English Synod of Ohio, 1840. The present number of synods is about 54. A great event in this era was the organization in 1847 of the Synod of Missouri, Ohio, and other States. It has been by preeminence the representative of Lutheran orthodoxy. Its founders were brought by religious convictions to the Western World. They experienced and overcame almost every kind of trial. The "Old Lutherans" from Prussia, forming the Buffalo synod, have fought and endured for the truth's sake, and have revived in our time the intensity of the martyr spirit of the ancient Church, both in testimony and endurance, and the synod of Missouri, composed of Saxon Lutherans originally, has shared in the same spirit of earnestness. This synod has done much for general and theological education, and for Church literature, both periodical and permanent. It has established a carefully arranged congregational order and discipline, has testified against all unionistic combinations both in the pulpit and at the altar, and against secret associations and all connivance with error. Its decided views and practices have not been maintained without violent controversies. The Synodical Conference of 1871 is the outgrowth mainly of its work. One of the most persistent of the antagonistic—or rather of the antagonized—bodies has been the Iowa Synod, which was formed in 1854. It is unreserved in the acceptance of the confessions of the Church, but considers them safeguards of its liberty as well as of its purity, and therefore considers the questions left undetermined by them, or which do not involve articles of faith, as open questions. It is distinguished by a large and noble spirit. It has shown great interest in the General Council, but stands only in an advisory relation to that body, because of what it regarded as the indeterminateness of its position on the fellowship of the pulpit and the altar. (See *Denkschrift . . . d. deutsch. E. L. S. v.* Iowa, 1864.)

III. *Efforts at General Organization.*—In 1820–21 the General Synod was organized; in 1863 the General Synod of North America (South); in 1867 the General Council; and in 1872 the Synodical Conference. The General Synod is largely unionistic, but with growing elements of a more churchly character; the General Synod of the South has a larger relative strength of the conservative element; the General Council, strictly Lutheran in confession, has failed to satisfy in the practical application of its principles in discipline on the "four points," the tendency which has found embodiment in the Synodical Conference. The "four points" are pulpit and altar fellowship, Chiliasm, and secret societies. The latest utterances of the General Council (Galesburg Oct. 11, 1875) have been so decided as to preclude all doubt as to its attitude on the two former questions. The work of this body in educating the mind of the Church and developing it has been very great, and in it a practical co-ordination of languages and nationalities almost without a parallel has been established. It embraces Danish, Norwegian, English, and German elements.

IV. *Internal History.*—1. *Pietism.*—The Lutheran Church in America has been throughout its entire history sympathetically affected by the condition of the Church in Germany. The mighty influence of the better Pietism has been felt all through its history, and is felt to this hour. Muhlenberg and the best men of his entire school were of the class of churchly pietists, strong in the faith of the Lutheran Church, and fully believing that the faith they confessed ought to be, and is in its proper nature, a power of regenerate life. They stamped upon the Church in America a spirit of solicitous care in things "indifferent," so far as those things naturally connect themselves with morals. They imparted to it a character of earnest devotion, activity in good works, justice to other Christians, gentleness to brethren. But Pietism here, as elsewhere, has shown its innate dangers, running out sometimes into superficial moralism, officious scrupulosity, laxity in doctrine, fanaticism in feeling, and unchurchliness in practice.

2. *Rationalism.*—The evidence of the presence of scattered rationalistic elements in the Lutheran Church in America in the first quarter of this century is given in the earnest solicitude of its best men to meet it and overthrow it. Rationalism never came to sufficient strength to avow itself, but moved furtively, showing itself rather as a negation or ignoring of the true than as an explicit avowal of the false. The position of those most widely suspected of affinity with it was indeterminate and a matter of dispute. But while the Church as a whole remained true to the orthodoxy which forms the common basis of nominal Protestantism, a great deal of looseness was allowed in regard to the ancient distinctive orthodoxy of historical Lutheranism. Dr. Hazelius wrote (1846), "We are fast verging to the other extreme, in believing that the great spirits of the Reformation scarcely preserved common sense when their deep-thought theories do not square with our superficial view of things." (*Hist. of the Amer. Luth. Church,* p. 250.)

3. *Unionism.*—Partly from pietistic, partly from rationalistic sources, and most largely from the dominant tendencies of the sect-life of America, the unionistic tendency has been shown in some extreme cases, even to the degree of proposing an organic fusion of the Lutheran Church with some other Church. Especially has this feeling been strong towards the German Reformed Church. But the unionism of the parts of the Church in which it is strongest has ordinarily gone no further than the encouragement of great freedom in the exchange of pulpits and in invitations to the Lord's Supper, the placing of a lax, and sometimes of an unfavorable, estimate on the distinctive doctrines of Lutheranism, and an interest in the syncretistic plans of union. Dr. S. S. Schmucker was one of the earliest and ablest advocates of the Evangelical Alliance. The great controversies of the most recent period have turned upon these unionistic tendencies. The General Synod warmly encourages them; the Synodical Conference rigorously opposes them; the General Council also earnestly opposes them, but has allowed within a carefully restricted range the possibility of exceptions to the ordinary mode of applying the rule.

4. *The Growth of Church Consciousness* has been a marked feature of the later life of the Church. This consciousness has never been totally wanting. There have been not only individuals, but synodical organizations, which have embodied it in the darkest hours. The General Synod in 1820, relatively to the laxer tendency, arose from this reviving consciousness, but there were even then bodies to whom its attitude seemed wanting in a clear churchly decisiveness. In the earliest history of the Church in America an unreserved acceptance of the BOOK OF CONCORD (which see) was required, but a special prominence was assigned to the Augsburg Confession. (See Dr. C. F. Schaeffer, *The Confession, etc., Ev. Review,* Oct., 1853.) The intermediate time was one of laxity. In the present an immense majority of the Church in America accepts the entire body of the Confessions *ex animo.* The Augsburg Confession is universally recognized in some shape—not always, however, without reservations which are not clearly defined.

5. *The Literature and Educational Work* of the Church in America have labored under many disadvantages. Her old vernacular is not the vernacular of the country, her ministry has been inadequate in numbers, and has been greatly overworked. She has not had the great denominational publishing agencies of other bodies. Nevertheless, she has names of great lustre in the general departments of science, literature, and theology. The Lutheran Church is an educating Church. From an early period in this country she has aimed at educating her people, and especially her ministers, and the large number of theological seminaries, colleges, and higher schools now under her care shows her earnestness in this great work. The struggle of her various languages has ended in a theoretical co-ordination of them, but a practical assimilation of them will be the growth of time.

V. *Practical Life.*—In her constitution in this country the Lutheran Church has combined the congregational and synodical elements, but her position is still in many respects unfixed. The powers of congregations, their relations to synods and to the ministry, are among the questions of the hour. The plan of permanent presidencies or of an evangelical superintendency has been recently urged. The preaching in the Lutheran Church is marked in the main by simplicity and power. The young people of the Church who give credible evidence of a desire to live as Christians are carefully instructed in the catechism as one of the preliminaries to being admitted to sacramental communion. Liturgies are in use in various degrees in every part of the Church. Many churches, some of them very noble specimens of architecture, have been reared within a recent period. The Church is growingly active in the work of home and foreign missions and in the various spheres of beneficence. The general integrity in business, the quiet, kindly home-life, the thriftiness, and reliableness of the Lutheran population are widely known, but none but those who are within it can appreciate fully the sterling, unobtrusive qualities of the heart and life which mark it, and which have been nurtured by the great communion of which they are members. The population, already so great, and the influx of such immense numbers of the most valuable classes of emigrants, both the old population and the new marked by a quiet vitality which makes each coming generation stronger than the past, furnish a basis for that great future which seems to await the Lutheran Church in the U. S.

VI. *Statistics.*—The latest reports (1884) show altogether in this country 56 different Lutheran synods. There are four larger organizations—the Synodical Conference, with 934 pastors, 1253 congregations, and 265,202 communicants, representing the extreme conservative side of the Church; the General Synod North, with 849 pastors, 1301 congregations, and 129,164 communicants, representing the liberal branch; the General Council, with 721 pastors, 1319 congregations, and 205,806 communicants, occupying a middle ground, but daily becoming more and more conservative; and the General Synod South, with 108 pastors, 187 congregations, and 14,336 communicants, inclining partly to the General Synod North and partly to the General Synod South. Besides these, there are 13 synods in no official connection with other bodies, numbering 1124 pastors, 201 parochial teachers, 2251 congregations, and 261,724 communicants. The grand total for the Lutheran Church in America is 3736 pastors, 779 teachers, 6302 congregations, and 873,382 communicants. It is the most polyglot communion in America (Americans, Germans, Swedes, Norwegians, Danes, Finns, and Hungarians).

The following list embraces the most important writings illustrating in some way the history of the Lutheran Church in the U. S.: Francke, *Nachricht.* (1744–85); Urlsperger, *Ausführliche Nachricht von den Salzburgischen Emigranten* (1744); *Patriarchs of American Lutheranism* (1845); *American Lutheran Church* (1851); *Lutheran Manual* (1855); *Definite Platform* (1856); *American Lutheranism Vindicated* (1856); *Brown's New Theology* (1857); Rupp, *Denominations in the U. S.* (1844, 370–403); Hazelius, *History of the American Lutheran Church* (1846); Reynolds, C. Philip Krauth, Steover, *Evangelical Review* (1849–70); Matthes, *Kirchliche Chronik* (1855–75); Baird, *Religion in America* (1856, 516–520); Mann, *Plea for the Augsburg Confession* (1856); *Lutheranism in America* (1857); Brown, *The New Theology* (1857); *The General Synod and her Assailants, Ev. Rev.* (Jan., 1867); Hoffmann, *Broken Platform* (1856); Reynolds, *Swedish Churches on the Delaware, Ev. Rev.* (Oct., 1849); *Scandinavians in the North-west, Ib.* (Jan., 1852); *Lutheran Church in the New Netherlands and New York, Ib.* (Jan., 1855); *German Emigration to North America, Ib.* (July, 1861); Richards, *Journal of Mühlenberg, Ib.* (Jan., 1850 *seq.*); Krauth, C. Philip, *Lutheran Church in the U. S., Ib.* (July, 1850; translated into German in Rudelbach and Guericke's *Zeitschrift*, 1851, Heft 2); F. A. Muhlenberg, *Memoir of H. M. Muhlenberg, Ev. Rev.* (Oct., 1851); *Educational Efforts of the Pennsylvania Synod, Ib.* (Oct., 1858; Apr., 1859); S. W. Harkey, *Resources of the Lutheran Church in America, Ib.* (Apr., 1852); *Early History of Lutheranism in Illinois, Ib.* (Oct., 1866); Walter, *Delegation of Missouri Synod in Germany* (1851–52; translated in *Ev. Rev.*, July, 1852 *seq.*); *Lehre u. Wehre* (1854–75); Krauth, Charles P., *Burning of the Old Lutheran Church* (1854); *Lord's Day* (1856); *Christian Liberty in its Relation to the Usages of the Evangelical Lutheran Church* (1860); *Evangelical Mass* (1860); *Conservative Reformation and its Theology* (1871, 150–161); M. L. Steover, *Memoir of H. M. Muhlenberg* (1856); *Memorial of P. F. Mayer* (1859); *Sketch of the Lutheran Church in this Country* (1860); *Discourse before the Historical Society* (1862); *Reminiscences of Deceased Lutheran Ministers*, eighty in all, the last appearing in the *Evangelical Quarterly*, July, 1870. They are by far the most important contributions yet made to the history of the Lutheran Church in America. J. G. Morris, *List of Publications by Lutherans in the U. S., Ev. Rev.* (Apr., 1861, art. v.); *Literature of the Lutheran Church in U. S., Ib.* (July, 1864); Focht, *Churches between the Mountains* (1862); Seiss, *Ecclesia Lutherana* (1868, 199–261); *The Javelin* (1871); Schaeffer, C. W., *Early History of the Lutheran Church in America* (1857); Sprague, *Annals of the American Lutheran Pulpit* (1869); Brown and Valentine, *Quarterly Review* (1871–75); Allibone, *Dictionary of English Literature* (1859–72); Spaeth, *Lutherische K. in Amer.*, in Schem's *D.-A. Conversations Lexicon* (1872, vi. 690); Bernheim, *History of the German Settlements and of the Lutheran Church in North and South Carolina* (1872); Schirmer, *History of the E. L. Synod of South Carolina* (1875). The minutes of synods and of other Church bodies, the hymn-books, liturgies, catechisms, and occasional sermons, also have much that illustrates the history of the Church in America. The periodicals are also of value here, and the almanacs (Brobst, Sheeleigh, Jacobs) are manuals of important information. C. P. KRAUTH.

Lüt'ke (FEDOR PETROVITCH), b. in Russia in 1797; educated in the Russian navy; accompanied Capt. Golownin on his circumnavigation of the earth 1817–19, and undertook from 1821 to 1824 four expeditions to Nova Zembla, of which he published a description in 1828. From 1826 to 1829 he made an exploration of Behring's Strait and the Sea of Kamtchatka, of which he gave a description (1834–36); in 1835 was made an admiral and appointed tutor to the grand duke Constantine; in 1850 made military gov. of Revel, and in 1853 of Cronstadt. He was the founder of the Russian Geographical Society, and attained the seat in the French Institute which had stood vacant since the death of Franklin. D. Aug. 21, 1882.

Lu'ton, town of England, county of Bedford, on the Lea, near its source and 31 miles N. W. of the city of London, has a fine Gothic church, dating from the fourteenth century, and is the principal seat of the straw-plait manufacturing industry in England. Pop. in 1881, 23,923.

Lu'tra [Lat., "otter"], of the Mustelidæ or weasel family, comprising the common otters. The genus is represented in the U. S. by the American otter of the East (*L. Canadensis*, Sab.), and by a doubtful species on the Pacific slope (*L. Californica*, Gray). Both are closely allied to *L. vulgaris* of Europe.

Lu'trinæ [Lat. *lutra*, "otter"], a sub-family of the Mustelidæ, including the otters. In the U. S. there are two genera—*Lutra*, the otter, and *Enhydra*, the sea-otter of the Pacific coast.

Lut'ti (FRANCESCA), b. at Riva di Trento, in the Italian Tyrol, where she still lives, devoted to literature and philanthropy. Her first poems, while giving proofs of her genius, indicated false taste, but an early friendship with the renowned poet Maffei corrected this defect, and she now stands, if not the first, at least among the first, living female poets of Italy. Her works are *Novelle e Liriche* (2 vols., 1862), *Alberto*, a poem in charming *ottave rime* (1867), and *Un Proverbio* (1874).

Lut'tringhausen, town of Rhenish Prussia, manufactures woollen, linen, and cotton fabrics, cutlery, and hardware. Pop. 9956.

Lutz, von (JOHANN), b. in Bavaria Dec. 4, 1826, a son of a schoolmaster; studied jurisprudence, and was appointed secretary to the cabinet of King Louis II. in 1866. In 1867 he became minister of justice, and Dec. 20, 1869, minister of public education and worship. In this position he rendered great services to the German empire by the energy with which he worked for its establishment in connection with the national party and in opposition to the Particularists and Ultramontanes. He has retained his seat as minister of public education in the various cabinets formed since 1870, and he has exercised a great and beneficial influence on the educational institutions of Bavaria. AUGUST NIEMANN.

Lut'zen, small town of Prussia, province of Saxony, famous for the two battles which were fought in its vicinity. On Nov. 16, 1632, the Swedish king, Gustavus Adolphus, fell here in a battle with Wallenstein, the general of the imperial army; the Swedes were victorious. On May 2, 1813, Napoleon defeated the Prussian and Russian armies.

Lüt'zow, von (LUDWIG ADOLF WILHELM), BARON, b. May 18, 1782, in the Prussian province of Brandenburg; entered the army in 1795; was a major in 1808, and received in 1813 a commission to form a free corps, which at one time consisted of 2000 infantry and four squadrons of cavalry. His corps never found an opportunity of doing anything striking; and if it took hold of the German imagination in a wonderful degree, this was due to Körner's songs (*Lutzow's wilde, verwegene Jagd*), to Turnvater Jahn's speeches, and to the poetical turn of mind characterizing its members. Lützow was several times wounded and taken prisoner. D. a major-general at Berlin Dec. 6, 1834.

Lu Verne, R. R. junction, cap. of Rock co., Minn. (see map of Minnesota, ref. 11–A, for location of county), on Rock River. Pop. in 1880, 679; in 1885, 1346.

Luxembourg', de (FRANÇOIS HENRI DE MONTMORENCY-BOUTEVILLE), DUKE, b. at Paris, France, Jan. 8, 1628, the posthumous son of François de Montmorency, Count de Bouteville, who was beheaded June 27, 1627; was educated by his aunt, the princess of Condé; entered early on a military career under the auspices of the great Condé, and distinguished himself so much in the battle of Lens (Aug. 20, 1648) that Anne of Austria made him a maréchal-de-camp. In the wars of the Fronde he sided with the aristocracy and fought against the court, but after the peace of the Pyrenées (Nov. 7, 1659), which ended these wars, he was pardoned, and through the mediation of the prince of Condé he married (Mar. 17, 1661) the heiress of the house of Luxembourg, whose name he assumed. In the wars against Spain and Holland he fought under Turenne; was made a lieutenant-general, and displayed great military talent, though also a terrible severity. He was one of the eight marshals created after the death of Turenne in 1675, and having received an independent command, captured Valenciennes and Cambrai, and defeated William of Orange at Mont Cassel Apr. 11, 1677, and at St. Denis, near Mons, Aug. 24, 1678. After the Peace of Nymwegen, Louvois, who was jealous of his talent, and still more of his influence, removed him from service, and entangled him in a horrible charge, accusing him of having sold himself to the devil and attempting to poison his wife. The case lasted fourteen months, during which time the marshal was treated with the utmost harshness, and although he was acquitted (May 14, 1680), yet he was banished from the court and from Paris. After nearly ten years of disgrace he was appointed commander-in-chief of the army of Flanders (Apr. 19, 1690), and made three brilliant campaigns, defeating the prince of Waldeck at Fleurus, July 1, 1690, and William III. at Steenkerke, Aug. 3, 1692, and at Neerwinden, July 29, 1693. The campaign of 1694 brought no great results, and on Jan. 4, 1695, he d. at Versailles. With him ceased the victories of Louis XIV.

Luxembourg Palace, in Paris, was built in 1615 for Marie de Médicis, but afterwards much enlarged and beautified. Gaston of Orleans, the duchess of Montpensier, and the count of Provence, afterwards Louis XVIII., lived here. During the Revolution it was for some time a prison.

The Directory made it the seat of the government. Under the Empire the senate held its meetings here; after the Restoration, the chamber of peers. One part of the palace is occupied by a collection of pictures of living artists, which ten years after the death of the artists are brought to the Louvre.

Lux'emburg, a territory situated between Rhenish Prussia, France, and Belgium, and consisting of an elevated tract on the slope of the Ardennes, with a rugged surface often covered with dense forests of oaks, and with a soil not very fertile. The region is rich, however, in minerals; coal, iron, copper, and lead are mined; marble, slate, and freestone are quarried. Tolerably good crops of corn, flax, hemp, hops, and wine are raised, and horses, cattle, and sheep of good breed are reared; cloth, earthenware, nails, and leather are manufactured, and much cheese, oak-bark, and timber exported. This territory formed originally a duchy which alternately belonged to Burgundy, Spain, Austria, France, and Holland. By the Congress of Vienna, in 1815, it was made a grand duchy, and, forming a part of the Germanic confederation, it was given to the king of the Netherlands as a compensation for Nassau. But when (in 1830) Belgium organized itself into an independent kingdom, a large part of the territory was transferred to this kingdom, of which it now forms a province. The Belgian province of Luxemburg contains the three districts of Arlon, Neufchâteau, and Marche, and comprises an area of 1705 square miles, with 209,118 inhabitants, most of whom speak French. The grand duchy of Luxemburg comprises an area of 998 square miles, with 209,570 inhabitants, most of whom speak German. It is not a province of Holland, but simply united to that kingdom by a personal union, the king of the Netherlands being also grand duke of Luxemburg. It is governed by a chamber of deputies consisting of 42 members elected directly by the districts for six years, and by a governor appointed by the king. For commercial purposes it is included in the German Zollverein. In military respects it was declared neutral territory by the Treaty of London, 1867. In 1882 the revenues amounted to £414,675, and the expenses to £389,446. There is a public debt of nearly £600,000.

Luxemburg, capital of the grand duchy of Luxemburg, on the Else or Alsette, was formerly the strongest fortress in Europe, next to Gibraltar, and garrisoned by Prussian troops. The main part of the city stands on a rocky table-land which rises abruptly 200 feet from the valley of the Alsette, while the modern suburbs, Pfaffenthal, Clausen, and Grund, are situated below, on the shore of the river. This location, so remarkable both for its natural beauty and for its military strength, was early used for fortifications—probably from the tenth century—and since the days of Vauban all the resources of modern engineering art have been employed to make it impregnable. But by the Treaty of London in 1867 it was declared neutral ground, the fortifications were demolished, and the space was laid out in streets and promenades. The city has large manufactures of wax, breweries, distilleries, tanneries, and an extensive trade in gold and silver wares, china, vinegar, and hats. Pop. 16,679.

Lux'or, a v. of Upper Egypt, on the right bank of the Nile, 1½ miles S. of Karnak, on the site of a part of ancient Thebes, is noted for its architectural remains. Its Arab name is El-Aksur ("The Castles") or "Abul Hajjaj," after its patron saint. As it is the only place beyond Osynt which affords suitable hotel accommodations for Europeans, it forms the centre for visitors to Thebes, and during winter is frequented by a great number of invalids.

Luynes, de (CHARLES D'ALBERT), DUKE, b. at Pont St. Esprit, department of Gard, France, Aug. 5, 1578, descended from a Florentine family, whose true name was ALBERTI, but which had bought the estate of Luynes in Touraine and assumed its name and title. Having been educated as a page at the court of Henry IV., he became the favorite of the dauphin, afterwards Louis XIII., and it was at his instigation that the young king gave orders for the imprisonment of Marshal d'Ancre and the queen Apr. 14, 1617. After this court revolution Luynes was made a duke and peer of France. He married the daughter of the duke of Montbazon, was made constable and chancellor, and exercised for a short time absolute control over the whole government. He was fortunate enough, however, to die Dec. 15, 1621, before the king became aware of his entire incapacity and mean avarice.—One of his descendants, HONORÉ THEODORIC PAUL JOSEPH D'ALBERT, duke de Luynes, b. at Paris Dec. 15, 1802, d. at Rome Dec. 14, 1867; became celebrated for the liberal and judicious support he gave to science and art, of which he was himself a successful cultivator. He wrote *Metaponte* (1836), *Description de quelques Vases peints* (1840), *Essai sur la Numismatique des Satrapies et de la Phénicie* (1846), *Voyage d'Exploration à la Mer Morte* (published after his death). In 1854 he superintended the publication of the catalogue of the National Library of Paris.

Lu'zenberg (CHARLES ALOYSIUS), M. D., b. in Verona, Italy, July 31, 1805; when only ten years old he entered college by a special act; went to Philadelphia in 1819; attended lectures in the Jefferson Medical College; removed to New Orleans in 1829; was attached to the Charity Hospital; then established one of his own, where he performed some difficult surgical operations; visited Europe in 1832–34; was made corresponding member of the Academy of Paris, and returned to Louisiana in 1834; founded the Society of Natural History in 1839, and the Louisiana Medico-Chirurgical Society in 1843, being the first president of both. D. in Cincinnati, O., July 15, 1848. PAUL F. EVE.

Luzerne, de la (Chevalier ANNE CÉSAR), LL.D., b. in Paris, France, in 1741; educated for the military service, and was aide-de-camp to his relative, the duke de Broglie, during the Seven Years' war, attaining the rank of major-general of cavalry (1762), with the coloneley of the grenadiers de France. He afterward abandoned the military career for diplomacy; was sent as minister to the court of Bavaria 1776, and to the U. S. as successor to Gerard after the recognition of American independence in 1778. He arrived at Philadelphia Sept. 21, 1779, where he resided four years, giving proofs of prudence and friendship for the struggling colonists which were highly appreciated, and gave him a considerable influence in the direction of affairs. In 1780 he contracted on his own responsibility a loan for the relief of the American army, then suffering the utmost destitution. In 1782 he obtained the postponement of the ratification by Congress of the American treaty of peace until that between England and France should be signed. On his return to France in 1783 he bore with him the most honorable testimonies of esteem from Congress and from individuals. Harvard College conferred upon him the degree of LL.D., and Pennsylvania gave his name to one of her counties. On the organization of the Federal government (1789) the secretary of state, by direction of Washington, addressed a letter to Chevalier Luzerne conveying the thanks of the nation for his services. He d. at London Sept. 14, 1791, being then French minister to the English court.—His elder brother, CÉSAR GUILLAUME, b. July 7, 1738; became bishop of Langres 1770, and cardinal 1817; was a distinguished theological writer, and defender of the liberties of the Gallican Church. D. June 21, 1821.

Luzon', or **Luçon,** the largest of the Philippine Islands, in the Malayan Archipelago, belonging to Spain, and situated between the Chinese Sea and the Pacific Ocean, between lat. 12° 30′ and 18° 40′ N., and between lon. 119° 45′ and 124° 10′ E. Area, 51,300 square miles. Like all the Philippine Islands, it is of volcanic origin, having several active volcanoes, among which is Mayon; earthquakes are frequent and destructive; the city of Manila was nearly destroyed by one in 1863. The ground is elevated and mountainous, several ranges of a height from 4000 to 7000 feet traversing the island from N. to S. But the soil is of exceeding fertility, and the climate being hot and moist, the luxuriance of the vegetation is almost unequalled. Immense forests of ebony, cedar, gum trees, and iron-wood, interspersed with orange, citron, cocoa, bread-fruit, and tamarind trees, cover the mountains to their very tops. Myriads of climbing plants and parasites wind from tree to tree, cover every twig, and form a forest growing on the forest. Rice, wheat, maize, sugar, cotton, indigo, tobacco, coffee, ginger, pepper, and vanilla are raised in continuous crops without difficulty and in great abundance. Luzon is entirely free from beasts of prey; oxen and buffaloes are employed in agriculture; sheep, goats, and swine are reared. Pheasants, ducks, and brilliantly colored birds swarm all over the island, and fish are abundant both in the rivers and the surrounding sea. Of minerals, gold, iron, copper, coal, and marble are found. Mother-of-pearl, amber, coral, and tortoise-shell are exported, together with rice, sugar, hemp, and tobacco; which last article is a government monopoly and yields a clear annual profit of nearly $5,000,000. The population of Luzon, which numbers 2,500,000, consists partly of negroes, who live as nomades in the interior in a savage state. They are idolaters, and are believed to be the original inhabitants of the island, driven back by the Tagals and Bisayers, two Malayan races which form the bulk of the population. These are Roman Catholics, industrious, hospitable, and open to progress and civilization, and besides being good agriculturists, possess some manufactures; they build ships with which they sail to Spain. Many Chinese have settled here, but comparatively few Spaniards. The trade, which is very considerable and increasing every year, is mostly in the hands of English and American merchants established at Manila, the principal town of the island. Luzon was discovered by Magallanes in 1521; Manila was built in 1581. (See PHILIPPINES.)

Luzu'la [It. *luciola*, a "glow-worm"], a perennial genus of pseudo-glumaceous plants, commonly called wood-rushes, belonging to the family JUNCACEÆ (which see), and differing from the *Juncus*, or rush proper, in the form of the leaves, which are flat, soft, usually hairy and grass-like, and in the three-seeded capsule. There are numerous species found in the woods of Europe and five in the U. S.: *L. pilosa* and *L. parviflora* or *melanocarpa*, which have the flowers loosely long-peduncled, umbelled, or corymbed; *L. campestris*, *L. arcuata*, and *L. spicata*, having the flowers crowded in spikes or close clusters.

Luzza'ra, town of Italy, in the province of Reggio nell' Emilia, on the right bank of the Po, near Guastalla. Pop. in 1874, 7609.

Luzzat'to (MOSE CHAYIM), called BEN-JACOB, b. at Padua, Italy, in 1707, of Jewish parentage; became a celebrated mystic writer, compiled a second book of *Zohar*, and announced himself as the Jewish Messiah. Excommunicated and forced to leave Italy, he settled at Amsterdam; went in 1744 to Palestine, and d. at Safed May, 1747. His writings are very numerous, and treat of many subjects, poetical, philosophical, moral, and devotional; twenty-eight of his treatises have been published, but twenty-four remain unedited.

Luzzatto (SAMUEL DAVID), b. at Trieste, Austria, in 1800, of Jewish descent; received a brilliant education, and became the most popular historian of his people, bringing to light the forgotten episodes of Jewish history and sufferings in Spain. He was liberal in his views of the Old Testament exegesis, of which science he was professor in the rabbinical school at Padua from 1829 to his death, Sept. 29, 1865. He wrote Hebrew, German, French, and Italian with great elegance, and is justly regarded as one of the chief restorers of Hebrew literature. He wrote a *Hebrew Grammar*, *French Notes on Isaiah* (1834), *Hebrew Notes on the Pentateuch* (1850), and Italian translations of Job (1844) and of Isaiah (1850), with a Hebrew commentary, besides *Dialogues on the Cabala, the Zohar, and the Antiquity of the Vowel-Points and Accents of the Bible* (1852), and a work on the Aramaic version of Onkelos (1830). (See Grätz, *History of the Jews*, vol. xi.)

Lycan'thropy [Gr. λύκος, "wolf," and ἄνθρωπος, "man"], a kind of madness in which the patient fancies that he is a wolf. The old and very widespread belief in the existence of man-wolves possessed of the devil has in many instances led deluded persons to fancy themselves thus possessed; and in not a few instances this fancy has become epidemic, and hundreds of persons have, in their delusion, become cannibals, going upon all fours, living in the forests, and howling like wolves. In 1600 there were hundreds of people executed in the Jura for lycanthropy.

Lyca'on, in Greek mythology, a king of Arcadia. According to one version of the myth, he and his sons, fifty in number, were changed into wolves by Zeus as a punishment for their insolence and impiety. When Zeus visited them they set before him a dish in which they had mixed the entrails of a boy they had murdered, but the god knew it, and avenged himself on them. There are, however, other and very different versions of the myth.

Lycao'nia, a small territory of Asia Minor, situated between Galatia, Cappadocia, Cilicia, and Phrygia. Its principal town was Iconium, the present Konieh. After being conquered by the Romans it was annexed to the province of Cappadocia. Lycaonia was visited by Paul and Barnabas in their first missionary journey. They were at first regarded as divinities, but afterwards Paul was stoned (Acts xiv.). The inhabitants then spoke a peculiar language of unknown affinities.

Lyce'um [Gr. τὸ Λύκειον, named from the neighboring temple of Apollo Lyceus], the largest of the three great gymnasia of ancient Athens. None but well-born youth, whose parentage on both sides was Athenian, were allowed to be trained here. In 335 B. C. Aristotle was allowed to make use of the Lyceum as a place for teaching philosophy. His instructions were given while walking in the groves which surrounded the Lyceum; hence his philosophy was called *Peripatetic* ("walking about"). The Lyceum stood on the E. side of the city, outside the gates, just S. of the Cynosarges, and near the fountain of Panops. It was surrounded by a grove of lofty plane trees.—In France the public schools for secondary instruction have the name of lyceum (*lycée*).

Lych'nis [Gr. λύχνος, a "light" or "lamp"], a genus of annual or perennial plants found in Europe and the U. S., the commonest species of which is the corncockle (*L. githago*). It belongs to the pink family (see CARYOPHYLLACEÆ), and received its name from a scarlet or flame-colored Grecian species. Several species are cultivated as garden-flowers in the U. S., the best known being the scarlet lychnis (*L. Chalcedonica*), sometimes called the Maltese cross, a native of Northern Asia, an elegant garden-flower, the tints of which vary from scarlet to rose-color and white. The common mullein pink or rose-campion (*L. coronaria*) is of this genus. The *L. Sieboldii*, a Japanese flower lately domesticated in the U. S., is thought to be a hybrid. The genus differs from *Silene*, or catchfly, only in having five (rarely four) styles, and a pod opening by as many or twice as many teeth. The corncockle is but too common in wheat-fields, the black seeds being injurious to the quality of the flour.

Lyc'ia [Gr. Λυκία], an ancient region of Asia Minor of small extent, lying on the Mediterranean, between Mounts Taurus on the N., Climax on the E., and Dædala on the W., the adjoining regions across the mountains being Phrygia, Pamphylia, Pisidia, and Caria, the chief rivers, Xanthus, Limyrus, and Glaucus, and the most noted cities, Xanthus, Patara, Pinara, Olympus, Myra, Tlos, and Telmissus. The most ancient name of the country, according to Herodotus, was Milyas, the inhabitants being of two races, Solymi and Termilæ or Tremilæ. Extended accounts of Lycia have been given by the Greek poets, historians, and geographers. It was a favorite region with Homer, who assigns to the Lycian heroes, Glaucus and Sarpedon, the place of honor among the Trojan allies. Apollo was often called Lycian Apollo from his temple at Patara, second in renown only to that at Delphi, and regarded by some as the place of his birth. The Solymi, doubtless the earliest inhabitants and of Semitic stock, were conquered by the Tremilæ, who are said to have come from Crete and took the name of Lycians. They appear as *Leka*, a seafaring people, in the Egyptian inscriptions of the fourteenth century B. C. It is to be noted that the only mention of writing found in the Homeric poems is in connection with the Lycian legend of Bellerophon. The Lycians were conquered by Harpagus, the general of Cyrus, notwithstanding the heroic and memorable resistance of the inhabitants of Xanthus, who burned themselves with their wives, slaves, and treasures in their citadel. They took part in the revolt of the Asiatic Greeks, were subdued and made a satrapy of Persia, and furnished fifty ships to Xerxes for his invasion of Greece. Alexander the Great subdued the country almost at the outset of his Asiatic career; it was afterwards attached to the Syrian empire, and was given to the Rhodians by the conquering Romans. Soon afterward it became independent as a republican confederation of cities, but ultimately became a Roman province, with Myra as the capital. In the great civil war on the death of Cæsar, Lycia espoused the cause of Octavius and Antony, and was conquered by Brutus after a desperate resistance, in which the city of Xanthus repeated its act of self-immolation by fire. In modern times Lycia had fallen into complete oblivion, no traveller had explored it, and the sites of its celebrated cities were unknown, when in 1838 and 1840 it was visited by Mr. (afterwards Sir Charles) Fellows, who found there vast ruins of temples, fortresses, and tombs, and inscriptions in an unknown character. An expedition under his leadership was sent in a British vessel of war 1846, which brought to London the remarkable sculptures now occupying the "Lycian room" of the British Museum. The Lycian language recovered from the inscriptions by Grotefend and Daniel Sharpe, and more recently by Prof. Moritz Schmidt of Jena, is found to belong to the Zendic or Old Bactrian subdivision of the Iranian family; and the date of the chief monuments being ascertained to range only from 530 to 335 B. C.—*i. e.* from the period of the Persian conquest—it is therefore inferred that the language of the inscriptions is not that of the earlier Lycians, but that of colonists introduced from Persia. The numerous coins of Lycia confirm this view. The Lycian alphabet consists of twenty-five single and several double letters. A few of the characters are peculiar: thirteen are identical with the Cypriote in form, and consequently related to the Phœnician, while three were borrowed from the Greek. The inscriptions are chiefly from tombs cut in the rock, the Lycians having been remarkable for the honors shown to the dead, as well as for the cyclopean character of their architecture, which in its later period showed traces of Grecian influence. (See Sir Charles Fellows, *Account of Discoveries in Lycia* (1841) and *Coins of Ancient Lycia* (1855), and Schmidt, *The Lycian Inscriptions, with a Critical Commentary and an Essay on the Alphabet and Language of the Lycians* (Jena, 1868).) PORTER C. BLISS.

Lycodidæ. See APPENDIX.

Lyc'ophron, an Alexandrian grammarian and poet, b. at Chalcis in Eubœa, lived at the court of Ptolemy Philadelphus, who entrusted him with the arrangement of the works of the comic poets contained in the Alexandrian library. He wrote an extensive work on comedy, but this, as well as his tragedies, which were very numerous, has been lost. Only his *Cassandra* or *Alexandra*, a monologue of 1474 iambic verses, is still extant, edited by Bachmann (Leipsic, 1828), translated into English by Lord Royston. It has the form of a prophecy uttered by Cassandra relating to the later fortunes of Troy, the Trojan and the Greek heroes, and winding up with a reference to Alexander the Great, who should unite Asia and Europe in one universal empire. As behooves prophecy, the style is overwrought and the expressions are almost enigmatical. Even in antiquity the poem was considered very obscure. It swarms with obsolete words and long-winded compounds, and seems to have been written for the purpose of displaying the author's mythological learning and his skill in applying it. Nevertheless, during the Byzantine period it was much admired, and Tzetzes has preserved a collection of scholia to it. A reference to the power and policy of the Roman people—which, of course, could not have been written 250 B. C.—has led some philologists to consider the whole work a later fabrication; but the reference is probably an interpolation, which is also the opinion of most commentators.

Lycopo'dium [Gr. λύκος, a " wolf," and πούς, "foot"], a genus of CLUB-MOSSES (which see). It is the typical genus of the order Lycopodiaceæ. The powder called lycopodium is composed of the sporules of *Lycopodium clavatum* (which is common in both the Old and the New World) and of other species. It is extremely inflammable, is used in fireworks for making a white flame, and in theatres for artificial lightning. In pharmacy it is used as a pill-powder, and in the nursery as a dressing powder for infants. The species are evergreen, and two or three are extensively sold for Christmas decoration.

Lycur'gus, the Spartan legislator, lived, according to the most common tradition, in the eighth century B. C., and was a son of King Eunomos; ruled for some time the country during the minority of his nephew, Charilaos, but was afterwards compelled to emigrate; visited Asia Minor, where he became acquainted with the Homeric songs; Crete, where he studied the laws of Minos; Egypt and other countries; and became on his return the founder of those institutions by which was developed in Sparta one of the most striking types of national character which history contains. All details of his life are very uncertain, however, and some modern scholars even consider him a mythical person: but the Spartans themselves built a temple to his honor, and told that he brought his laws from Crete, and introduced them with the sanction of the Delphic oracle. The most prominent feature of Spartan society was the division into two classes or castes—the slaves, helots, who performed all the labor and had absolutely no rights; and the citizens, Spartans, who were completely exempted from labor, and owned and ruled the land. The most prominent feature of this privileged class was its military discipline. The individual was absolutely subordinate to the state, and lived only for the state. The Spartan had no talent, no passion, no plan of his own; he was merely a tool. Only strong and well-formed children were allowed to live; the weak or deformed were exposed to die on Mount Taygetus. At the age of seven years the boy was taken from his mother and educated by the state, which subjected him to the severest discipline. When he was thirty years old he was allowed to marry, but the state chose his wife, and, although married, he continued to live in garrison till his sixtieth year. By the establishment of this social order (of which more detailed information will be found in the article on the ancient history of GREECE) Lycurgus succeeded in transforming the Spartans from one of the rudest and wildest to the most quiet and dignified of all the Greek peoples, and was worshipped by them as a god.

Lycurgus, an Attic orator, b. at Athens about 396 B. C.; belonged to Demosthenes' party; held several responsible positions in the city, and enjoyed the confidence of his countrymen in a very high degree. When Alexander demanded that the Athenians should deliver him up on account of his opposition to the Macedonian influence, they boldly refused. D. at Athens 323 B. C. Of his orations, fifteen were still extant at the time of Plutarch, but only one has come down to us—that against Leocrates, delivered in 330 B. C., edited by Maetzner (Berlin, 1836).

Lyd'da [Gr. Λύδδα], an ancient town of Palestine, within the tribe of Ephraim, on the road from Jerusalem to Joppa, 9 miles E. of the latter. In the Old Testament it bears the name of Lod, as also in the Apocrypha. It was the scene of Peter's miracle of healing Eneas (Acts ix. 32, 35); was destroyed by Cestius Gallus in his march against Jerusalem, rebuilt as capital of one of the nine toparchies of Judæa, and became the seat of a celebrated Jewish school of the law. Later it received the name of Diospolis, was one of the principal places of Palestine for several centuries, was the seat of a bishopric, and the birthplace of the celebrated martyr St. George, the patron of England. It figured largely during the Crusades, and is still an extensive town under the name of *Lud.*

Lyd'gate (JOHN), b. at Lydgate, Suffolk, England, about 1375; studied at Oxford; travelled in France and Italy, and became the head of a school at Bury St. Edmund's. He wrote several poetical works—*The Fall of Princes*, *The Storie of Thebes*, and *The Historie, Siege, and Destruction of Troye*—which are chiefly valuable as monuments of the English language in that obscure period. D. at Bury St. Edmund's about 1461.

Lyd'ia, country of Asia Minor, situated between Ionia, Caria, Phrygia, and Mysia. It was very famous for its wealth. Pactolus ran through it, and Crœsus was one of its kings. The inhabitants were noted for the corruption of their morals. The capital was Sardis. The history of the country during the dynasties of the Atyadæ, Heraclidæ, and Mermnadæ is merely fabulous, with very few glimpses of actual truth. On the defeat of Crœsus by Cyrus the country became a dependency of Persia.

Lyd'ian [from *Lydia*], in music, the designation of one of the ancient ecclesiastical modes. Its scale is that of F, and it differs from the modern scale on that letter by having B *natural* instead of B♭.

Lydian Stone, a silicious slate or flinty jasper of a velvet-black color, used as a touchstone for testing the quality of gold and silver. (See JASPER.)

Ly'ell (Sir CHARLES), BART., D. C. L., F. R. S., F. G. S., b. at Kinnordy, Forfarshire, Scotland, Nov. 14, 1797; was educated at Exeter College, Oxford, where he graduated in 1819; studied law, and was called to the bar, but soon devoted himself to scientific researches, especially in geology, in which branch he had become interested through the university lectures of the celebrated Dr. Buckland. His earliest labors consisted in an extensive personal examination of the deposits of Forfarshire, Dorsetshire, and Hampshire, concerning which he published in the *Transactions* of the Geological Society and in Brewster's *Journal of Science* (1826–27) several papers, which displayed great powers of observation, conjoined with remarkable acuteness in detecting the real significance of scientific data—qualities which were exemplified in a still higher degree in his great work, *Principles of Geology* (3 vols., 1830–33), which immediately became the standard authority on the subject. It received large additions in successive editions, which were rapidly called for. In 1838 he published a work embracing the principles set forth in this, which under the titles *Elements of Geology* and *Manual of Elementary Geology* passed through many editions, until in 1870 it was definitely recast into the *Student's Manual of Geology*. In 1832 he was appointed professor of geology at King's College, London; married in the same year the eldest daughter of another eminent geologist, Leonard Horner; became president of the Geological Society in 1836, and again in 1850; delivered a course of geological lectures at Boston, Mass., in 1841, after which he travelled extensively in Canada, Nova Scotia, and the U. S. as far S. as Kentucky, and published his *Travels in North America* (1845), which, though popularly written, contained a better geological map of the U. S. than had previously appeared; made another tour in the U. S. (Sept., 1845–June, 1846), giving especial attention to the Southern States and the Mississippi River, and published *A Second Visit to the United States* (1849), treating at some length of American social life and political aspects. He was knighted in 1848, and created a baronet Aug. 22, 1864. On the appearance of Darwin's celebrated *Origin of Species*, Sir Charles made a careful re-examination of the geological evidences bearing upon the subject thus brought into prominence, and gave his support to the "Darwinian theory" in a learned work, *Geological Evidences of the Antiquity of Man* (1863), revising his earlier books in conformity with these views. D. in London Feb. 22, 1875.

All the writings of Sir Charles Lyell give evidence of fine literary as well as scientific ability, are models of clearness and accuracy, and may be read with interest by the public in general. His power of grasping some single, though perhaps very complicated, natural phenomenon, analyzing and explaining it until it stood clear and translucent before the reader, self-revealing like a living organism, was something marvellous. Notice, for instance, his *On the Cretaceous and Tertiary Strata of Seeland and Möen*, after his visit to Denmark; his *On the Proofs of the Gradual Rising of the Land in Certain Parts of Sweden*, after his visit to that country; or, from his visits to America, his estimation of the rate of recession of the Falls of Niagara and of the annual average accumulation of alluvial matter in the delta of the Mississippi, his illustration of the formation of beds of coal, derived from his study of the Great Dismal Swamp of Virginia, etc.; or, finally, his observations on the structure of Etna, completely refuting the theory of Leopold von Buch and Elie de Beaumont concerning craters of elevation. Nevertheless, his greatest merit is that he gave to the whole study of geology another course, another principle, doing away with the catastrophic geology which flourished luxuriantly during the period of speculation which characterized the contest between Neptunism and Plutonism, and substituting the geology of minute causes effecting even the most tremendous changes by working through epochs of huge duration. This truth, which is in such perfect harmony with the evolutionist view of the universe, he illustrated with such a wealth of facts that, in spite of the opposition with which it was at first met, it soon became the leading idea of all scientific geology.

Lygo'dium [Gr. λυγώδης, "flexible"], a genus of climbing ferns found in New Zealand, Japan, and America. One species only, *L. palmatum*, is found in the U. S., from Massachusetts to the Gulf States. It is much prized for purposes of decoration. One or two species are cultivated in greenhouses.

Ly'kens, on R. R., Dauphin co., Pa. (see map of Pennsylvania, ref. 5–G, for location of county), 44 miles N. E. of Harrisburg, has a public library, 2 foundries, a machine-shop, a steam saw and planing mill, etc. Principal business, shipping Lykens Valley coal. Pop. in 1880, 2154.

Lyl'y, or **Lilly** (John), b. in the Weald of Kent, England, in 1553 or 1554; graduated at Magdalen College, Oxford, in 1573. His *Euphues the Anatomy of Wit* (1579) and *Euphues and his England* (1580) attained great popularity in his own times. They are novels of that half-sentimental, half-didactic description which the time adored. It was, however, not so much their contents as their style which made them popular. This "new style," whose characteristics depend more upon syntax and construction than upon phraseology and consist in "a peculiar combination of antithesis with alliteration, assonance, rhyme, and play upon words, a love for the conformity and correspondence of parallel sentences, and a tendency to accumulate rhetorical figures—such as climax, the rhetorical question, objections and refutations, the repetition of the same thought in other forms," etc. (see Landmann, *Der Euphuismus sein Wesen, seine Quelle, seine Geschichte*, etc., Giessen, 1881)—became extremely fashionable. The books ran through thirteen editions before 1636, but then they fell into utter oblivion. In 1868, however, they were again edited among the Arber reprints. Prof. Rushton of Cork has discovered that *Euphues and his Ephœbus*, the most valued portion of the *Euphues*, is a rather close paraphrase of Plutarch *On Education*. Lyly also wrote nine court-plays, which contain fine passages and songs. He was perhaps the author of *Pap with an Hatchette*, a once famous pamphlet. His life was mostly spent at Elizabeth's court. Burghley seems to have been his special patron; he obtained, however, no substantial patronage either from him or from the queen. D. in Nov., 1606.

Lyman (Chester Smith), b. at Manchester, Conn., Jan. 13, 1814; studied astronomy and the kindred sciences in boyhood without a teacher, constructing astronomical and optical apparatus with his own hands, and computed complete almanacs for 1830 and 1831, and tables of eclipses for fifteen years ahead. He graduated at Yale College 1837, taught school at Ellington two years, studied theology at Union Seminary, N. Y., and at New Haven 1840–42; was pastor of a Congregational church at New Britain, Conn., 1843–45; went to the Sandwich Islands on account of failing health in 1845; taught the Royal School, having as pupils four of the recent occupants of the Hawaiian throne; became a surveyor in California 1847; was one of the earliest to send to the Eastern States authentic accounts of the discovery of gold; settled at New Haven 1850, where he engaged in scientific pursuits, and was one of the revisers of Webster's *Dictionary* for the edition of 1864, taking charge of the scientific terms, and became in 1859 professor of industrial mechanics and physics in Yale College, and took an active part in organizing the Sheffield Scientific School, in which he also taught astronomy, both theoretical and practical. Since 1870 his professorship has been that of astronomy and physics. He has published articles in the *Am. Jour. of Science*, *The New Englander*, and elsewhere, and made various useful inventions; *e. g.* his wave apparatus, his pendulum apparatus for acoustic curves, etc. He is an honorary member of the British Association for the Advancement of Science, and fills positions in several scientific bodies in his own country.

Lyman (Henry), b. in Northampton, Mass., in 1810; graduated at Amherst College 1829, at Andover Theological Seminary 1832, and was one of the first missionaries sent to the East Indian Archipelago by the American Board of Commissioners for Foreign Missions (Congregationalist). With his companion, Rev. Samuel Munson, he labored for two years among the savage Battahs of Sumatra, by whom they were both murdered June 28, 1834. He had published a volume entitled *The Condition of Females in Pagan Countries*.

Lyman (Joseph Bardwell). See Appendix.

Lyman (Laura Elizabeth Baker). See Appendix.

Lyman (Gen. Phineas), b. at Durham, Conn., about 1716; graduated at Yale College in 1738; was tutor there till 1741; became a lawyer at Suffield; was appointed major-general and commander-in-chief of the Connecticut forces in the French war; built Fort Lyman (since called Fort Edward), N. Y.; succeeded Sir William Johnson in command at the battle of Lake George; was engaged in the attack upon Ticonderoga, the capture of Crown Point, the surrender of Montreal, and the expedition against Havana (1762); spent several years in England as agent to solicit lands for a colony in Florida, and d. in West Florida (now Mississippi), near Natchez, in 1775.

Lyman (Gen. Theodore), b. in Boston, Mass., Feb. 19, 1792; graduated at Harvard College 1810; inherited an ample fortune; visited Europe 1814; wrote a small volume, *Three Weeks in Paris* (1814); studied law, and made a second European tour, on returning from which he published *The Political State of Italy* (1820); delivered the Fourth of July oration at Boston 1820; wrote an *Account of the Hartford Convention* (1823), in defence of that celebrated political demonstration, and published a useful work, *The Diplomacy of the U. S. with Foreign Nations* (1826). He took an active part in politics, served in both branches of the legislature, became brigadier-general of militia, and was mayor of Boston 1832–35. In the latter year he was prominent in disapproval of the early popular meetings of the abolitionists, and incurred obloquy on that account. D. at Boston July 17, 1849. He was a liberal benefactor to the State Horticultural Society and the Farm School, and was the founder of the State Reform School at Westborough, to which he gave $82,000.

Lyman (Theodore). See Appendix.

Lyman (Theodore Benedict), D. D., b. near Boston, Mass., Nov. 27, 1815; graduated at Hamilton College, Clinton, N. Y., in 1837, and at the General Theological Seminary in the city of New York in 1840; ordained deacon in Christ church, Baltimore, in September of the same year, and early the next month became rector of St. John's church, Hagerstown, Md., where he remained until he entered upon the rectorship of Trinity church, Pittsburg, Pa., in Apr., 1850; continued in charge of that parish until May, 1860, when he went to Europe, and remained nearly ten years. During that time he had charge for a short period of an American church in Florence, and later was for several years rector of the American Episcopal church in Rome. Upon his return to America in 1869, he became rector of Trinity church, San Francisco, and was in charge of that church when elected assistant bishop of North Carolina in May, 1873. He was consecrated to that office in Christ church, Raleigh, Dec. 11, in the same year.

Lymington (in Doomsday Book called *Lentune*, which was afterward changed to *Limentum*), a seaport-town of Hampshire, England, stands on the Lym, near its confluence with the Solent, just opposite the Isle of Wight. Its manufactures of salt and Epsom salt were once important, but have for some years declined. It is much frequented, however, as a summer resort and for its sea-bathing, and from its yards some of the best racing-yachts have been launched. The parish church dates from the time of Henry IV. Pop. in 1881, 5462.

Lymphatics. See Histology.

Lyn, post-v. of Leeds co., Ont., Canada, on the Grand Trunk Railway, has good water-power and manufactures of cloth, leather, lasts, and rubber goods. Pop. about 750.

Lynch (Capt. Henry Blosse), C. B., b. in Castlecarra, Mayo, Ireland, about 1798; entered the British navy in 1823; was employed in surveys of the Persian Gulf; learned Arabic and Persian; became in 1825 lieutenant and interpreter to the squadron; was employed in negotiations with the independent Arab chieftains; was shipwrecked on the Nubian coast of the Red Sea in 1832, and crossed the Desert to the Nile; was appointed in 1834 second in command in Col. Chesney's Euphrates expedition; commanded a squadron of the Indian navy in 1842 off the coast of Scinde, and in 1851 on the Irrawaddy; settled at Paris in 1854, and d. there Apr. 14, 1873. He was a frequent contributor to the *Transactions* of the Royal Geographical Society.

Lynch (Patrick Nilson), D. D., b. at Cheraw, S. C., Mar. 10, 1817; studied theology in the Catholic seminary at Charleston and in the College of the Propaganda at Rome; was ordained priest in 1840; became rector of the seminary at Charleston, vicar-general of the diocese in 1850, and bishop of Charleston in 1858. He built several churches, including the fine cathedral of St. Michael; founded an Ursuline convent, an orphan asylum, and many schools; and some of these establishments having been destroyed during the war, he chiefly devoted himself to their restoration, for which purpose he made extensive tours through the Northern States, preaching and collecting funds. He wrote some theological and scientific essays, and participated in the Vatican Council of 1869–70, supporting the dogma of infallibility. D. Feb. 26, 1882.

Lynch (Thomas, Jr.), one of the signers of the Declaration of Independence, b. in Prince George parish, S. C., Aug. 5, 1749; was educated at Eton and Cambridge, England, and studied law in the Temple, London. In 1772 he returned to South Carolina; became in 1775 a captain in the provincial troops: was sent in 1776 to Congress to succeed his father, who died in that year, but his own health failing, he soon left Congress. In 1779 he sailed for the West Indies on account of his health, but the ship was never again heard from.

Lynch (Com. William F.), b. in Virginia in 1801; entered the naval service in 1819; became a lieutenant in 1828, and conducted in 1848 an official survey of the Jordan and Dead Sea, the results of which were given in his *Narrative* (1849). He published in 1851 *Naval Life, or Observations Afloat and on Shore;* became commander in 1849, captain in 1856, resigned in 1861; was commodore in the Confederate service, and d. at Baltimore Oct. 17, 1865.

Lynchburg, cap. of Moore co., Tenn. (see map of Tennessee, ref. 7–F, for location of county). Pop. in 1880, 345.

Lynchburg, city and R. R. centre, Campbell co., Va. (see map of Virginia, ref. 7–F, for location of county), on the S. bank of the James River. The Richmond and Alleghany R. R. connects it with Richmond, distant 147 miles E. by N. Lynchburg is situated on the sides of a hill rising abruptly from the river, and presents a picturesque appearance with its numerous terraces and ornamental villa-residences, which command a splendid view of the Blue Ridge and the celebrated Peaks of Otter, 20 miles distant. It is a central point for an extensive shipping and distributing business, has about 40 manufactories of tobacco, several iron-foundries, railway machine-shops, cotton and flouring mills, and possesses a magnificent water-power, as yet but slightly developed, while in the immediate vicinity vast deposits of coal and iron are found. The reservoir constructed in 1828 is situated 253 feet above the river, from which the water is supplied by a double force-pump worked by a breast-wheel. There are a number of large public-school buildings, several private schools, a hospital, orphan asylum, etc. Pop. in 1870, 6825; in 1880, 15,959.

Lynch Law, the practice of trying and punishing men for alleged crimes and offences with which they are charged by unauthorized persons, who unjustifiably attempt to administer what they may deem to be justice, without regard to the forms or sanctions of law, and in violation of the right of the proper legal authorities to bring alleged offenders to trial. In times of especial turbulence and disorder, when the duly constituted legal authorities seem powerless or unwilling to enforce the laws, or when the necessity of making a terrible example of offenders in order that the criminal classes may be intimidated is particularly felt, it has sometimes happened in the history of this country, especially in the Western and Southern States, that members of the community have taken the execution of the law into their own hands, and by the organization of so-called "vigilance committees" have endeavored to suppress crime by the vigorous and effective though illegal methods of lynch law. So in communities largely made up of desperadoes, or in those where the orderly methods of civil administration have not become fully established, this form of mob-law, as it has been aptly termed, is wont to be frequently resorted to. Many instances of this kind have occurred in the mining districts of the Western States. Sometimes the methods of lynch law are adopted to mark the popular abhorrence of some particularly atrocious crime, and to ensure the rapidity, certainty, and severity of punishment which are thought necessary, but which may not result from the regular administration of the law if it be suffered to take its due course. While lynch law has been in some instances productive of much advantage in stamping out crime, yet it is ordinarily an unmixed evil. The legal safeguards which serve to protect an innocent man from unjust conviction are almost invariably disregarded, and the excitement and passion under which the self-constituted judges usually labor render conviction almost a certainty in all cases, whether the person accused be innocent or guilty. Moreover, the natural effect is to produce social disorganization by weakening the power and influence of the proper legal tribunals, and by accustoming men's minds to the usurpation of judicial power and the disregard of legal methods of procedure.

The origin of this phrase has been variously accounted for. It is usually derived from a Virginian farmer named Lynch. It is said that in the early history of this State it became the practice in its western districts, by reason of their distance from the courts of law, to refer legal controversies to the leading men of the neighborhood, to try criminal offenders before them, etc., and that this man exercised these unauthorized judicial functions so commonly that he became well known as "Judge Lynch." His name was readily transferred to the illegal method of administering justice which he adopted. Another account of the origin of the phrase is that it is derived from the name of James Fitzstephens Lynch, the mayor of Galway, Ireland, in 1493, who is said to have hanged his son with his own hands out of a window for defrauding a Spaniard and afterwards murdering him in order to conceal the defalcation. Another derivation is from the name of one Lynch, said to have been sent to America in 1687–88 to suppress piracy, and supposed to have received authority to punish summarily such pirates as might be captured, without a formal legal trial. Another explanation is that it is derived from the name of Mr. Lynch, the founder of Lynchburg, Va. The real origin of the term "lynch law" must be considered doubtful. (See Wheeler's *Dictionary of the Noted Names of Fiction,* title "Judge Lynch.")

George Chase. Revised by T. W. Dwight.

Lynde (William Pitt), b. at Sherburne, N. Y., Dec. 16, 1817; graduated at Yale College 1838; was admitted to the bar in New York City 1841, and removed the same year to Milwaukee, Wis., where he has since resided; was appointed attorney-general of Wisconsin 1844, U. S. district attorney 1845; was a member of Congress 1847–49, mayor of Milwaukee 1860, member of the State legislature 1866, of the State senate 1868–69, and was again chosen to Congress as a Democrat at the election of 1874.

Lyn′don, Whiteside co., Ill. (see map of Illinois, ref. 2–D, for location of county), on R. R. and Rock River, has excellent public schools, several large mills, and good water-power. Pop of v. in 1880, 557.

Lyndon, cap. of Osage co., Kan. (see map of Kansas, ref. 6–I, for location of county). Pop. not in census.

Lyndon, post-v. and tp. of Caledonia co., Vt. (see map of Vermont, ref. 4–D, for location of county), on the Connecticut and Passumpsic R. R., 40 miles S. of the Canada line, has a Baptist college, a large academy and graded school, carriage-factories, the offices and repair-shops of the Connecticut and Passumpsic R. R., several large mills, etc. Pop. of tp. in 1870, 2179; in 1880, 2434, including 349 in village.

Lynd′hurst (John Singleton Copley), Baron, b. at Boston, Mass., May 21, 1772, son of the artist J. S. Copley; was carried to England in 1774; graduated with high honors at Trinity College, Cambridge, in 1794, and became a fellow of Trinity; visited the U. S. in company with Volney; was called to the bar at Lincoln's Inn in 1804; became a sergeant-at-law in 1813; chief-justice of Chester 1817; entered Parliament as a Tory in 1818; was knighted and made solicitor-general 1819; was counsel of George IV. in 1820 in the trial of Queen Caroline; became attorney-general in 1823; sat in Parliament for Cambridge University 1826, and was made master of the rolls; opposed Catholic emancipation; was raised to the peerage as Baron Lyndhurst and appointed lord chancellor in 1827, holding that office until 1830, a second time from 1834–35, and again from 1841–46; was chief baron of the exchequer 1830; lord high steward of Cambridge University 1840, and d. in London Oct. 12, 1863. He originally entertained very advanced views. While still a simple lawyer, he was a republican and a Jacobin. But when, in 1817, he was taken up by the leaders of the Tories, on account of his brilliant defence of Dr. Watson, who was on trial for his participation in the Spa Fields riot, and when he shortly after entered Parliament by their support, he became a steady, and often a violent, opponent to all liberal measures. He was possessed of great eloquence, and continued to astonish the House by his speeches up to his ninetieth year. His denunciation of the aggressive policy of the emperor Nicholas in 1853 created a European sensation, and in 1859 he attacked the policy of Napoleon III. with equal effect.

Lyndsay (Sir David), b. about 1490, probably in the old mansion-house of the Lyndsays, at Garleton, near

Haddington, in East Lothian, Scotland, entered the University of St. Andrews in 1505; travelled in France and Italy 1509–11, and received in the latter year some position at the court of James IV. When James V. was born, in 1512, he was appointed his personal attendant, and he remained about the young king until the Douglases came into power, in 1524, when he was banished from the court. He was recalled, however, in 1529, and afterward often served in important diplomatic missions to the Netherlands, to France, to Denmark, etc. He died early in 1555. It is, however, not as a courtier and a statesman, but as a poet, that he acquired his great fame. Indeed, he was for two centuries and a half the most popular poet Scotland produced. His principal works are *The Dreme*, a half-didactic poem, and *The Satire of the Three Estates.* The poetical merits of these productions are not so very great, but a vigorous spirit of reform, especially on the domain of the Church, is alive in them and gives them a considerable interest. The best editions of his works are those by George Chalmers (London, 1806, 3 vols.) and David Laing (Edinburgh, 1879, 3 vols.).

Lynn, a city of Essex co., Mass. (see map of Massachusetts, ref. 1–I, for location of county), is a R. R. centre and port for vessels of light draught, on N. shore of Massachusetts Bay, about 9 miles N. E. of Boston. It was settled by the English in 1629, one year before Boston. Lynn's present territory—four towns (Lynnfield, Saugus, Swampscott, and Nahant) having been set off since 1814—is an area of about 10 square miles, its coast-line being about 3 miles long. It is settled its entire length, and in breadth varies from 1 mile to 2 miles. N. of this is a tract of dense forest and wild pasture, except where pierced by two roads, which are sparsely settled. The W. boundary runs near the Saugus River, a stream which empties into the harbor. Near its N. E. boundary is a chain of basins called the "Lakes of Lynn." The city proper is built mainly upon a plain, with a salt marsh upon its W. border; a line of wooded hills forms its N. boundary, and Swampscott, Salem, and Peabody its E. limits. A spur of these hills of considerable breadth, rocky and devoid of trees, nearly at a right angle from the main line, and known as the "Highlands," projects almost to the centre of the business part of the city, and terminates in High Rock, 170 feet above the level of the sea. The harbor is well sheltered, but naturally shallow. By aid of a recent appropriation by Congress it is being dredged, the ultimate purpose being to admit vessels drawing at least 10 feet. It is defended by a long beach ending with the rock-bound promontory of Nahant. Between this and the coast of Swampscott is Lynn Bay. Lynn is connected with Boston by the Eastern section of the Boston and Maine R. R., also by the Boston Revere Beach and Lynn (a narrow-gauge) R. R., of which it is the terminus, and by the Boston and Lynn (horse) R. R. The latter has branches to Saugus, Peabody, Swampscott, and Marblehead, and to all parts of Lynn; a branch is projected to Nahant. The first named of these by its trunk line connects with Swampscott and Salem and all eastward to the British provinces, while branches unite it with Saugus and Malden on the W. and with Marblehead on the E. The celebrated Lynn Shore, leading to Swampscott, is largely occupied by beautiful houses, many of them owned by citizens of Boston and used by them as summer residences. In the W. part of the city is Lynn Common, one of the largest in the State, planted with shade trees, many of them nearly fifty years old. Pine Grove Cemetery, in the N. suburbs, laid out in 1850, is one of the most beautiful in New England. The city is furnished with excellent water from two artificial basins, Breed's and Birch Ponds, which supply has just been augmented by the utilizing of Hawkes' and Penney Brooks. The pumping apparatus is capable of pumping 8,000,000 gallons in twenty-four hours. The city-hall, finished in 1867, is a very handsome brick edifice with brownstone trimmings and a lofty tower; its entire cost was a little more than $300,000. The soldiers' monument, near it, is a fine work of art, cast in Munich from designs by Jackson, and costing $30,000. Among the public buildings are Music, Odd Fellows', and Exchange Halls and the building of the Young Men's Christian Association. It has many beautiful churches, a hospital, public library with 33,000 volumes, home for aged women, and several very handsome and convenient school-buildings; also an electric fire-alarm and a paid fire department. There are two gas companies, one for illuminating purposes, and the other, at present, for heating purposes. There are four national banks, with an aggregate capital of $1,000,000, and two for savings, the total deposits of the latter being over $4,000,000. Lynn is, and has been for many years, the leading city in the world for the manufacture of ladies' boots and shoes, which industry greatly exceeds all others. The *Report of the Massachusetts Bureau of Statistics* for 1883 gives the following figures: Capital, $4,263,250; average number of hands employed, 10,708; wages paid during the year, $4,931,530; value of products, $20,946,867; number of factories, 174. Collateral branches of this business are the manufacture of kid and morocco, which industry occupies a number of large factories; also establishments for the production of various materials used in the making of shoes, including the making of many ingenious machines invented by Lynn men. A creditable fact of these industries is that the capital is all made here. A new enterprise has lately been established here, the manufacture of electric dynamo-machines and lamps. Number of hands employed, 200; amount of business done, aggregating $600,000 annually. Lynn has furnished her quota of soldiers for all the wars in which the country has been engaged, and more than her quota in the late civil war. Upon the first call of President Lincoln for 75,000 troops, Apr. 15, 1861, she sent her two companies of the Eighth regiment Massachusetts volunteer militia at a few hours' notice, and during the war a total of 3275 men, 230 more than required. Lynn was incorporated as a city Apr. 9, 1850, being the seventh in the State. Lynn has 2 daily and 4 weekly newspapers. Pop. in 1870, 28,233; in 1880, 38,274. By the Massachusetts State census, taken May 1, 1885, the population is 45,861.

GEORGE T. NEWHALL, ED. "LYNN TRANSCRIPT."

Lynn Re'gis, or **King's Lynn,** town of England, in the county of Norfolk, on the estuary of the Great Ouse, 9 miles from its mouth, is well built, has a good harbor, a fine church of the twelfth century, and beautiful public walks, and carries on a very extensive trade with Spain, the Baltic, and North America. Corn, wine, hemp, and timber are imported; manufactured goods exported. It has also large breweries, iron-foundries, shipyards, and manufactures of tobacco, cork, and rope. Pop. 18,475.

Lynx [Gr. λύγξ], a genus of the Felidæ or cat family, distinguished from the true cats by wanting the first upper premolar tooth, and by other slight anatomical peculiarities. They have also shorter, abruptly truncated tails. Four species—*L. Canadensis*, the Canada lynx, of the northernmost parts, *L. rufus*, the bay lynx, or common American wild-cat of the States generally, and *L. fasciatus* and *L. maculatus*—are recorded as occurring within the limits of the U. S. The most remarkable species of the Old World is the CARACAL (which see), the name being a Turkish word which means "black-eared." It is a small animal, of the size of a fox, but peculiarly ferocious and surly, perpetually wearing an expression of malevolence and always appearing ready for a snarl and a bite. The color is a pale brown, the under parts of the body being paler than the upper ones and slightly sprinkled with dark spots. The ears are perfectly black.

Lyon (CALEB), LL.D., b. Dec. 7, 1822, at Lyondale, N. Y., of which his father, who bore the same name, was the founder, whence he was usually called "of Lyondale." He graduated at the Norwich University 1841; was appointed by Pres. Polk consul at Shanghai, China; was in California in 1849; acted as secretary to the constitutional convention and designed the coat-of-arms for that State; made another tour in Europe, visiting Egypt and Palestine, and was identified with the Koszta affair at Smyrna; was elected to the New York assembly, and afterwards to the senate; was a member of Congress 1853–55, and governor of Idaho 1864–66. D. Sept., 1875.

Lyon (GEORGE FRANCIS), b. at Chichester, England, Jan. 23, 1795; entered the naval service in 1808; was engaged in the defence of Cadiz in 1810, and in the attack on Algiers in 1816; accompanied the traveller Joseph Ritchie to Fezzan in 1818, and Capt. Parry in his Arctic voyage (1821) as commander of the Hecla; became post-captain in 1823; made another Arctic exploration in 1824, and travelled in Mexico 1826. Of all these travels he published accounts. D. Oct. 11, 1832.

Lyon (MARY), the founder of Mount Holyoke Seminary, b. at Buckland, Mass., Feb. 28, 1797; became a school-teacher at Shelburne Falls, Mass., in 1814; taught 1821–24 in the academy at Ashfield, Mass., 1824–28 in the Female Academy at Londonderry, N. H., and then until 1834 in the ladies' seminary at Ipswich, Mass. Her great work, the founding of the Mount Holyoke Female Seminary at South Hadley, Mass., of which she was principal from 1837 to 1849, is the abiding monument to her practical sagacity, no less than to her unconquerable energy and sublime faith. D. at South Hadley Mar. 5, 1849. (See her *Life*, by Pres. Hitchcock, and *Recollections of Mary Lyon*, by Miss Fiske.)

Lyon (MATTHEW), b. in Wicklow co., Ireland, in 1746; emigrated to New York in boyhood; worked on a farm in

Connecticut for some years; removed to Vermont; became in 1775 lieutenant in a company of "Green Mountain Boys;" became paymaster-colonel of militia, member of the legislature, and assistant judge; founded the town of Fairhaven in 1783; built saw and grist mills; established a forge; made paper from basswood; manufactured types, and issued a paper called *The Scourge of Aristocracy and Repository of Important Political Truth;* took an active part in politics; was elected to Congress in 1797 as a Jeffersonian; was in Oct., 1798, convicted of libel against Pres. Adams, fined $1000, and imprisoned four months in Vergennes jail, during which time he was re-elected twice; narrowly escaped expulsion, first as a convicted felon, and afterward on account of an altercation on the floor of the House with Roger Griswold of Connecticut, resulting in blows; removed to Kentucky in 1801; was immediately elected to the legislature, and to Congress from 1803 to 1811; built gunboats on speculation for the war of 1812, and became bankrupt; was appointed by Pres. Monroe in 1820 U. S. factor among the Cherokee Indians in Arkansas, from which Territory he was elected delegate to Congress, but before taking his seat d. at Spadra Bluff, Ark., Aug. 1, 1822.

Lyon (Gen. NATHANIEL), b. at Ashford, Windham co., Conn., July 14, 1819; graduated at West Point; entered the army as second lieutenant of infantry July, 1841; promoted to be first lieutenant 1847, captain 1851. His first service was a brief campaign against the hostile Indians in Florida, succeeded by four years of garrison-life, when he was called to Mexico by the outbreak of war. From the siege of Vera Cruz to the capture of the City of Mexico Lyon bore an active part, being wounded at the final assault at the Belen Gate; brevet captain for gallantry. Returning to New York at the close of the war, he sailed thence to California, remaining on the Pacific coast some five years; served in Kansas during the political troubles, and remained actively engaged on frontier duty until Feb., 1861, when he was placed in command of the U. S. arsenal at St. Louis, which he not only defended against threatened attack, but on the 10th of May, with Col. Blair, at the head of some 6000 "home guards," surrounded and captured the "State guard" in the vicinity, together with twenty cannon, large numbers of small-arms, and quantities of ammunition. He was now (May 17) appointed a brigadier-general of volunteers, and in June succeeded Gen. Harney in command of the department. Embarking his army (June 13) at St. Louis, he reached Jefferson City on the 15th, to find the place abandoned, and after securing the State archives, he re-embarked the following day, arriving opposite Booneville next morning, where he found an encampment of some 2000 or 3000 State guards, which he easily routed, and continued his march to Springfield, where he was compelled to remain by the superior force of the enemy, who now overran Southern Missouri; after vainly awaiting reinforcements, and being apprised of an advance of the enemy in two columns, he moved out (Aug. 1) from Springfield, hoping to defeat the column from the S. before it could unite with that coming up from the W. The following morning he met and defeated McCulloch at Dug Spring, who retreating now united with the other wing, and the whole body advanced toward Springfield, to which place Lyon had fallen back. Arriving at Wilson's Creek on the 7th, Lyon proposed to surprise them here; which plan, however, failed, and on the 9th he again moved out from Springfield and fought the battle of Wilson's Creek on Aug. 10. This battle is said to have been fought against his own judgment; but the evil to be apprehended from abandoning South-western Missouri without a battle being strongly represented, determined him to risk the engagement, throughout which he displayed the most daring courage, and it was after being twice wounded that, placing himself at the head of a regiment whose colonel had fallen, he was struck by a minie ball and almost instantly killed. His death produced a profound sensation throughout the country. His remains were received with military honors in all the principal cities through which they passed *en route* to Connecticut, where they were interred with great military and civic honors. By will he left almost his entire property to the government to aid in preserving the Union. Congress ordered by resolution that a recognition of his "eminent and patriotic services" be entered upon its records. A series of able letters written by him during and subsequent to the Kansas troubles were published in 1862, entitled *The Last Political Writings of Gen. Nathaniel Lyon.* G. C. SIMMONS.

Lyon King-at-arms (often called **Lord Lyon King-at-arms,** because the office, unlike other heraldships, has been usually occupied by a peer), the chief herald of Scotland. When the office is held by a nobleman certain of its duties must be performed by Lyon Depute, one of his subordinates. The Lyon also appoints messengers-at-arms for the courts and counties of Scotland. He is the chief officer of Lyon Court, the heraldic college of Scotland. His subordinates are the Lyon Depute, the Lyon clerk, Lyon-clerk-depute, the procurator-fiscal, a herald painter, and a macer. The proper heralds and pursuivants of Scotland perform duties which are chiefly ceremonial, and do not relate to the blazoning of arms. These last duties are performed by the Lyon court, and are even more elaborate and formal than those of English heraldry.

Lyonnais′, an ancient province of France, which is now divided into the departments of Loire, Haute-Loire, Puy-de-Dôme, and Rhône.

Ly′ons [Fr. *Lyon;* anc. *Lugdunum*], next to Paris the largest city of France, and without any exception the most important manufacturing place of the country, is situated in lat. 45° 45′ 44″ N., lon. 4° 49′ 43″ E., at the confluence of the Saône and the Rhone; and consists of a central part, covering a peninsula formed by the two rivers, and a number of suburbs scattered over the hills on the right bank of the Saône and on the left bank of the Rhone. It is the capital of the department of Rhône, the head-quarters of the seventh military division of France, and is very strongly fortified. Eighteen detached forts which defend and command it form a circle around it 16 miles in circuit. The quays along the Rhone and the Saône are surprisingly beautiful; they are planted with magnificent trees and lined with elegant houses. Twelve bridges span the Saône, seven the Rhone. Some other quarters of the city and several of the many public squares are also handsome. Place Bellecour is one of the largest squares in Europe; on Place des Terreaux stood the guillotine in 1794; from the summit of the hill of Fourvières, on the right bank of the Saône, where stands the church of Notre Dame de Fourvières, a most magnificent view is presented of the city, the Alps to the one side and the Cevennes to the other. But other parts of the city contain nothing but narrow, crooked streets, lined with tall, gloomy houses, and have a squalid and dismal appearance. Among the public buildings the most remarkable are—the Hôtel de Ville, one of the most interesting and beautiful buildings of its kind in Europe; the Palais des Beaux-Arts, on the Place des Terreaux; the cathedral, on the declivity of the hill of Fourvières, in Gothic style of the time of Louis XI., and with four towers; the church of St. Nizier, of the fourteenth century, etc. The educational and benevolent institutions of the city are numerous and good. The Royal College was founded in 1519, and enjoys a great reputation. The School of Drawing and the Veterinary School are model establishments. In the Martinière 220 sons of artisans receive gratuitous education. There is a public library with over 100,000 volumes, a botanical garden, several scientific associations, etc. The dye-works, foundries, glass-houses, potteries, tanneries, and breweries of Lyons are very extensive, especially the latter. Its manufactures of jewelry, hats, fine liqueurs, and chemicals are also important, and its trade in its own manufactures and in the produce of the surrounding country, especially in wine, is very brisk; it communicates by canals with Bordeaux, Paris, Marseilles, Geneva, and the Rhine. But its principal business is its silk manufacture, in which branch of industry it is hardly surpassed by any other place in the world. The average annual value of raw silk imported is estimated at $60,000,000; of manufactured silk exported, at $76,000,000. Silk-weaving was first started here in the reign of Louis XI. by artisans from Florence, Lucca, and Genoa; in the latter part of the seventeenth century between 9000 and 12,000 looms were in operation. But the Revocation of the Edict of Nantes bereft the city of many of its most skilled workmen, and the number of looms decreased to about 4000. In the latter part of the eighteenth century it had risen again, to about 18,000, but the Revolution interfered sadly with the industry. At present about 70,000 looms are worked in and around Lyons, employing about 140,000 hands.

The city is very old. The ancient *Lugdunum,* on the hill of Fourvières (*Forum vetus*), was colonized in 43 B. C. by Munatius Plancus. Under Augustus it became the capital of the province of Gaul, and the centre of the different roads which the Romans built in the country. Germanicus, Claudius, Marcus Aurelius, Caracalla, and Geta were born here. During the early Middle Ages it belonged to the archbishop of Lyons, and was very much disturbed by feuds between its municipal council and its ecclesiastical ruler. But in 1307 it was incorporated with the kingdom of France by Philip the Fair, and its prosperity increased very much after that period. During the Revolution it suffered terribly; its insurrection against the Convention was punished by Collot d'Herbois and Fouché with an unheard-of cruelty. A great number of its buildings were demolished, and its very name was changed from Lyons to *Ville-affranchie.* Of its inhabitants many fled, while their property was confiscated, and many more perished on the scaffold or were mown down by grapeshot. After the fall of Robespierre the horrors were repeated. The terrorists and their adherents were drowned in the Rhone. Again in 1814, 1815, 1830, and 1831 it was much disturbed by riots. These, however, ceased after the completion in 1834 of its fortifications, but it has suffered severely in late years by inundations, especially in 1840 and 1856. The injudicious felling of the forests of the Vosges Mountains soon began to show its bad effects on the Saône; the rising and the falling of the waters of the river became completely uncontrollable. In 1856 the river broke the dykes at Lyons, and the whole lower and modern part of the city was inundated. Pop. in 1881, 376,613.

Lyons, city and R. R. centre, Clinton co., Ia. (see map of Iowa, ref. 5–L, for location of county), on the Mississippi River. There is a steam-ferry to Fulton, Ill., and the town is traversed by a horse railroad. It has an excellent wrapping-paper mill, saw-mills, sash-factories, flouring-mills, machine-shops, an oil-can factory, carriage-shops, a library of 2000 volumes, graded public schools, a seminary, and private schools. There are extensive nurseries, and best of land well farmed surrounding. Pop. of city in 1870, 4088; in 1880, 4095; in 1885, 4893.

Lyons, city, cap. of Rice co., Kan. (see map of Kansas, ref. 6–F, for location of county), is situated on the McPherson branch of the Atchison Topeka and Santa Fé R. R., 21 miles E. of Ellinwood. Pop. in 1880, 509.

Lyons, R. R. centre and cap. of Wayne co., N. Y. (see map of New York, ref. 4–E, for location of county), on the New York Central R. R. and the Erie Canal, midway between Syracuse and Rochester. It has a good water-power, and its manufactures consist of iron-works, fanning-mills, agricultural implements, and tool handles. It contains a flourishing union school and a musical academy. Lyons is a great peppermint-oil mart. Pop. of v. in 1870, 3350; in 1880, 3820.

Lyons, Gulf of, a large bay formed by the Mediterranean on the southern coast of France. It receives the Rhone. Marseilles and Toulon stand on its shores.

Lyons (EDMUND), FIRST BARON LYONS of Christchurch, b. at Burton, Hampshire, England, Nov. 21, 1790, descended from Gov. John Winthrop of Massachusetts; entered the British navy in childhood; became a midshipman in 1803; served in the East Indies; became commander in 1812, and post captain in 1814. In 1828 he was engaged in the blockade of Navarino, Greece, then held by the Turks, and conveyed King Otho to Athens on the formation of the new kingdom; was knighted, and resided there as minister for fourteen years. In 1849, Sir Edmund became minister at Berne, and in 1851 at Stockholm. At the outbreak of the Crimean war he was appointed second in command of the Black Sea squadron, became commander-in-chief in Dec., 1854, and distinguished himself by brilliant services, which procured him a peerage in 1856 under the title of Baron Lyons of Christchurch. D. at Arundel Castle, Sussex, Nov. 23, 1858.

Lyons (RICHARD BICKERTON PEMELL), G. C. B., D. C. L., SECOND BARON LYONS, b. at Lymington, England, Apr. 26, 1817; educated at Winchester School and Christ Church, Oxford; appointed attaché at Athens 1839, at Dresden 1852, at Florence (residing at home) 1853; secretary of legation there 1856, and envoy to Tuscany 1858; was envoy at Washington Dec., 1858–65; ambassador at Constantinople Aug., 1865; at Paris July, 1867. He was sworn a member of the privy council 1865.

Lyra′, de (NICHOLAS), b. at Lyre, Normandy, France, about 1270; studied in the Franciscan college at Verneuil and at the University of Paris; became a doctor of theology and an eminent lecturer upon biblical interpretation. His great knowledge of Hebrew led to the erroneous statement that he was a Jew. He held the most eminent posts in the Franciscan order, and his commentaries upon the Scriptures were approved and used by the Reformers, whence the punning couplet—

Si Lyra non lyrasset,
Lutherus non saltasset—

"If Lyra had not piped, Luther would not have danced." His great work was the *Postillæ perpetuæ in universa Biblia,* printed very early at Rome (5 vols. folio, 1471–72), which earned him the title of *Doctor planus et utilis.* It is the only exegetical work of any merit produced by the Middle Ages before the revival of letters. The Schoolmen seldom understood Greek, and never Hebrew; thus, they lacked the very first requisites as exegetical commentators. He also wrote a work *On the Coming of the Messiah* (1309), in reply to the Jews. D. at Paris Oct. 23, 1340.

Lyre [Gr. λύρα], a musical instrument of unknown origin and antiquity, famous in mythology and poetry. Diodorus ascribes its invention to the Egyptian Hermes (Mercury). According to the tradition, the Nile in its subsidence left on its bank a tortoise-shell, the contents whereof were so dried by the sun that the hard-strained cartilage was like stretched catgut. This gave the hint of an instrument. The Greek tradition does not materially differ from the Egyptian. The improvements in the lyre were made by the Greeks, who increased the capacities of the instrument by adding to the number of the strings. The most ancient lyre had three; the lyre of Terpander (B. C. 680) had seven; the lyre of Pythagoras (B. C. 600) had eight. The number was afterwards increased to eleven, and even to thirteen. In its perfected form the lyre consisted of two side-pieces set upright, like horns, connected together near the top by a wooden cross-piece; the strings were attached to this, and stretched perpendicularly, the lower end being fastened to the bottom of the resonant shell. They were struck either with the fingers or a plectrum, a stick of polished wood or ivory. When played, the lyre was held between the knees. The form of the instrument varied slightly, as can be imagined, in different epochs and among different peoples. It was used chiefly as an accompaniment to the voice in passionate, pathetic, and heroic song. For this reason it has given the name *lyric* to a class of poetry that expresses the mood of private and personal emotion. Literature celebrates the lyre of Sappho, the Lesbian lyre, and the lyre of Apollo. The Abyssinians and neighboring peoples of the present day use an instrument of seven strings that closely resembles the lyre of ancient Greece.

O. B. FROTHINGHAM.

Lyre-Bird, a name applied to two birds of Australia from the lyre-shaped outline of the erect tail-feathers of the male. (See MENURIDÆ.)

Lyr′ic Po′etry. Poetry, as defined by Aristotle, is an imitation, the things imitated being chiefly the actions and passions of men. Epic poetry, according to the same authority, imitates by words (ἔπος, "word"); lyric, by words accompanied with music (λύρα, "lyre"); and dramatic, by words accompanied with music and action (δρᾶν, to "act," δρᾶμα, an "act"). Epic and dramatic poetry *can* be sung, and among the Greeks they were in fact sung wholly or in part; but lyric poetry is made to be sung, and *is song* in its nature and essence. According to the etymology of the word, poetry is a creation. In the language and conception of the Greeks, from whom we derive the word, the poet is ποιητής, a "maker." In Old English also poets were called makers. "We Englishmen," says Sir Philip Sidney, "have met with the Greek in calling him (the poet) *maker.*" He is a maker of ideas and images, a creator of his own facts and characters, while the historian has all his facts and characters furnished to his hand. The poet is the former and fashioner of an ideal world of men and things, while the historian has to do with men and things only as they exist in the real world. It is only in a very limited sense, however, that any being but God can create. The poet can only make out of his materials, reproduce a world of order and beauty out of the chaos into which our world has fallen. Poets, therefore, are, as Bailey has well expressed it, a kind of "*under*-makers."

Epic poetry is national, general, perhaps universal in its scope. Like history, it tells of the wars of nations, the conflicts of races, the strife and conquest of religions, the struggles of heroes, and the battles of gods. Lyric poetry is individual, personal, perchance wholly emotional and spiritual. Like a meditation, a soliloquy, or a conversation with a friend, it sings of hope and fear, of joy and sorrow, of inward struggles and conflicts. Epic poetry is objective. Quite forgetful of self, the poet is lost in his subject, lives only in the life of his characters, and grieves or exults only in the defeat or triumph of his hero, his country, or his race. Lyric poetry is essentially subjective. Forgetful of everything else, the poet dwells on his own joys or sorrows, exaggerates them, and strives to awaken the sympathy of his hearers. Or if he expresses the sentiments and emotions of others, he is one of them, and he gives utterance to their common feelings and experiences as his own. "He is the *true* lyric poet," says Ulrici, "who portrays not *merely* his own personal subjectivity, but that of the human mind generally, of which his own is but a particular manifestation."

Epic poetry has to do with the past, lives or would fain live in the good old times, and magnifies the achievements of bygone ages and generations into something more than human. Lyric poetry forgets the past in the love or hate of the present and the hope or fear of the future. "It delineates the mental states and impulses out of which events and destinies proceed." (*Ulrici.*) It forecasts future events, anticipates or forebodes, perhaps foreshadows and foretells immortal destinies. Epic poetry is commemorative, lyric poetry is prophetic. Epic poetry is near akin to history, lyric poetry is more closely allied to religion. Hence, in that most impressive and instructive group of sculpture which has given name to the Hall of the Muses in the Vatican, Calliope and Clio, the Muse of Epic Poetry and the Muse of History, sit together on the breezy heights of Parnassus, while Erato, the Muse of Lyric Poetry, is grouped with Euterpe, the inspirer of music, and Urania, the heavenly Muse.

Epic poetry resembles sculpture, while lyric is more like music; in other words, epic is the sculpture and lyric the music of poetry. The former stands fixed in sublime dignity and eternal repose, like the unalterable Past, which it represents. The latter, like the Present and the Future, of which it is the expression, is ever changing and *becoming*, ever thrilling with joy or sorrow, trembling with hope or fear, breathing forth its passions and its inspirations, not in solid marble, but on the yielding air—an element as changeful and fleeting as itself. Hence, in the above-mentioned group, while every fold of Calliope's garments exhibits self-forgetfulness and repose, the whole frame of Erato quivers with emotion, and the lips are just ready to break forth in impassioned song.

Of dramatic poetry, we can only say here that in all the respects in which epic and lyric poetry thus contrast with each other, dramatic is a mean between them or a compound of both.

Only nine names, the number of the Muses, are comprised in the Alexandrian list of Greek lyric poets: Alcman, Stesichorus, Alcæus, Sappho, Ibycus, Anacreon, Simonides, Bacchylides, and Pindar. But these are only a fraction of the whole number. Of these, Anacreon and Pindar are the most celebrated, the former surpassing in grace, the latter in sublimity. The chief Latin lyric poets are Lucretius, Catullus, Horace, Tibullus, Propertius, and Ovid, among whom Horace holds the front rank. The greater part of Chinese poetry—"words of the temple," as they call it—is strictly gnomic or didactic, which is a variety of the lyric. Such are the *Five Classics* and the *Four Books*, composed by Confucius and his disciples about the time of the Seven Sages and in the golden age of Greek lyrics. The oldest sacred books of the Hindoos, the Vedas, are partly prose and partly poetry, and that lyrical, consisting of hymns, prayers, praises of the gods, and moral and religious precepts. The Vedas probably date as far back as B. C. 1000. They are anonymous, and were sometimes asserted to be the breath of Brahma, to have issued from his mouth at the creation, or even to have been eternal. The two principal lyric poets of the Persians are Saadi (d. A. D. 1292) and Hafiz (A. D. 1389). Arabic poetry, which is so abundant that the *catalogue* of Arabic poems in the Escurial fills twenty-four volumes, is largely lyric. It belongs, for the most part, to the Mohammedan era, extends over the Middle Ages, and exerted an important influence on the poetry of the modern European nations. The Hebrews had no strictly epic or dramatic poetry. But different forms of lyric poetry, including the didactic, make up the whole Old Testament, exclusive of the history. It begins with Moses, their great lawgiver, and continues a thousand years, till after the return from the Captivity. David, the greatest of their kings, was also the greatest of their lyric poets. Christian psalmody takes its rise, and more or less its form, from the Psalms of David. Petrarch is so pre-eminently the lyric poet of the Italians, that those who succeeded him imitated him, and have often been called Petrarchists, although the epic and dramatic poets of Italy, particularly Ariosto, have also left sonnets and canzoni of scarcely inferior merit. Boscan, Garcilaso, and Mendoza are named as the triumvirate of Spanish lyric poets. But Herrera surpassed them in Pindaric sublimity, and Ponce de Leon in classic elegance. They all belonged to the age of Charles V. The chief lyric poets of France, after the Provençals, are Marot and Malherbe prior to the reign of Louis XIV., La Fontaine and Boileau in that golden age, and Béranger, Lamartine, and Alfred de Musset in the nineteenth century. Of these, Béranger, by his gay and witty songs, has earned the title of "the French Burns." The Minnesingers were the earliest lyric poets of Germany. Klopstock and Wieland, Schiller and Goethe, all composed lyrics of great excellence, although they gained their reputation chiefly in other departments. Tieck, Uhland, and Körner—the last celebrated for his patriotic and war-songs—were more distinctively lyric. Among English poets, Collins, Cowper, and Burns are pre-eminently lyrical. Moore and Crabbe belong to the same category. Dryden and Pope are also lyric rather than epic or dramatic, although they are more properly didactic poets and satirists. Byron may be classed with them under this last title. Scott stands alone as the only recent representative of the ballad. Wordsworth's popularity, not to say his fame, rests chiefly on his odes and sonnets. In hymnology or church lyrics the names of Ephraem of Syria and Gregory of Nazianzen among the early Greek Fathers, St. Ambrose and Hilary of the Latin Fathers, St. Bernard and Thomas à Celano in the Middle Ages, Luther and Gerhard among the Germans, and in English Watts and Doddridge, Newton and Keble, Wesley and Cowper, are particularly deserving of mention. W. S. TYLER.

Lys, a river which rises in France, in the department of Pas-de-Calais, flows in a north-eastern direction into Belgium, and joins the Scheldt at Ghent after a course of 100 miles.

Lysander, a Spartan general, received in 407 B. C. the command of the Spartan fleet, and defeated the Athenians off the promontory of Notium. His term of command having expired, he was replaced by Callicratidas, but Callicratidas was defeated in 406 B. C. in the battle of the Arginusæ; and as it was against the Spartan laws that the same person could hold an office twice, Aracus was nominally placed at the head of the fleet, while in reality Lysander held the command. His campaigns were very brilliant. He routed and captured the Athenian fleet at Ægospotami, and early in the next year (404 B. C.) took Athens, thus ending the Peloponnesian war. At this moment he was the most prominent man in Greece, but his arrogance and enormous ambition made it impossible for him to hold any office. When, in 395 B. C., he was sent at the head of an army against the Bœotians, during which campaign he was killed while besieging Haliartus, it is said that he was deeply involved in a conspiracy for the subversion of the dynasty of the Heraclidæ in Sparta. It seems very probable that at the time of his death he was deeply implicated in various revolutionary schemes, but he had, nevertheless, committed no overt act. He was buried on the road from Delphi to Choronea, and a monument was erected on his tomb.

Lys'ias, a Syrian nobleman of the blood-royal, whom King Antiochus Epiphanes, on setting out for Persia, appointed guardian of his son and regent of the kingdom, and as such he waged a formidable war with the Jews. His vast forces were defeated by Judas Maccabæus near Emmaus (B. C. 166); he was himself repulsed near Bethsura in the following year, but took that fortress B. C. 163, and laid siege to Jerusalem, but was forced to treat with the Jews by an insurrection at Antioch. Shortly afterwards Lysias was put to death by the populace of Antioch, who had rebelled in favor of Demetrius Soter.

Lysias, an Athenian orator, b. in Athens in 458 B. C.; educated at Thurii, whence he was expelled in 413; went to Athens, but was imprisoned as an adversary of the oligarchs; escaped to Megara, and returned in 403, after the overthrow of the tyranny of the Thirty, and d. in 378. Of his numerous orations, thirty-five are still extant, edited by Förtsch (1829) and Franz (1831); some of them have been translated into English by Dr. Gillies.

Lysima'chia [Gr. λύσις, "release," and μάχη, "strife," but more probably named from King Lysimachus], a genus of herbaceous perennial plants mostly with yellow flowers, belonging to the primrose family (see PRIMULACEÆ), generally called loosestrife, from an etymology as old as the time of Pliny. The European *L. nummularia*, or moneywort, is an ornamental plant commonly cultivated in gardens.

Lysim'achus, b. at Pella, Macedonia, about 360 B. C.; served as a general in the army of Alexander the Great, and received Thrace on the division of the empire at the death of Alexander in 323. In 306 he assumed the title of king, and having defeated Antiochus in the battle of Ipsus in 301, he united a large part of Asia Minor to his dominions. An expedition he undertook in 292 against the Getæ, N. of the Danube, was very unfortunate; he was taken prisoner with his whole army, and received his freedom only by giving his daughter in marriage to the king of the Getæ. After the murder of his son Agathocles, who was much loved, the population of Asia Minor rose in insurrection, and was supported by Seleucus, and in the battle of Corus (281) Lysimachus was defeated and killed.

Lysip'pus, b. at Sicyon, flourished in the fourth century B. C.; became especially celebrated for his statues of Alexander the Great, he being the only sculptor, as Apelles was the only painter, to whom Alexander would sit. Pliny tells us that Lysippus made about 1500 pieces, but as he always worked in bronze, his works have all perished.

Lysko'vo, or **Liskovo,** town of Russia, in the government of Nizhnee-Novgorod, on the Volga, has considerable trade in potash and dyed mats. Pop. 5216.

Ly'sons (Daniel), F. R. S., b. at Rodmarton, Gloucestershire, England, in 1760; graduated M. A. at Oxford in 1785; took holy orders, and became vicar of Putney about 1790, rector of Rodmarton 1801; was distinguished as an antiquary; published, under the patronage of Horace Walpole, *The Environs of London, being an Historical Account of the Towns, Villages, and Hamlets within Twelve Miles of that Capital* (5 vols., 1792–1800), and, in conjunction with his brother Samuel, *Magna Britannia, being a Concise Topographical Account of the Several Counties of Great Britain* (6 vols. 4to, 1806–22), a colossal work, left unfinished, containing the counties in alphabetical order up to Derby inclusive. The materials collected for this vast enterprise are now deposited in the British Museum, forming sixty-four MS. volumes. D. at Rodmarton Jan. 3, 1834.—His son, Major-General Daniel Lysons, C. B., b. 1816, is a distinguished officer, who became commander of the northern military district of Great Britain.

Lysons (Samuel), F. S. A., b. at Rodmarton, England, May 17, 1763; aided his brother Daniel in the preparation of the *Magna Britannia*, and published several splendid works on British antiquities, among which were *An Account of Roman Antiquities discovered at Woodchester* (1797, colombier folio), *Reliquiæ Britannico-Romanæ, containing Figures of Roman Antiquities discovered in Various Parts of England* (1813–17, folio, with 156 colored plates), and *The History and Antiquities of Devonshire* (2 vols. 4to, 1822), in which he was aided by Dean Buckland, the bishop of Cloyne, and other distinguished archæologists. He was called to the bar in 1798; became keeper of the records in the Tower of London 1803, and vice-president of the Society of Antiquaries 1812. D. at London June 29, 1819.

Lys'tra, an ancient city of Asia Minor, placed by Pliny in Galatia and by Ptolemy in Isauria, while in the Acts of the Apostles it is placed in Lycaonia. It was the native place of Timothy, the scene of Paul's miracle of healing a lame man, of the attempted worship of Paul and Barnabas as Jupiter and Mercurius, and of the stoning of the former (Acts xiv.). The site of Lystra has been disputed by modern travellers, Leake, Arundell, and Hamilton placing it at different localities.

Lyte (Henry Francis), b. at Kelso, Ireland, June 1, 1793, was educated at Trinity College, Dublin; ordained in 1815, and appointed to the curacy of Lower Brixham, Devon, in 1823. He published *Tales upon the Lord's Prayer* (1826), *Poems, chiefly Religious* (1833), etc., and is the author of many popular hymns: "Abide with me; fast falls the eventide," etc.

Lythra'ceæ [Gr. λύθρον, "blood"], a natural order or family of herbaceous plants characterized by entire leaves, mostly opposite, no stipules, the calyx enclosing, but free from the many-seeded ovary and membranous pod, and bearing deciduous petals and stamens on its throat. Style one; stigma capitate or rarely two-lobed. Flowers axillary or whorled, rarely irregular, perfect, sometimes dimorphous, or even trimorphous; those on different plants with filaments and style reciprocally longer and shorter. Petals sometimes wanting. Pod with one to four cells, placentæ in the axis. Seeds anatropous, without albumen. Branches usually four-sided. There are four genera—*Ammannia, Lythrum, Nesæa*, and *Cuphea*. Like the *Lysimachia*, from which this family is botanically very distinct, it bears the common name of loosestrife.

Ly'tle (Gen. William Haines), b. at Cincinnati, O., Nov. 2, 1826; graduated at Cincinnati College; studied and practised law; during the Mexican war he served as captain of Ohio volunteers, returning at its close to Ohio and resuming his profession; elected to the State legislature, and soon after chosen major-general of militia, a position which had been previously held by his father and grandfather. Being thus identified with military life, his services were availed of at the outbreak of civil war, first as colonel of the 10th Ohio Vols., in command of which regiment he served in the campaign of 1861 in West Virginia, at Rich Mountain and Carnifex Ferry, commanding a brigade at the latter battle, where he was severely wounded, Sept. 10, 1861. Returning to the field as soon as his wounds would permit, he commanded a brigade under Gen. O. M. Mitchel during the latter's operation in Alabama; at the battle of Perryville, Ky. (Oct. 8, 1862), he was dangerously wounded and made prisoner, but soon exchanged and promoted to be brigadier-general of volunteers Nov., 1862, continuing in active service thereafter in the West, and while gallantly leading a charge at the battle of Chickamauga was killed, Sept. 20, 1863. He also possessed literary ability of a high order.
G. C. Simmons.

Lyt'telton (Edward), D. C. L., Baron, b. at Mounslow, Shropshire, England, in 1589; graduated at Oxford 1609; became chief-justice of North Wales 1621; entered Parliament 1626; recorder of London 1631; solicitor-general and knight 1634; chief-justice of common pleas 1640; lord keeper of the great seal 1641; raised to the peerage Feb. 18, 1641; escaped with the great seal to Charles I. at York May, 1642; required by Parliament to return it or lose his place 1643; first commissioner of the treasury Mar., 1644; commissioned to raise a regiment of foot-soldiers May, 1644. D. at Oxford Aug. 27, 1645.

Lyttelton (George), first Baron, son of Sir Thomas Lyttelton, Bart., b. at Hagley, Worcestershire, England, Jan. 17, 1709; was educated at Eton and at Christ Church, Oxford; travelled in France and Italy; entered Parliament in 1730; joined the young "Patriots," who eventually drove Walpole from power, and soon figured by the side of Pitt and Pulteney among the most formidable opponents of the ministry; took part in most of the debates, exhibiting great fluency of speech and elegance of expression; wrote *Letters from a Persian in England to his Friend at Ispahan* (1735–36), an imitation of Montesquieu, which had an immediate success; became secretary to Frederick, prince of Wales, when that prince formed his little court as head of the opposition; was intimate with Pope and his literary school, and proved himself the official patron and private benefactor of Thomson, Fielding, and Mallet; married, in 1741, Lucy, sister of Lord Fortescue, and on the fall of Sir Robert Walpole in 1744 became one of the lords of the treasury. He is said to have been a skeptic in early manhood, and in 1747 produced his celebrated *Observations on the Conversion and Apostleship of St. Paul*, which was considered a masterly treatise upon the evidences of Christianity, and as such has been frequently reprinted. The death of his wife, to whom he was tenderly attached, in the preceding year, gave occasion to his pathetic *Monody to the Memory of a Lady lately Deceased* (folio, 1747), considered the best of his poetic efforts. On the death of his father in 1751 he succeeded to the baronetcy and to the vast family estates, when he gave free scope to his artistic tastes, and made Hagley one of the most beautiful seats in England. He became successively cofferer of the king's household, privy councillor, and chancellor of the exchequer (1756), and on the dissolution of the ministry in 1759 was raised to the peerage with the title of Baron Lyttelton of Frankley. In 1760 he published his *Dialogues of the Dead*, and in 1764–67 his *History of Henry II.* (4 vols.), a work upon which he had been engaged more than twenty years, and which was highly commended for accuracy and research, but is now forgotten. D. Aug. 22, 1773. His *Miscellaneous Works* (2 vols.) appeared in 1774, and his *Poetical Works* in 1785.

Lyttelton (Thomas), Lord, son of the preceding, b. in 1744; exhibited extraordinary precociousness in youth; at the age of sixteen was regarded almost as a prodigy by several of the ablest writers and most erudite scholars in England; became dissipated and dissolute in his habits; lost the favor of his father; an alienation between them ensued; his marriage proved to be unhappy, and a separation followed. He was returned to the House of Commons in 1768; lost his seat on a contest early in Jan., 1769, and on the death of his father in 1773 took his seat in the House of Lords; d. in 1779, under most extraordinary circumstances. From a presentiment he predicted his death three days before it occurred, though he was at the time in good health, and remained so until a few moments before he suddenly expired while conversing with friends. While in the House of Commons as well as in the House of Lords, he was greatly distinguished for vigor of thought, elegance of language, and for the force and power of his speeches. His style, tone of political sentiments, and other points of coincidence have led to the hypothesis, entertained by many, that he was the author of the *Letters of Junius*. A strong article sustaining this view was published in the *London Quarterly* for Dec., 1851. A very important fact, however, in support of the hypothesis was not presented with its due force in that article. It was the fact in the life of Lord Lyttelton that he was voted out of his seat in the Commons by the Tory administration early in Jan., 1769, and just before the appearance of Junius's first letter to the *Public Advertiser*. The deep personal interest Lord Lyttelton had in the questions growing out of his own contested seat might account for that surpassing special knowledge of the parliamentary law of England on such subjects exhibited with such extraordinary effect by Junius in his discussion of the Wilkes and Luttrell case with Sir William Blackstone. The first of Junius's *Letters* which thoroughly attracted the attention of the leading minds of the kingdom, and started an anxious inquiry in the circles of the most intellectual everywhere as to who he could be, were those in which he so completely floored this most eminent jurist and statesman on a question of parliamentary law. He was at that time a member of the Commons, and, siding with the ministry, justified the action of the House in excluding Wilkes because of his alleged disability, and in seating Luttrell, against whom a majority of the electors had voted. The pointed and wounding strictures of Junius upon this very able and erudite judge's position called forth from him a reply in pamphlet form, that cost him some time as well as labor to prepare, in which he cited the celebrated case of Walpole as a precedent in point. In a very few days his harassing and unknown assailant was upon him again through the columns of the *Advertiser*, utterly demolishing the shelter under which the great commentator had sought refuge, and showing with unquestionable proofs that the precedent cited, so far from sustaining the position for which it had been brought forth, left it without the slightest ground to stand upon. When Junius came back so quickly with his extinguisher upon the "parliamentary precedent directly in point" produced with so much confidence by the recognized "expounder of the constitution and laws of the realm," all England was excited in wonder and amazement as to who this "masked man" could be who had thus with two thrusts so thoroughly harpooned the acknowledged whale of the British law, and sent him spouting cascades of quite a different character from those of the briny element which constituted the amusement of his usual sports. This reply of Junius to Blackstone must have taken even Camden and Chatham by surprise. Neither of them could have been aware of the historic fact brought out by Junius. Chatham had discussed the question in the House of Lords with his greatest vehemence and eloquence. He had said, in speaking of the action of the Commons in voting out Wilkes and voting in Luttrell, as they had done, "A breach has been made in the constitution; the battlements are dismantled; the citadel is open to the first invader; the walls totter. What remains, then, but for us to stand foremost in the breach to repair or perish in it?" But he had not exposed the precedent by which the defenders of the ministry attempted to justify the monstrous deed. It was after this had been done by the hand of the great unknown correspondent of the *Public Advertiser* that Burke in the House of Commons exclaimed, "How comes this Junius to have broken through the cobwebs of the law, and to range uncontrolled, unpunished, through the land? The myrmidons of the court have been long, and are still, pursuing him in vain. They will not spend their time upon me, or you, or you. No; they disdain such vermin when the mighty boar of the forest, who has broken through all their toils, is before them. But what will all their efforts avail? No sooner has he wounded one than he lays another dead at his feet. . . . King, Lords, and Commons are but the sport of his fury."

It is not a little remarkable that none of those who have attributed the *Letters* of Junius to Lord Lyttelton seem to have attached any importance in support of their hypothesis to the fact of his having been ousted of his seat in the House, as stated; especially in connection with the extraordinary triumph of Junius over Blackstone in the matter of the Middlesex election. This was the first great feat of the "mighty boar of the forest," as Burke styled him, which gave him unquestionable position among the master intellects of his time and country. Without intending to espouse the side of any one for whom claims have been set up for the authorship of Junius, it is quite pertinent to this sketch to say that in the opinion of the writer this single fact in the life of Lord Lyttelton, with all its surroundings, bearings, and connections, has more weight in behalf of the Lyttelton hypothesis than any other single fact has in behalf of any other hypothesis suggested, and more than all the facts together in behalf of the Sir Philip Francis hypothesis, taken, as they must be, with their well-known surroundings, bearings, and connections. It is quite pertinent also here to submit some reflections for the consideration of all who are inclined to enter upon an inquiry as to the identity of Junius. The true Junius, when discovered, must fit the outlines of that character and position which are unmistakably stamped upon his writings. "By their fruits ye shall know them." The real author of these productions, for instance, must have been a man of wealth, or with pecuniary resources placing him far above all dependence on subordinate official service for means of support, as clearly appears from his private correspondence with Woodfall, who was imprisoned for publishing the *Letters*, and from his surrender to him of his entire copyright interest in the subsequent publication of them in book-form in 1772. His vast learning and extensive general information very unmistakably appear throughout his productions. He must have been a man of leisure as well as of fortune and culture. He was a Briton to the core, and unsurpassed in his devotion to the liberties of his country as secured in Magna Charta. Intellectually, he certainly had no superior at the time in England. This is clear from the manner in which he disposed of Blackstone in the case of the Middlesex election, and of Mansfield on the rights of juries in all criminal cases whatsoever to be the sole judges of the law as well as the fact. All these conditions, qualities, and essential requisites to fit the true character (to say nothing of others) should be ever borne in mind when the question of the identity of Junius is raised. Is it at all probable that any one filling a clerkship in any of the departments of government could have proved himself such an overmatch for Blackstone and Mansfield on their own elevated arenas of professional learning, or exhibited such extraordinary powers as Burke recognized in Junius? Without pursuing the inquiry further, suffice it to say in conclusion of this sketch that whoever he was, or whatever may have been said or written, or may hereafter be said or written, about the *Letters* of Junius, either in relation to the identity of the author or to the character of their matter, one thing must be conceded by all; and that is, they produced a deeper and more lasting impression upon the popular mind in Great Britain in the cause of liberty than any anonymous writings ever did before or have done since in any age or country. To this it may also be added the probability is that no part of the great work of Junius was better executed than that in which he undertook to be "the sole repository of his own secret." If so, it certainly "perished with" him. His political principles, however, still live, and will live for ever. A. H. Stephens.

Lytton (Edward George Earle **Lytton Bulwer**), first Baron. See Bulwer.

Lyt'ton (Edward Robert **Bulwer-Lytton**), Earl, eldest son of the eminent novelist, b. in England Nov. 8, 1831; was educated first at Harrow, then under private tutors, and afterwards at Bonn, Germany, where he devoted himself especially to modern languages; entered the diplomatic service in 1849 as attaché and private secretary to his uncle, Sir Henry Bulwer, minister at Washington; was transferred in the same capacity to Florence in 1852, and to Paris in 1854. As paid attaché he was sent to the Hague in 1856, to St. Petersburg in 1858, to Constantinople in the same year, and to Vienna in 1859. He was acting consul-general at Belgrade in 1860, and was employed on a special confidential mission for preventing the renewal of hostilities between the Turks and the Servians (1862). He was in the same year made second secretary of legation, and in Jan., 1863, was sent to Constantinople as first secretary; was chargé d'affaires for brief intervals in 1863 and 1864; secretary of legation at Athens in 1864, and at Lisbon in 1865, where he was chargé d'affaires several times, and at Madrid in 1868; became secretary of embassy at Vienna in the same year; at Paris in 1872, where he acted twice in 1873 as chargé d'affaires; received the appointment of ambassador at Lisbon in Dec., 1874; in May, 1875, declined the governorship of Madras, and was viceroy of India 1876–80, during the last Afghan war. He married in 1864 a niece of the late earl of Clarendon, succeeded to his title as Baron Lytton on the death of his father, Jan. 18, 1873, and was promoted to an earldom on his return from India. His first appearance as an author was under the *nom de plume* of "Owen Meredith" with *Clytemnestra and Other Poems* (1855). *The Wanderer, a Collection of Poems in Many Lands* (1859), and *Lucile* (1860), a novel in elegant verse, established his reputation as a popular poet. In 1861 he published anonymously *Tannhäuser, or the Battle of the Bards*, in collaboration with an intimate friend, since deceased, whose biography he wrote in 1871 under the title *Julian Fane, a Memoir*. In 1861 he issued *Serbski Pesme*, a translation of the national songs of Servia; in 1863 a prose romance, *The Ring of Amasis*; in 1868 *Chronicles and Characters*; in 1869 *Orval or the Fool of Time*, a dramatic poem paraphrased from the Polish, with imitations of authors in several other languages; in 1874 *Fables in Song* (2 vols.) and *Speeches of Edward, Lord Lytton, with some of his Political Writings Hitherto Unpublished, and a Prefatory Memoir*. In 1867 a collected edition of the *Poetical Works of Owen Meredith* appeared in two elegant volumes, and were republished in the U. S., where most of them had previously appeared. Without attaining the mark of creative genius, all the poems of Lord Lytton are fluently and elegantly written.

Porter C. Bliss.

Lyve'den (Robert Vernon Smith), first Baron, b. in London Feb., 1800, nephew of Rev. Sidney Smith; educated at Eton and Christ Church, Oxford; entered Parliament for Tralee in 1829; was member for Northampton in the Liberal interest from 1831 until his elevation to the peerage, July, 1859. He was a lord of the treasury 1830–34, secretary of the board of control 1835–39, under-secretary of state for the colonies 1839–41, secretary at war 1852, and president of the board of control 1855–58. D. in London Nov. 10, 1873.

M.

M, a labial consonant, of the class called liquids. In the Roman notation it stands for *mille*, one thousand. As an abbreviation it represents *mile*, noon (*meridies*), *mètre*, *Marcus*, the French title *Monsieur*, etc. M̄. stands for 10,000; M' for the Roman name *Manius*. For its usual meanings in combination with other letters, see A. M., H. M., M. C., M. D., M. E., M. P., N. M., P. M., Q. M., R. M., S. M., etc. in the table of ABBREVIATIONS. In music it is often used in the following combinations: M. G., *main gauche*. "the left hand;" M. D., *main droit*, "the right hand." M. M., with a note and certain figures annexed, indicates the minute measure of a bar as shown by Maelzel's metronome. M. F. and M. P., for *mezzo forte* and *mezzo piano* (or *mf* and *mp*), mean, respectively, "rather loud" and "rather soft."

Maabar, a kingdom existing during the Middle Ages on the Coromandel coast of India, occupying nearly the same territories as the modern presidency of Madras.

Maas. See MEUSE.

Mab [Cymric, "a child"], an imaginary being, who in English folk-lore shares with Titania the honor of being queen of the fairies. In Shakspeare's *Romeo and Juliet*, Ben Jonson's *Satyr*, Milton's *L'Allegro*, and other poems of the seventeenth century, her characters are variously set forth.

Mabillon' (JEAN), b. Nov. 23, 1632, at St. Pierremont, in Champagne, France; educated at the theological seminary of Rheims; entered in 1563 the order of the Benedictines, and d. at Paris Dec. 27, 1707. His collections and editions of historical documents, *Vetera Analecta* (4 vols., 1675–85) and *Musæum Italicum* (2 vols., 1787–89), gathered in Germany and Italy, and based on critical researches, are very valuable; and his *De Re Diplomatica* (1681), in which he set forth and defended his method, and which was violently attacked by the Jesuits, exercised a wholesome influence on the study of history. He also wrote *Acta Sanctorum Ordinis S. Benedicti* (9 vols., 1668–1702) and *Annales Ordinis S. Benedicti* (6 vols., 1703–39).

Mably', de (GABRIEL BONNOT), a brother of Condillac, b. at Grenoble, France, Mar. 14, 1709; educated in the college of the Jesuits at Lyons; served for some time as secretary to his relative, the minister-cardinal Tencin, but gave up this position, and lived afterwards in retirement, solely occupied with literary pursuits. D. in Paris Apr. 23, 1785. He was an enthusiastic admirer of the ancient republics of Greece and Rome, as shown by his works, *Observations sur l'Histoire de la Grèce* (1766) and *Observations sur les Romains* (1751), but his understanding of their social and moral order was incomplete, and the conclusions he arrived at with respect to modern societies in his *Parallèle des Romains et des Français* (1740) were very erroneous and superficial. He enjoyed a great reputation, however, with his contemporaries, and he was invited by the Polish diet and the American Congress to write his *Du Gouvernement de Pologne* (1781) and *Observations sur le Gouvernement et les Lois des Etats-Unis d'Amérique* (1784). The singular, often ludicrous, enthusiasm for antique ideas and forms which prevailed during the Revolution was largely due to him, and later philosophers have generally agreed in tracing the rudimentary ideas of modern communism in his *Entretiens de Phocion* (1763), *De la Législation* (1776), and *Principes de Morale* (1784).

Macad'am (JOHN LOUDON), b. at Ayr, Scotland, Sept. 21, 1756; came to New York in 1770 to reside with an uncle; was during the American Revolution a loyalist; made a considerable fortune as agent for the sale of vessels brought into port as prizes, but lost most of it by his forced withdrawal at the peace of 1783; returned to Ayrshire, Scotland; became a magistrate and deputy lord lieutenant of the county, and as trustee of roads introduced the system of roadmaking called by his name. He was engaged for much of the time during many years in travelling at his own expense through Great Britain to examine the condition of the roads; addressed in 1811 a memorial on the subject to the House of Commons, which led to the adoption of his system and to his own appointment as surveyor of roads in the Bristol district, where in 1816 he commenced *macadamizing* the highways. Within a few years he had personally supervised the roadmaking in twenty-eight counties of England, and during his lifetime nearly every travelled route in Great Britain was a monument of his success. No patent was solicited for his system, which consists in the application of a layer of broken stones to the centre of the road, and no remuneration asked beyond the payment of the expenses of his personal supervision; he refused an offered knighthood—which he declined on account of his age—but accepted a testimonial of £2000 voted him by Parliament. D. at Moffat, Scotland, Nov. 26, 1836. He wrote *A Practical Essay on the Scientific Repair and Preservation of Public Roads* (1819), *Remarks on the Present State of Roadmaking* (1820), and *Observations on Roads* (1822).—His son JAMES (d. 1852) accepted knighthood and the office of superintendent of roads for the London district.

McAdoo (WILLIAM GIBBS), A. B., A. M. See APPENDIX.

McAl'ester (Gen. MILES D.), b. in New York in 1834; graduated at the U. S. Military Academy July, 1856, and entered the army as brevet second lieutenant of engineers; received his full appointment of second lieutenant Dec., 1856; promoted to be first lieutenant May, 1861, captain Mar., 1863, and major of engineers Mar., 1867. His first service was at Fort Taylor, Fla., where he remained a year, whence he was transferred to New York, and at the outbreak of the civil war was engaged in repairing Fort Mifflin, Del. During the Peninsular campaign (1862) he was chief engineer of the 3d corps of the Army of the Potomac, and engaged at Yorktown, Williamsburg, Fair Oaks, and Malvern Hill; in the Maryland campaign at South Mountain and Antietam. In Oct., 1862, was transferred to Ohio as chief engineer of that department, and engaged in fortifying Cincinnati, Newport, and Covington, and in constructing bridge-trains; during the siege of Vicksburg was selected by Gen. Grant to serve under him, and on the surrender of that place was assigned to duty at the Military Academy as assistant professor of engineering; in July, 1864, was transferred to the South, and as chief engineer of the division of West Mississippi participated in the siege and capture of Forts Morgan and Gaines, Ala.; for gallant services during the Peninsular campaign received the brevets of major and lieutenant-colonel, and for highly meritorious services at the siege of Forts Gaines and Morgan that of colonel and brigadier-general. After the close of the war he superintended the defences of Mobile and Pensacola, and subsequently the important work of improving the mouths of the Mississippi River, where he introduced various new methods, and designed a boat especially adapted to the work, which has since been in operation with eminent success. D. at Buffalo, N. Y., Apr. 23, 1869. G. C. SIMMONS.

McAl'lister (HUGH N.), b. in Juniata co., Pa., in June, 1809; graduated at Jefferson College, Canonsburg, Pa., and at the Dickinson College law school; was a prominent citizen of Bellefonte, Pa., the principal founder of the State Agricultural College, and a member of the constitutional convention of 1873. D. at Philadelphia May 5, 1873.

McAllister (MATTHEW HALL), LL.D., b. at Savannah, Ga., Nov. 26, 1800; educated at Princeton College; became a renowned lawyer and politician in his native city, where his father and grandfather had previously practised law with distinction; was appointed in 1827 U. S. district attorney for Georgia; was in 1832 active in opposition to nullification; was several times elected to both branches of the legislature, in which he obtained the establishment of the court for the correction of errors; was some years mayor of Savannah; was a noted protector and friend of the colored people, and was defeated by a very small vote in 1845 as Democratic candidate for the governorship. In 1850 he removed to California with his family; entered upon the practice of law in San Francisco, and was from 1855 to 1862 the first U. S. circuit judge of California. In this capacity he rendered eminent services by his wise decisions upon land-titles, which were then in the utmost confusion, and also by his energetic action in suppressing the "Vigilance Committee" by an appeal to the naval authority. Judge McAllister was a brother-in-law of Dr. J. W. Francis, and like him a courtly gentleman of the old school. He resigned his judgeship from failing health in 1862, and d. at San Francisco Dec. 19, 1865. A volume of his legal opinions was published by one of his sons.

McAllister, Fort, a strong earthwork built by the Confederate engineers on Genesis Point, on the right bank of the Great Ogeechee River, 6 miles from Ossabaw Sound and 12 miles S. of Savannah, Ga., had three half bastions, two curtains, and twenty-one guns; successfully resisted assaults by the fleet of monitors under Com. Worden Jan. 27, Feb. 1, and Mar. 3, 1863, partially disabling by its fire the Montauk and Passaic. It was taken by assault by Gen. Hazen with the 2d division of the 15th corps, Dec. 13, 1864, with a loss of 90 men. After a brief but desperate struggle, fighting hand to hand over the parapet, Hazen's troops won a complete victory. The fort, garrison, and armament fell into the hands of the nationals. This was the closing military feat of Sherman's "march to the sea," and was a chief cause of the surrender of Savannah.

McAlpine (William J.), b. in New York City in 1812; received a high academic education, and commenced engineering in 1827 under John B. Jervis, with whom he remained until 1839, having been employed upon the Delaware and Hudson Canal and R. R., and upon the State canals and other hydraulic works planned and constructed by that eminent engineer, and incidentally on the St. Lawrence canals, under the late Benjamin Wright. He succeeded Mr. Jervis as engineer of the Erie Canal enlargement, E. D., until 1846, when he was called upon to construct the dry dock at the Brooklyn navy-yard; in 1852 was elected State engineer of New York; in 1854–56 was railroad commissioner of the State, and made a valuable report on the principles and practice of railway construction and management; for two years was acting president and engineer of the Erie Railway, and later engineer of the Galena and Chicago and of the Ohio and Mississippi railways; constructed the Albany and Chicago waterworks, and planned those for Brooklyn, New Bedford, etc.; in 1870 presented plans for the improvement of the cataracts of the Danube ("the Iron Gates"), which were adopted by the Austrian government. His advice has been called for upon important engineering works in this country, and as a writer he has contributed useful and practical information to the engineering profession.

Macanal′ly (David Rice), D. D., b. in Granger co., Tenn., Feb. 17, 1810; ordained a Methodist clergyman in 1831; preached in Tennessee, North Carolina, and Virginia; was president of the East Tennessee Female Institute at Knoxville, Tenn., 1843–51, and became editor of the St. Louis *Christian Advocate* in 1851. He wrote *Martha Laurens Ramsay, a Biography*, and *Life and Times of Mr. William Patton, Sunday-school Manual*, and compiled a hymn-book.

Macao′, city and seaport on the coast of China, in the province of Quang-Tong, belonging to Portugal, and situated on a peninsula at the mouth of the Canton River, 40 miles from Hong Kong. The Portuguese established a factory here in 1517, obtained a grant of the place from the Chinese emperor in 1586, and made it the seat of a very extensive trade. But since the establishment of the English at Hong-Kong its commerce has much decreased, though it was made a free port in 1846. The coolie-trade was the chief business until abolished in 1874. Its situation and climate are delightful. Camoens resided here, and wrote his *Lusiad;* an adjacent cave is still pointed out as a favorite place of his. Pop. 100,000, of whom 10,000 are European.

Macapa′, town of Brazil, in the province of Para, on the left bank of the Amazon, is situated just below the equator, is well built, has a good harbor, and trades much in timber and ornamental woods. Pop. 7500.

Macaro′ni [It. *maccheroni*], **Vermicelli** ["little worms"], **Fedelini**, and **Italian Paste** are all forms of the same familiar substance, much used for culinary purposes. They are made from very white and glutinous varieties of wheat, such as are grown in Russia, Italy, and California. The wheat is ground by a peculiar process, being first wet and then heated. The flour resulting is very coarse. It is mixed with warm water and carefully worked into a uniform paste. This paste is forced by a press through holes in an iron plate. If the holes are very small, *vermicelli* is thus formed. A still finer and smaller sort is *fedelini.* Large pipe-shaped cylinders of this paste constitute *macaroni.* When the paste is rolled thin and cut into various shapes, *Italian paste* is the result. After moulding the macaroni is partially baked. Italy is the principal seat of this manufacture. France and England produce a considerable quantity, and of late a few firms in the U. S. produce an article not inferior to any of the imported kinds.

Macaron′ic Verse is named from the *Maccaronea* (1521) of Teofilo Folengo (1491–1544), called Merlino Coccajo, a Benedictine, whose work was republished as *Opus Macaronicum* in 1651. The name designates a sort of humorous verse in which Latin and Latinized words are mixed with the vernacular. This sort of literature is far older than Folengo, but the name does not seem to have been used before he adopted it and made others adopt it. (See Delepierre, *Macaroneana* (1852), *De la Littérature Macaronique* (1856), and Morgan's *Macaronic Poetry* (New York, 1872).)

MacArthur, on R. R., cap. of Vinton co., O. (see map of Ohio, ref. 7–F, for location of county), has numerous iron-furnaces and potteries, flouring-mills, a saw-mill, tannery, marble-works, carriage-factories, a woollen-factory, etc. Pop. in 1870, 861; in 1880, 900.

McArthur (Gen. Duncan), b. in Dutchess co., N. Y., June 14, 1772; removed in childhood to Western Pennsylvania; was a volunteer in Harmar's and the succeeding Indian campaigns in Kentucky and Ohio from 1790 until Wayne's victory (1797), after which he settled near Chillicothe, O., as a surveyor; acquired large property in land; was chosen to the legislature (1805), became major-general of militia (1808), colonel of Ohio volunteers May 7, 1812; was second in command at Hull's surrender; made brigadier-general in the U. S. army Mar. 12, 1813; was second in command of the army of the West under Gen. Harrison, whom he succeeded in 1814, when he projected and partially executed a plan for the conquest of Upper Canada; was joint commissioner with Gen. Cass to treat with the Ohio Indians for the sale of their lands within the State (1816–17); served in the legislature (1815–21), was Speaker (1819); member of Congress (1823–29), and governor of Ohio (1830–32). D. near Chillicothe Apr. 28, 1839.

McArthur (John), b. at Plymouth, England, in 1766; entered the army, and was stationed in Australia in 1790 with the rank of captain, when, perceiving that the country was peculiarly adapted to wool-growing, he procured a small grant of land at Paramatta, near Sydney, brought sheep from India, South Africa, England, and Spain; improved the fleeces by crossing the breeds, and in a few years obtained a quality nearly equal to the genuine merino wool. In 1802 he obtained the patronage of the English government and a grant of 10,000 acres of land; became a grazier on a large scale, and soon afterwards devoted a similar attention to the introduction of suitable vegetable crops into Australia. These labors procured him the reputation of being the "founder of the colony," in which the woollen industry has now reached vast dimensions. D. at Camden, New South Wales, Apr. 10, 1834.

McArthur (Gen. John), b. in Erskine, Renfrewshire, Scotland, Nov. 17, 1826; worked as a blacksmith till twenty-three years of age, then settled at Chicago as a boilermaker. He entered the Union army in 1861 as lieutenant-colonel of the 12th Illinois Vols.; was soon promoted to colonel, commanded a brigade at Fort Donelson, and was made brigadier-general of volunteers Mar. 21, 1862; was wounded at Shiloh; commanded a division under McPherson in the Vicksburg campaign, and under Gen. A. J. Smith at the battle of Nashville, and for gallantry in that engagement was made brevet major-general.

Macart′ney (George **Macartney**), K. B., first Earl of, b. at Lissanore, near Belfast, Ireland, May 14, 1737; graduated at Trinity College, Dublin, 1757; studied law at the Middle Temple, London; travelled over a great part of Europe; entered Parliament on his return; was sent as envoy to Russia 1765; signed a commercial treaty with that power 1766, which was disavowed by the foreign office; published *An Account of the Russian Embassy* (1767); became chief secretary to the viceroy of Ireland 1769; took a prominent part in the debates of the Irish Parliament for the ensuing period; wrote *A Sketch of the Political History of Ireland* (1773); was appointed governor of the British Antilles 1775; made baron in the Irish peerage 1776; was forced to surrender to the French squadron of Admiral d'Estaing, and carried a prisoner to France 1779; appointed political resident at Madras 1780; governor of that province June 21, 1781; distinguished himself for high administrative qualities at a critical period, when Hyder Ali, the sultan of Mysore, was vigorously assaulting the British posts in the Carnatic; raised money and recruits, repulsed the natives, aided Hastings and Sir Eyre Coote in driving the Dutch from the Coromandel, took Trincomalee in Ceylon, made treaties with the native chiefs, and held Madras against the powerful French squadron, enduring famine until relieved from a perilous situation by the peace of 1783. Involved in a rivalry with Warren Hastings, he was recalled in 1785, but while still at Calcutta was tendered the position of governor-general of Bengal, which he declined, and returned to England 1786. A few years later he was selected as first British ambassador to China; sailed from Portsmouth with a brilliant suite Dec. 26, 1792; was received by Kien-Lung, emperor of China, in Mantchooria, Sept. 14, 1793, and returning to Peking, opened negotiations for a commercial treaty, demanding the right to establish factories at Peking and three other cities, free trade between Macao and Canton, and a fortified post in the latter port. Offended at the pressure put upon him, or perhaps (according to French authorities) acceding to the advice of the Jesuit missionaries, Kien-Lung suddenly broke off the conferences and ordered the British embassy to leave the capital within forty-eight hours. After experiencing some dangers the embassy arrived at Macao in December; sailed for Java in Mar., 1794; sent thence to India tea-plants and other useful Chinese plants, which were soon naturalized there; and reached Portsmouth Sept. 26, 1794. Lord Macartney was made an earl in the Irish peerage Mar., 1794; was sent as minister to Italy 1795; became a baron of the United Kingdom 1796; went as first British governor to the Cape of Good Hope 1797; returned in feeble health 1798, and lived thenceforth in retirement until his death at Chiswick, Surrey, Mar. 31, 1806. An official account of Earl Macartney's embassy to China was published by Sir George L. Staunton, his secretary (2 vols., 1797), and was of great value in diffusing more exact information upon the history, political and natural, and the social condition of the Chinese empire. Macartney's *Journal of the Embassy* and a selection of his other writings was edited by Sir John Barrow, with a memoir (2 vols., 1807).

Macartney Pheasant. See PHEASANT.

Macas'sar, town of Celebes, situated on the southern shore of the island, on the Strait of Macassar, in lat. 5° 10′ S. and lon. 119° 20′ E. It is the capital not only of the government of Macassar, but of all the Dutch possessions in Celebes. The residence of the governor is surrounded by walls and ditches, and defended by Fort Rotterdam. Its harbor is spacious and safe, and its trade, especially in tortoise-shell, edible nests, ebony, sandalwood, rice, and spices, is very brisk. The native inhabitants of the town and government of Macassar are Mohammedans, and are considered the most gifted and civilized tribe of the Malayan race, carrying on agriculture, commerce, and shipbuilding with great success. Pop. of town, 12,000.

Macas'sar, Strait of, separates Borneo from Celebes, and varies in breadth from 50 to 150 miles. Its navigation is somewhat difficult on account of shoals and rocks.

Macau'lay (CATHERINE **Sawbridge**), b. at Ollantigh, Kent, England, in 1733; married in 1760 Dr. George Macaulay, devoted herself to political studies, and published a *History of England, from the Accession of James I. to that of the Brunswick Line* (8 vols., 1763–83), a work written from a republican point of view, and which had great success, though now forgotten. She commenced another *History of England from the Revolution to the Present Time* (1778), of which but one volume, reaching to 1742, was published, and wrote several political and philosophical pamphlets. After the death of Dr. Macaulay she married in 1778 a Mr. Graham. She was a great admirer of Washington, with whom she maintained a correspondence, and visited the U. S. in 1785, chiefly to see him. D. at Binfield, Berkshire, June 22, 1791.

Macaulay (THOMAS BABINGTON), BARON MACAULAY OF ROTHLEY, b. at Rothley Temple, Leicestershire, England, Oct. 25, 1800, son of Zachary Macaulay, eminent as a philanthropist, and grandson of Rev. John Macaulay, a Presbyterian minister at Inverary in the Scotch Highlands, who is mentioned with respect by Dr. Johnson in his *Tour to the Hebrides.* The family was originally from the island of Lewis, the largest of the group of the Outer Hebrides. The mother of Lord Macaulay was Selina Mills, daughter of a bookseller at Bristol, of Quaker descent. His early education was of a religious type, not unmixed with austerity, but this influence was happily modified by frequent visits to the celebrated authoress, Hannah More, who took great interest in the precocious boy, of whose early traits of character and literary tastes she gave valuable notices in her *Letters to Zachary Macaulay* (published in 1860). At the age of twelve years he was placed under the tutorship of a Mr. Preston at Shelford, made surprisingly rapid progress in the classics, and in 1818 entered Trinity College, Cambridge, where he gained the chancellor's medal in 1819 for a poem on *Pompeii*, and again in 1820 for a poem on *Evening;* took the second Craven scholarship in 1821, and bore off the palm at the "Union" debating society from many brilliant competitors, among whom were his intimate friends, W. M. Praed and Nelson Coleridge. Having a distaste for mathematics, he did not compete for honors in scholarship, but the extent and variety of his classical and literary reading while at college was probably never surpassed by any undergraduate. He took his bachelor's degree in 1822, was chosen to a fellowship the same year, and passed his time until 1826 alternately at London and Cambridge, untiringly engaged in adding to his vast stores of miscellaneous information. His début as a writer was made in the columns of the *Quarterly Magazine*, published by Charles Knight, and edited by his college friends Praed and Coleridge, to which he contributed his fine poems *Ivry* and the *Spanish Armada* and several prose articles (1824); but his brilliant essay on *Milton*, published in the *Edinburgh Review* for Aug., 1825, first revealed him to the world as an aspirant for the highest honors in the modern science of criticism. For twenty years thereafter he was a constant writer for the *Review*, chiefly upon subjects involving a wide range of historical knowledge, as well as an almost unexampled mastery of ancient and modern literature; and his essays were soon regarded as the leading feature of a periodical which counted many celebrated names among its contributors. Macaulay took his master's degree in 1825; was called to the bar at Lincoln's Inn Feb., 1826, but seems never to have practised law, and soon devoted all his splendid energy to the service of the Whig party, to whose doctrines he adhered with an unquestioning and fervent conviction which quickly advanced him to a place in its counsels. In 1828 he was appointed by the Whig government a commissioner of bankruptcy, and in 1830 Lord Lansdowne procured his election to Parliament from the "pocket borough" of Calne. His first public appearance as an orator had been made in 1826, at the annual meeting of the Antislavery Society; his first speech in Parliament was in favor of the repeal of the civil disabilities of Jews (Apr. 5, 1830), and his second against slavery in the West Indies (Dec. 13). In the great debates on the Reform bill Macaulay took a very prominent part, making eight speeches on the subject, and in the election to the reformed Parliament was returned for the town of Leeds. As a parliamentary orator he took high rank for real eloquence and for the exhaustive manner in which he treated his subjects, though his delivery was too rapid and monotonous to produce upon the audience the full argumentative effect of his speeches, which was better understood when they appeared in print. In 1833 he was appointed secretary to the board of control, but in 1834 resigned that office and his seat in Parliament to accept the post of legal member of the supreme council of India. He remained at Calcutta nearly three years, chiefly engaged in the preparation of a new penal code, which embodied the most liberal principles. It established in many respects an equality of rights between natives and Europeans, and was therefore unpopular with the latter. This code was published in 1838, but never put in operation, though many of its features have quite recently been adopted with good results. During his residence at Calcutta he continued the main line of his historical studies, writing several of his most brilliant essays upon European topics, his only Oriental essays, those on Lord Clive and Warren Hastings, not having been written until some years later. Returning from India in 1838, he was elected to Parliament from Edinburgh, and was secretary of war in the Melbourne ministry, with a seat in the cabinet (1839–41), taking, as before, a prominent part in the parliamentary debates, but finding leisure to write his *Lays of Ancient Rome* (1842). An imperfect collection of his essays having been printed in the U. S., where they attained an enormous circulation, he issued an authorized edition in 1843, and thenceforth directed his studies to the higher task of a history of his native country. He was an active member of the opposition during the five years of Tory supremacy (1841–46), and on the return of the Whigs to power (1846) received the lucrative post of paymaster of the forces, but having incurred the disfavor of his Edinburgh constituency by his course in support of the Maynooth grant, he was defeated at the election of 1847, and thus involuntarily found himself at leisure to give definite form to his long-projected *History of England*, which was awaited with eager interest. Never perhaps were high expectations better satisfied than by the first two volumes of Macaulay's *History*, which appeared in 1848, and were immediately sold by scores of thousands, both in England and the U. S., and hailed as the great work of the age. The third and fourth volumes did not appear until 1855, when they had an equal success. In 1849, Macaulay was chosen lord rector of the University of Glasgow, and announced his retirement from political life, but was returned to Parliament in 1852 by his former constituency of Edinburgh. Owing to feeble health he took no part in debate. In 1857 he was made a peer of the realm under the title of Baron Macaulay of Rothley, and in the same year received the greater honor of being chosen a foreign associate member of the French Academy of Moral and Political Sciences. Lord Macaulay survived his promotion but a short time. D. at his residence, Holly Lodge, Kensington, Dec. 28, 1859, and was buried in Westminster Abbey. As he was never married, the title expired with him. A posthumous volume of his *History* brought it down to the death of William III., but the great work was destined to remain a mere fragment of that originally projected, which was to have included the reign of George III. A collection of Lord Macaulay's *Speeches* first appeared in the U. S. in 1853, which led to an authorized edition in 1854. Biographies of Dr. Johnson, Atterbury, Bunyan, and Goldsmith, contributed to the 8th ed. of the *Encyclopædia Britannica* (1857–58), were among the latest productions of Macaulay's pen. His characteristics as a historian are well known, and his interesting volumes will remain one of the English classics; but the view of English history which they present will require constant correction by the perusal of annalists of humbler name, less governed by partisan interests. The mind of this brilliant essayist was so peculiarly constituted, and so devoted to antithesis and paradox, that it is a rare occurrence to find any speculative opinion in his pages which can maintain itself intact against a searching criticism. (See his *Biography*, by his nephew, George Otto Trevelyan (2 vols., 1876).) PORTER C. BLISS.

MacAu'ley (CATHARINE E.), b. in Dublin co., Ireland, in 1787; while a child lost her parents; was adopted by Mr. Callahan, and at his death received his fortune; founded in 1827 in Dublin a home for poor women, which was the nucleus of the order of the "Sisters of Mercy," of which she became superior in 1831, and which has since spread widely in Europe and America. D. in 1841. (See *Life of Catharine MacAuley* (1866).)

Macaw', a name given to a large number of tropical American birds of the parrot family (Psittacidæ), constituting a rather well-marked group, and according to some authors a sub-family, called Macrocercinæ. They are easily tamed, but hard to instruct, and seldom become good talkers; but they are large and handsome birds, of very bright plumage, and usually of gentle disposition. The red and blue macaw (*Macrocercus macao*), the blue and yellow macaw (*M. ararauna*), the great green macaw (*M. militaris*), and the great scarlet macaw (*M. aracanga*) are among the best-known species. The parrakeet macaws are of the genus *Conurus*, to which the Carolina parrot belongs. The *Conurus Guianensis*, generally known as the parrakeet-macaw, is the best talker of all the long-tailed parrots.

Macbeth', or **Macbeathad MacFinlegh,** a king of Scotland in the eleventh century, immortalized as the hero of one of Shakspeare's tragedies, but of whom little is positively known. He was the son of Finlegh, a chieftain from whom he inherited the rule of the province of Moray, and married Gruoch MacBoedhe, a granddaughter of King Kenneth MacDuff. In a war with King Duncan MacCrinan, Macbeth defeated and killed that prince at Bothgouanan, near Elgin, in 1039, after which he was proclaimed king of Scotland, probably as a vassal of Thorfinn of Norway. His reign is chronicled as a time of plenty and prosperity. He made grants to the Culdees of Loch Leven, and made a pilgrimage to Rome in 1050. In 1054, Malcolm MacDuncan (or Ceanmore), eldest son of King Duncan, invaded Scotland with a force collected by the aid of Siward, earl of Northumberland, and defeated Macbeth near Dunsinane. He fled N. of the Grampians, and resisted nearly three years longer, until he was killed at the battle of Lumphanan, Aberdeenshire, Dec. 5, 1056, by Malcolm and MacDuff; in consequence of which Malcolm was crowned king at Scone in the following April. Many fabulous circumstances attributed to Macbeth were compiled from early chronicles by the Scottish historian Hector Boece or Boethius (1526), from whose pages they were taken by Holinshed, and thus became known to Shakspeare.

McCabe (JAMES D., JR.), b. in Richmond, Va., about 1840; was educated at the Virginia Military Institute; wrote in early youth for the Abingdon *Virginian*; resided in Richmond during the war, employing his pen in the service of the Confederate cause; wrote three plays upon war-topics 1862–63; edited the *Magnolia Weekly* 1863–64; published a *Life of Lieut.-Gen. T. J. Jackson* (1863), a *Memoir of Gen. A. S. Johnston* (1866), and a *Life and Campaigns of Gen. R. E. Lee* (1867), besides many poems, miscellaneous writings, and nearly 200 short stories. He has since the war resided chiefly at Brooklyn, N. Y., engaged in constant and successful literary work.

McCabe (WILLIAM BERNARD), b. at Dublin, Ireland, Nov. 23, 1801; was engaged as a writer on the Irish press 1824–35; was Parliamentary reporter for the *Chronicle* and *Herald* 1835–51, gaining a high reputation for the accuracy of his reports; was editor of the *Weekly Telegraph*, a Catholic paper in Ireland, 1851–56, and has since been engaged upon magazine essays, novels, and translations from the Greek, German, and Italian. He has published 3 volumes of a *Catholic History of Ireland* (1848–54), embracing the Anglo-Saxon period.

Maccabees. See JEWS, by PROF. FELIX ADLER.

Mac'cabees, Books of, are five in number. Two are received as canonical by the Roman Catholic, and three by the Greek Church. The first two are sometimes printed in Protestant Bibles in the Apocrypha.

THE FIRST BOOK OF THE MACCABEES is now generally received as trustworthy history, and is a work of great value. It narrates in modest and well-chosen language the history of Mattathias and his three most famous sons, comprising the history of the Jews from 175 to 135 B. C., and was probably written in Palestine by a Jew between the death of John Hyrcanus (B. C. 106) and the capture of Jerusalem by Pompey (B. C. 63). Its original language was Hebrew, but the Hebrew original is lost, and the Jews have never received it as canonical. An ancient Greek version is the oldest text now known.

THE SECOND BOOK OF THE MACCABEES is of later date and smaller value than the first. Its narrative begins some four years earlier than that of the first book, with which it is partly a parallel history. It is a compilation from different sources not always harmonious or correct. Its author was apparently a Jew of Palestine who wrote in Greek at an uncertain date, though probably before the destruction of Jerusalem, in 70 A. D., and professes to follow in the main the narrative of one Jason of Cyrene, an eye-witness of the recorded events. The second book was written with a religious or didactic design, rather than to serve simply as a record of events, and was never received as canonical by Jews or Protestants. It has some historical value.

THE THIRD BOOK OF THE MACCABEES (so called) was probably written in Greek by a Jew of Alexandria. It has nothing to do with the Maccabees, but gives a marvellous and distorted account of the sufferings and deliverance of the faithful Jews of Alexandria during the reign of Ptolemy Philopator. It is of little value, though there may be a basis of historic truth underneath the distorted narrative. It has never been received as canonical by the Jews, Roman Catholics, or Protestants.

THE FOURTH BOOK OF THE MACCABEES, written in Greek, probably by a Jew of Alexandria, treats of the philosophy of morals and religion from a Jewish-Stoical standpoint, and contains illustrations derived from the narrative of the second book of Maccabees. It is of no historic value, and is not received as canonical by either Jews or Christians. Still another fourth book of the Maccabees is mentioned by old writers, but it is probably not extant.

THE FIFTH BOOK OF THE MACCABEES, in fifty-nine chapters, was translated into English (1832) by Cotton from the Arabic. It was probably written in Hebrew by a Jew after the destruction of Jerusalem. It is a compilation, and has some historic value. It has never been received as canonical, and has been but little noticed.

McCaine (ALEXANDER), b. in Tipperary, Ireland, about 1775; came to America in 1791; entered the Methodist ministry in 1797; filled many important pulpits until 1821, and was prominent in the movement for lay representation. He was one of the leaders of the Methodist Protestant Church, and published in 1829 his work, *History and Mystery of Methodist Episcopacy*, which called forth Bishop Emory's *Defence of our Fathers*. D. June 1, 1836.

McCall (EDWARD R.), b. at Charleston, S. C., Aug. 5, 1790; entered the navy in 1808 as midshipman; became first lieutenant in 1813, in which year he succeeded to the active command of the Enterprise after Capt. Burrows was mortally wounded in the engagement with the British brig Boxer, which vessel fell into his hands. For this service Congress presented him with a gold medal. Attained a captaincy in 1835. D. at Bordentown, N. J., July 31, 1853.

McCall (Gen. GEORGE ARCHIBALD), b. in Philadelphia Mar. 16, 1802; graduated from West Point, and entered the army as second lieutenant of infantry 1822; first lieutenant 1829, captain 1836, major 1847. In addition to the routine of garrison-life, McCall served for five years (1831–36) on the staff of Gen. Gaines, and in 1836 and 1841–42 was actively engaged in Florida against the Seminoles. In the war with Mexico he won the brevets of major and lieutenant-colonel for gallantry in the battles of Palo Alto and Resaca de la Palma; subsequently served as chief of staff to Gen. Patterson. Appointed inspector-general, with the rank of colonel, in 1850, he resigned from the army in 1853. In the civil war he organized the Pennsylvania Reserve Corps, and was commissioned, May 15, 1861, by the State a major-general of Pennsylvania volunteers. Two days later he was appointed brigadier-general of U. S. volunteers, but retained command of the Reserve Corps, which as a division of the Army of the Potomac held the right of the line of that army before Washington 1861–62, and a portion of which was engaged in the action and occupation of Dranesville, Dec. 20, 1861. In the Virginia Peninsular campaign of 1862 he was engaged with his command at Mechanicsville, Gaines's Mill, and Frazier's Farm, being taken prisoner at the latter battle, and held until August, when he was exchanged; but his impaired health not permitting his return to the army, he resigned Mar. 31, 1863, and retired to his farm near West Chester, Pa., where he d. Feb. 25, 1868.

McCallum (DANIEL CRAIG). See APPENDIX.

McCalmont (ALFRED B.), b. at Franklin, Venango co., Pa., about 1826; became a lawyer of Franklin, and afterwards of Pittsburg, Pa., where he was made city solicitor in 1855. He was a prominent Democrat, and was assistant attorney-general of the U. S. during the Presidency of Mr. Buchanan. He removed to his native town; was lieutenant-colonel, and afterwards colonel, of the 142d Pennsylvania Vols. in the civil war, and in 1864 became colonel of the 208th Pennsylvania, and in 1865 was brevetted brigadier-general. After the war he resumed the practice of his profession. D. at Philadelphia May 7, 1874.

Maccalub'ba [Arabic], a mud-volcano 6 miles N. of Girgenti, Sicily, rises 147 feet above the plain, and 804 feet above the sea, has numerous small craters, and occasionally casts up stones and mud. Gas is continually pouring out, and there are signs of petroleum. Sulphur, salt, and petroleum are obtained near by. Earthquake-shocks are not unfrequent. Solinus is the earliest extant writer who mentions this remarkable volcano.

McCann (WILLIAM P.), b. in Kentucky May 4, 1830; entered the navy as a midshipman Nov. 1, 1848; became passed midshipman in 1854, lieutenant in 1855, lieutenant-commander in 1862, commander in 1866. Executive officer of the Maratanya in 1862, and very frequently in battle on the York, James, and Pamunkey rivers, Va.; commanded the Hunchback at the battle of New Berne, Mar. 14, 1863, and is thus highly spoken of by Com. Murray in his official report of that action: "The manner in which Lieut.-Com. McCann handled the battery which the enemy unmasked upon him in the morning was as gratifying to us, and as creditable to him, as it must have been mortifying and vexatious to the enemy." Commanded the Kennebec at the battle of Mobile Bay, Aug. 5, 1864, where he fully sustained his former well-earned reputation for courage and ability; became captain. FOXHALL A. PARKER.

McCartee (ROBERT), D. D., b. in New York City Sept. 30, 1791; graduated at Columbia College in 1808; studied law, and practised several years, when he entered the Theological Seminary of the Associate Reformed Church, and was licensed to preach in 1816. In May, 1817, he was installed pastor of the Old Scots' church, Philadelphia; married a daughter of Rev. Dr. Divie Bethune; was very successful in building up his church; became in 1822 pastor of the Irish Presbyterian church in New York, which under his ministrations increased from 30 members to over 1000, and became one of the leading churches in the country. In 1836 ill-health led him to take a less laborious charge at Port Carbon, Pa., where he organized a lyceum of natural history and labored effectually for the education of the mining population. In 1840 he removed to Goshen, N. Y., in 1849 to Newburg, and in 1856 took charge of the Associate Reformed church in 25th street, N. Y. In 1862 he resigned from ill-health, and retired to Yonkers, where he d. Mar. 12, 1865. Dr. McCartee was one of the most earnest, eloquent, and successful preachers of his time.

McCar'thy (DENIS FLORENCE), b. in Ireland about 1820; published in 1850 a volume of *Ballads, Poems, and Lyrics* founded upon the patriotic traditions of the Irish, with translations from several modern languages; issued in 1853 a translation of Calderon's dramas, in 1857 two new volumes of poems, and in 1872 *Shelley's Early Life, from Original Sources.* In recognition of literary merit he received a pension of £100 in 1871, and in Aug., 1875, produced a magnificent poem on the occasion of the centennial anniversary of the birth of O'Connell. D. Apr., 1882.

McCarthy (JUSTIN), b. in Cork, Ireland, Nov. 22, 1830; received a liberal education; became connected with a Liverpool newspaper 1853; parliamentary reporter for the London *Star* 1860; was its chief editor 1864–68; spent three years (1868–70) travelling and lecturing in the U. S., where he became editorially connected with the New York *Independent,* and wrote much for the leading magazines, as he had previously done in England. Returning to London, he became a radical writer, novelist, and historian; was elected to Parliament 1880, and was a leader of the Irish Home-Rule party. He has written several novels, among them *My Enemy's Daughter, Lady Judith, A Fair Saxon,* and *Linley Rochford.* In 1878-80 he published *A History of Our Own Time,* and in 1884 vol. i. of *A History of the Four Georges,* to be completed in 4 vols.

McCaul (JOHN), D. D., LL.D., b. in Dublin, Ireland, in 1807; educated at Trinity College, Dublin, where he became classical tutor and examiner; was appointed in 1838 principal of the College of Upper Canada; became in 1842 vice-president of King's College, Toronto, in 1849 president of the University of Toronto, and in 1853 president of University College and vice chancellor of the University of Toronto. Dr. McCaul has published several volumes of essays and treatises on classical topics, has edited portions of Horace, Longinus, Lucian, and Thucydides as collegiate textbooks, and given special attention to Latin epigraphy. His *Britanno-Roman Inscriptions* and *Christian Epitaphs of the First Six Centuries* were very favorably received.

McCausland (DOMINICK), LL.D., was b. at Roe Park, near Derry, in Ireland, Aug. 20, 1806; graduated at Trinity College, Dublin, 1826; studied law, and was admitted to the bar in 1835; was appointed queen's counsel in 1860; and d. June 28, 1873. His leisure-hours were devoted for many years to the study of questions of natural science as related to revelation. He published *The Latter Days of the Jewish Church and Nation, as revealed in the Apocalypse* (1841; 2d ed. 1859), *The Times of the Gentiles, as revealed in the Apocalypse* (1852; 2d ed. 1859), *Sermons in Stones* (1856; 13th ed. 1873), *Adam and the Adamite* (1864; 3d ed. 1872), *The Builders of Babel* (1871). R. D. HITCHCOCK.

McCaw (JAMES BROWN), M. D., b. at Richmond, Va., 1823; graduated at the University of New York 1844; was editor of the *Virginia Medical and Surgical Journal* twelve years; lecturer, then professor, in the Medical College of Va., which position he still retains (1875). During the war he organized the Chimborazo Hospital at Richmond, the largest on either side, having admitted into its wards in 1861–65 no less than 71,000 patients. PAUL F. EVE.

McCaw'ley (Col. CHARLES G.), a native of Pennsylvania; entered the marine corps as second lieutenant Mar. 3, 1847; became a first lieutenant in 1855, a captain in 1861, a major in 1864, a lieutenant-colonel in 1867; served with the marine battalion in Mexico, and took part in the storming of Chapultepec and the capture of the city of Mexico; commanded a detachment of marines in the boat-attack upon Fort Sumter, Sept. 8, 1863; twice brevetted "for gallant and meritorious conduct in battle." FOXHALL A. PARKER.

McCheyne' (ROBERT MURRAY), b. at Edinburgh, Scotland, May 21, 1813; studied at the University of Edinburgh, and prepared for the Presbyterian ministry under Dr. Chalmers; was licensed in 1835; preached for some years with great success at St. Peter's, Dundee, until his health failed, when he undertook, with three other ministers, a "mission of inquiry" to the Jews in Palestine, and on his return was engaged as an evangelist in the N. of England until his death by fever, Mar. 25, 1843. He had fine literary tastes, was learned in the sacred languages, and enjoyed a high reputation for zeal and piety in evangelical work. (See his *Life and Remains,* by Rev. A. A. Bonar, N. Y., 1857.)

Macchiavel'li (NICCOLÒ), b. in Florence, Italy, May 3, 1469, in a house belonging to the Macchiavelli family, on the S. side of the Arno, and still standing in the street now called Via dei Guicciardini. His father was Bernardo Macchiavelli, and his mother, Bartolomea Nelli, was a cultivated and amiable woman, the widow of Niccolò Bonizzi. Marcello Virgilio, who was at the head of the Cancellaria dei Dieci, appears to have been his teacher about 1494, and, perhaps through his instrumentality, Macchiavelli was appointed assistant chancellor (June 14, 1498) in the council of the Signoria. On July 14 of the same year he assumed, provisorily, the office of secretary to the Signori Dieci di Libertà e di Pace, an office in which he was afterwards confirmed by a special decree, and which he retained until Nov. 8, 1512, when he was deprived of it. From 1512 to June 22, 1527, the day of his death, Macchiavelli led a private life, devoting himself entirely to study. Little is known of the early years of this distinguished man, and that little is of small interest. The second and third periods, on the contrary, which exhibit the statesman and the author in full activity, merit special consideration. As secretary of the republic for fourteen years and five months, the home and foreign correspondence devolved upon him, also the records of the councils and of the debates of the Signoria, the drafting of public treaties with foreign states and princes, twenty-three foreign legations, and numerous internal missions. He understood magnifying the importance of his office so well that now, when one speaks of the "Florentine secretary," Macchiavelli is always meant. He not only knew how to fulfil his duties ably, but also to carry out by their means his own political ideas and patriotic sentiments with regard to the liberties of the citizen—sentiments that, unfortunately, in his time were not very common in the republic of Florence. In his office of secretary he always showed himself an eager and jealous defender of popular rights, as is very apparent from his *Legazione* and from his *Lettere*. Finding in the employment of mercenary troops one of the greatest obstacles in the way of freedom, he undertook to organize a national militia, and in a measure succeeded. Apropos of the imbecile gonfaloniere, Pietro Soderini, who had given himself over to the control of the victorious French, he said, "The success of the French has cost us the loss of half the state; their failure will deprive us of our liberty"—an expression that seems a paradox, but that, alas! proved only too true in the case of Florence; for with the diminution of French authority and influence rose the power and importance of the imperial and Medicean party, which was to prove far more fatal to the destiny of the Florentine republic. The triumph of the Medici and of the imperialists naturally brought a change in the government of the republic, and the fall of the gonfaloniere Soderini was followed by that of the secretary Macchiavelli. Not only was Macchiavelli deprived of his office by decree, but he was restricted to the Florentine territory for a year, and forbidden to enter the palace of the Signori. But the Signori afterwards, feeling the need of his services, frequently suspended this prohibition. The fourteen years of Macchiavelli's secretaryship are the purest and most glorious of his life. By what means he may have attained to his office, and by what means, having lost it, he endeavored to ingratiate himself with the Medici, is not clear, and perhaps careful research might make us acquainted with a very different man from the Macchiavelli who between 1458 and 1512 served the republic. The mystery of *Il Principe* remains still unsolved, and, however much critics may endeavor to defend it, that formidable book will always cast a sinister shadow upon the character of Macchiavelli. *Il Principe* has had many apologists and many assailants, but the name of "Macchiavellian," as applied in Italy to malicious craftiness, did not perhaps originate until after the circulation of this work, and the fame of the author will never come forth entirely unspotted. The suspicion will always remain that Macchiavelli, before becoming chancellor of the republic, then freed from the yoke of the Medici, had aspired to become the chief counsellor of a Medicean tyrant. The words of the contemporaneous historian Varchi are very significant: "Macchiavelli dedicated *Il Principe* to Lorenzo, in order that he might make himself absolute master of Florence; and after the revolution in the state—that is, after the driving out of the Medici—he attempted to suppress this work, which was not yet printed." It is possible that Macchiavelli himself was the first to insinuate, during his fourteen years of secretaryship under the republic, that he had written *Il Principe* to bring odium upon the Medici; and that the knowledge of this fact, being brought to the Medici, may have been one of the causes, and perhaps the principal one, for which Macchiavelli was subjected to torture. Perhaps he wrote *Il Principe* in good faith, but in the good faith of a politician of the fifteenth century, with the principles of that century and in an atmosphere wholly averse to popular liberty. Macchiavelli hoped at first by means of his *Principe* to create a position for himself and for his ideal sovereign, whoever he might be. The Medici being driven out and the post of chancellor obtained, his zeal for the liberty of the republic returned, and he served it with all the fervor with which he would have served the prince had the prince succeeded, and had he been made his first counsellor. The third period of Macchiavelli's life, in which he appears essentially as an author, embraces the two preceding, or rather sums up their contradictions. *I Discorsi sopra la prima Deca di Tito Livio*, several passages in his Florentine history, and some letters show us the republican spirit of the Florentine secretary; the new duties accepted from the same Medici who had put him to torture, his gross *Comedie*, and other letters and sayings represent him as the humble servant of princes and the corrupter of public morals. Most powerful in intellect, but neither great nor noble in character, equally capable of good and of evil according to the caprice of his exalted genius, he could find pleasure in boasting that he had at the same time taught princes to be tyrants and the people to exterminate them. Macchiavelli died poor, and was buried in the family tomb in Santa Croce. His death was regretted by none. Nothing marked his resting-place until towards the end of the last century, when the English lord Nassau-Clavering, Earl Cowper, patronized the quarto edition of his works, published in 1782 in 6 vols., and promoted the erection of his monument in Santa Croce, on which is the brief but eloquent inscription: *Tanto nomini nullum par elogium.* In 1869 the fourth centennial anniversary of the birth of Macchiavelli was celebrated in Florence, and a prize of $1000 was offered for the best work on the life and writings of the great secretary. The period allowed for the work having expired in 1873, none of the aspirants obtained the prize, for the two principal competitors, Ruggiero Bonghi and Pasquale Villari, both of whom have been occupied many years with the study of Macchiavelli and the preparation of a work on the subject, did not present themselves. Honorable mention, however, was made of the work of Carlo Gioda published that year, and entitled *Macchiavelli e le sue Opere.* Among the abundant literature treating of the *Principe,* the discourse of P. S. Mancini, *Sulla Dottrina politica del Macchiavelli,* Andrea Zambelli's *Considerazione sul Libro del Principe,* Baldelli's *Elogio del Macchiavelli,* and Artaud's *Machiavel son Génie et son Siècle* deserve special mention. F. A. P. BARNARD.

McClellan (GEORGE), M. D., b. at Woodstock, Conn., Dec. 23, 1796; graduated at Yale in 1816; received his medical degree from the University of Pennsylvania in 1819; in 1825 became one of the founders of the Jefferson Medical College, Philadelphia. He also assisted in establishing the medical school at Gettysburg, Pa., in 1839; was professor of surgery in Jefferson Medical College 1826–38; at Gettysburg 1839–43; was an able surgeon and lecturer, a frequent contributor to medical journals, and author of a treatise on the *Principles and Practice of Surgery,* which was found complete among his papers and published after his death. D. at Philadelphia May 9, 1847.

McClellan (Gen. GEORGE BRINTON), b. in Philadelphia Dec. 3, 1826, son of Dr. George McClellan; graduated at the University of Pennsylvania 1842; from West Point 1846, and commissioned brevet second lieutenant of engineers; served in the Mexican war at the siege of Vera Cruz and in the battles of Cerro Gordo, Contreras, Churubusco, Molino del Rey, and Chapultepec, winning the brevets of first lieutenant and captain for gallantry. At the close of the war he returned to West Point, where he remained until 1851, when he was assigned to duty in the construction of Fort Delaware; subsequently, in his engineering capacity, accompanied the expeditions to explore the sources of the Red River and the Northern Pacific R. R.; promoted to be captain of cavalry in 1855 in that year, he went to Europe as a member of a military commission to visit the seat of war, and upon his return prepared an official report upon the *Organization of European Armies and Operations in the Crimea,* which was published by order of the government. In 1857 he resigned from the army, and was chief-engineer and vice-president of the Illinois Central R. R. 1857–60, being chosen president of the St. Louis and Cincinnati R. R. in the latter year. On the outbreak of the civil war in 1861 his services were enlisted by the governor of Ohio in organizing the volunteers called for by the first proclamation, and he was placed in command of the department of the Ohio, and commissioned major-general of Ohio volunteers Apr. 23, 1861. On the 14th of May following the President appointed him a major-general in the U. S. army, and directed him to disperse the Confederate force occupying and threatening to overrun West Virginia. By a well-executed movement he met and defeated the enemy, and on the 14th of July reported his task accomplished and West Virginia clear. The thanks of Congress were tendered him for these services, and after the battle of Bull Run he was called to Washington and (July 25) placed in command of a division comprising the department of Washington and department of North-eastern Virginia: three weeks later he was assigned to command the department of the Potomac, and Aug. 20 the Army of the Potomac. Upon the retirement of Lieut.-Gen. Scott the command of the army of the U. S. fell upon him, which he retained until Mar. 11, 1862, when he was relieved from command of all military departments except that of the Potomac. On the 6th of March he had made an advance upon Manassas, only to find the enemy gone, and, returning, embarked his army for Fortress Monroe; the siege of Yorktown lasted until May 5, when followed the disastrous campaign known as the Peninsular campaign, resulting in the retreat of the army to the James July 4–5, 1862, and final withdrawal the following month to the relief of Gen. Pope in North-eastern Virginia, leaving McClellan for a short time without any distinct command. After the defeat of Pope (Aug. 29–30), McClellan was (Sept. 2) placed in command of the capital and the troops for its defence, which latter he reorganized, and followed Lee into Maryland, the battles of South Mountain and Antietam ensuing, Sept. 14–17; the delay which followed again created much dissatisfaction in Washington, and on the 7th of November, just as he had moved into Virginia with apparently a well-devised plan of operations, he was relieved of his command at Warrenton, and Gen. Burnside ordered to succeed him. Proceeding to New Jersey, he took no further part in the war. On Aug. 31, 1864, he received the nomination of the Democratic national convention for the Presidency. The election occurred on the 8th of November, when Lincoln was almost unanimously re-elected by the States participating, McClellan receiving only the votes of New Jersey, Kentucky, and Delaware. On the day of election he resigned his commission as major-general, and in the spring of 1865 sailed for Europe, where he made an extended stay. Returning in 1868 he superintended the construction of the Stevens floating battery; also of the railway bridge across the Hudson, and in 1870 was appointed chief engineer of the department of docks of New York City, which latter office he resigned in 1872. Author of various military reports, textbooks, and manuals; governor of New Jersey 1878–81. D. Oct. 29, 1885. G. C. SIMMONS.

McClel'land (ROBERT), b. at Greencastle, Pa., in 1807; graduated at Dickinson College; was admitted to the bar in 1831; practised law in Pittsburg, Pa., and Monroe, Mich.; won distinction by his ability in the Michigan constitutional convention of 1835; was Speaker in the State legislature in 1843; a member of Congress 1843–49; governor of Michigan 1852–53; secretary of the interior under President Pierce 1853–57, after which time he practised law at Detroit. D. at Detroit, Mich., Aug. 30, 1880.

McClen'achan (CHARLES THOMSON), b. in Washington, D. C., Apr. 13, 1829, nephew of Blair McClenachan; removed to Philadelphia, and was educated at Germantown College; went to New York in 1844, and was instructor in the institute of the blind for six years; was clerk of the board of assistant aldermen for eleven years; quartermaster of the 7th regiment, and present with it during its army operations in 1861; studied law, and was admitted to the bar in 1863; and since 1862 has been chief bookkeeper of the department of public works. Author of *Book of the Ancient Accepted Rite of Freemasonry* (1859); by direction of the city government edited and published *Opinions of the Counsels to the Corporation* (New York City) *from 1849 to 1860* (1860); *Ferry Leases and Railroad Grants affecting the City of New York from 1730 to 1860* (1860); *Laws of the Fire Department* (New York City) *from 1812 to 1860* (1860); and *Report of the Proceedings in Commemoration of the Laying of the Atlantic Cable of 1858* (1863).

McCler'nand (JOHN A.), b. in Breckenridge co., Ky., May 30, 1812; his father dying in 1816, his mother removed to Illinois, and settled at Shawneetown, where the youth, in addition to farming, found time to study law, and was admitted to the bar in 1832. In the Black Hawk war he served as a private, resuming his profession on his return, and in 1835 started the *Democrat;* was elected to the legislature in 1836, also in 1840 and 1842, and to the U. S. Congress from 1843 to 1851. Removing to Jacksonville in 1851, he was sent to Congress from that district in 1859, but resigned on the outbreak of civil war, and returning home engaged actively in raising the brigade which bore his name, and which he commanded at Belmont, having been appointed brigadier-general of volunteers May 17, 1861; at Fort Donelson he commanded the right of the Union lines; promoted to be major-general Mar., 1862, he commanded a division at the battle of Shiloh; in Jan., 1863, relieved Gen. Sherman in command of the expedition for the capture of Vicksburg; commanded the expedition which stormed and carried Arkansas Post; in command of the 13th corps was engaged in the Vicksburg campaign, including the assault on that place, until relieved in July, to date June 18, 1863. Resigned Nov. 30, 1864.

Mac'clesfield, town of England, in Cheshire, on the Bollin, in the beginning of this century rapidly rose to great eminence as a manufacturing town. Its silk fabrics are of the finest quality, and more than 8000 operatives are employed in this branch of industry; its cotton manufactures are also considerable. Its vicinity is rich in coal. Pop. 37,620.

McClin'tock (Sir FRANCIS LEOPOLD), D. C. L., LL.D., F. R. S., b. at Dundalk, Ireland, in 1819; entered the navy at the age of twelve; accompanied Sir James Ross in his Arctic expedition of 1848; was engaged in Captain Austin's expedition of 1850 in search of Sir John Franklin, with the rank of lieutenant, and made a sledge-journey of 760 miles along the N. shore of Parry Sound; was made commander the following year, and sent on the expedition of five vessels under Sir Edward Belcher; rescued Captain McClure from a three years' imprisonment in the ice near Melville Island, but subsequently had to abandon his own ship and three others; returned to England Sept., 1854, and in 1857 took command of the expedition despatched by Lady Franklin which ascertained the fate of her husband (see the article POLAR RESEARCH), for which he received many deserved honors. He was knighted in 1860, employed in 1861 in surveying a route for a North Atlantic telegraph, became a rear-admiral Oct., 1871, and a vice-admiral in 1877. He published *The Voyage of the Fox in the Arctic Seas to discover the Fate of Sir John Franklin and his Companions* (1860).

McClintock (JOHN), D. D., LL.D., b. at Philadelphia Oct. 27, 1814; graduated at the University of Pennsylvania 1835, in which year he began preaching as an itinerant in the New Jersey conference of the M. E. Church; was elected professor of mathematics (1836) in Dickinson College at Carlisle, Pa., professor of ancient languages 1839; was a thorough and successful instructor for twelve years; aided in translating Neander's *Life of Christ* (1847); prepared (in connection with Prof. G. R. Crooks) several elementary classical textbooks upon the system of "imitation and repetition" which has since become so general; was editor of the *Methodist Quarterly Review* 1848–56, during which time he gave that periodical a high literary and scholarly character; was sent to Europe with Bishop Simpson in 1856 as delegate to the Wesleyan Methodist Conference of England, and to the Evangelical Alliance at its Berlin meeting; was the eloquent and influential pastor of St. Paul's church, New York, 1857–60; became pastor of the American chapel in Paris, France, in 1860; performed excellent service in diffusing a knowledge of the merits of the great American war for the Union by pen, on the platform, and in society, gaining the valuable aid of Count Gasparin and other noted writers, while by his editorial letters published in the New York *Methodist* he kept the American public advised of the fluctuations of European opinion upon the war. Returning to the U. S. in 1864, he was again for a few months pastor of St. Paul's, New York, which he resigned on account of broken health; became in 1866 chairman of the Central Centenary Committee of the M. E. Church, which organized the celebration of the completion of the first century of American Methodism; and upon the foundation by Mr. Daniel Drew of a theological seminary in connection with this anniversary, Dr. McClintock was chosen its first president, and superintended its successful opening at Madison, N. J., in 1867. During the ensuing three years his health rapidly declined, and he d. at Madison, N. J., Mar. 4, 1870. As a preacher Dr. McClintock was very successful. "A fine presence, a rich voice, and a graceful delivery gave effect to the utterances of a well-stored mind." In the management of the *Quarterly Review*, in his *Analysis of Watson's Theological Institutes* (1850), his essay on *The Temporal Power of the Pope* (1851), his *Sketches of Eminent Methodist Ministers* (1863), and his translation of Bungener's *History of the Council of Trent* (1855) he gave proof of that eminently complete and versatile scholarship in which he had no superior within his Church. But the great work of his life, projected as early as 1853, and thenceforth pushed forward in conjunction with the best talent of the M. E. Church, was the *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature,* which he edited with the scholarly co-operation of Dr. James Strong. The first volume was published in 1867, the second in 1868, the third in 1870; the whole was completed, in 10 large volumes, in 1882. In this vast undertaking Dr. McClintock essayed the treatment of the whole department of systematic, historical, and practical theology; how thoroughly and conscientiously he executed that task his pages will long demonstrate to an admiring Church. He was endeared to a wide circle of friends by his eminent social qualities, swayed the minds of his hearers by his fervid eloquence, and satisfied the understanding by the clearness and scientific precision by which he arranged and set forth the stores of his varied learning. Since his death a volume of Dr. McClintock's sermons has been published, *Living Words* (1870), and a course of *Lectures on Theological Encyclopædia and Methodology.* Other of his writings have also been prepared for the press and successfully published. PORTER C. BLISS.

McClos'key (JOHN), D. D., CARDINAL, b. at Brooklyn, N. Y., Mar. 20, 1810; received his early classical training in New York; graduated at Mount St. Mary's College, Emmittsburg, Md.; studied theology in the Roman Catholic seminary connected with the same institution; was ordained a priest in St. Patrick's cathedral, New York, Jan. 9, 1834; spent two years attending lectures at Rome, and another year in France; became on his return assistant pastor, and soon afterwards pastor, of St. Joseph's church, New York; was appointed by Bishop Hughes in 1841 first president of St. John's College, Fordham, N. Y.; returned the following year to his pastoral charge; was appointed coadjutor to Bishop Hughes Nov. 23, 1843; consecrated under the title of bishop of Axiere *in partibus infidelium* Mar. 10, 1844, and on the division of the diocese of New York was installed in Sept., 1847, as first bishop of Albany. He administered that diocese seventeen years with signal ability, erected a splendid cathedral, founded at Troy a well-equipped theological seminary, built a large number of churches, founded many charitable and religious institutions, and introduced numerous monastic orders and lay communities. On the death of Archbishop Hughes he was appointed his successor, May 6, 1864, and took possession Aug. 21, after which time he repeated upon a larger scale the activity shown at Albany. For the completion of the magnificent cathedral on Fifth Avenue he was very active, and visited Rome in 1874 to procure materials for it. Raised to the princely dignity of cardinal-priest Mar. 15, 1875, he received the *biretta* in May, after which he visited Rome to obtain the investiture. D. in New York City Oct. 10, 1885.

McClung′ (Col. Alexander K.), b. in Mason co., Ky., about 1812, was a nephew of Chief-Justice Marshall; enlisted in the navy in youth; studied law, and practised in Mississippi; volunteered in the Mexican war; was dangerously wounded at Monterey, attained the rank of lieutenant-colonel, and was *chargé d'affaires* to Bolivia 1848–51. He was an orator of brilliant powers and wide reputation, but left no public sample of his eloquence except a eulogy on Henry Clay, delivered at the State capital of Mississippi 1852. He committed suicide at Jackson Mar. 23, 1855.

McClung (John Alexander), D. D., brother of Col. A. K. McClung, b. in Washington, Ky., Sept. 25, 1804; studied at Princeton Theological Seminary; was licensed as a preacher in the Presbyterian Church 1828; abandoned the pulpit soon after on account of doubts as to the authenticity of some books of the Bible; was admitted to the bar 1835, and practised with great success until 1849, when he made a fresh study of theology; was again ordained 1851; was pastor of the First Presbyterian church of Indianapolis, Ind., 1841–57; declined the presidency of Hanover College, Ind.; settled as pastor at Maysville, Ky., 1857, and occupied a high position as a learned theologian, though he has left no literary monument of himself. He was drowned in the summer of 1859.

McClure (Alexander K.), b. in Perry co., Pa., Jan. 9, 1828. After receiving a very meagre education, he was apprenticed at the age of fifteen to the tanning trade, and in 1846 he went to Philadelphia and worked as a journeyman tanner for a few months. Returning to his native county in the fall of the same year, he established the Juniata *Sentinel* at Mifflin. In 1852 he purchased the Chambersburg *Repository*, which he enlarged and conducted with much success. In 1857 he was elected to the lower house of the State legislature; was returned in 1858, and in the following year was chosen State senator. He held many positions of trust in the Republican party during the war; returned again to the legislature in 1864 as representative, and again in 1872 as senator from Philadelphia. In 1874 he ran as Reform candidate for mayor of Philadelphia, but was defeated. In the spring of 1875 he founded the Philadelphia *Times*, an independent daily newspaper which achieved a rapid and unusual success. J. B. Bishop.

McClure (Alexander Wilson), D. D., b. at Boston, Mass., May 8, 1808, graduated at Amherst College 1827, at Andover Seminary 1830; was pastor of a Congregational church at Malden 1832–43; preached at St. Augustine, Fla. (1841–44); edited for several years the *Christian Observatory* and the *Puritan Recorder* at Boston; preached again at Malden; was three years pastor of the Grand street church, Jersey City; was secretary of the American and Foreign Christian Union and chaplain at Rome, whence he returned a confirmed invalid 1858. He wrote two volumes of the *Lives of the Chief Fathers of New England*, the *Bi-Centennial Book of Malden* (1850), *The Translators Revived* (1853), and several controversial religious treatises. He was a learned scholar, a genuine wit, and a keen polemic. D. at Canonsburg, Pa., Sept. 20, 1865.

McClure (Sir Robert John le Mesurier), C. B., b. at Wexford, Ireland, Jan. 28, 1807; educated at Winchester and Sandhurst; entered the navy as a midshipman; joined the Arctic expedition under Capt. Back (1836) as a volunteer; was appointed lieutenant on his return, and superintendent of the Quebec dockyard; took part in Sir John Ross's Arctic expedition (1848), and took command in 1850 of another exploring expedition, which discovered the North-west passage, for which service he was knighted, received a captaincy and a reward of £5000. From his journals Capt. Sherard Osborne published in 1856 *The Discovery of the North-west Passage*. He afterwards served in the China squadron. D. in London Oct. 14, 1873.

McClurg′ (James), M. D., b. at Hampton, Va., in 1747; was a fellow-student with Jefferson at William and Mary College; took his degree in medicine at Edinburgh 1770; pursued his studies in Paris and London, where he published an *Essay on the Human Bile*, so elegantly written that it was translated into several languages. He practised his profession at Williamsburg 1773–83; settled in Richmond when the capital was removed thither 1783, and rose to the head of his profession in Virginia, though the delicacy of his constitution prevented his practising surgery. He was noted for the integrity of his character, his industry, and his varied attainments. He was long a member of the Virginia council of state, and was a member of the convention that formed the Constitution of the U. S. He had considerable skill as a writer of verses, and a pleasing *jeu d'esprit* from his pen (but with some stanzas by Judge Tucker), entitled the *The Belles of Williamsburg* (1777), may be found in Duyckinck's *Cyclop. Am. Lit.*, as also in J. Esten Cooke's novel of the *Virginia Comedians*. Dr. McClurg figures in Cooke's romantic sketch, *The Youth of Jefferson*. His discourse *On Reasoning in Medicine* has been highly commended. Killed at Richmond, Va., by his horses running away, July 9, 1825. One of his granddaughters married the celebrated Benjamin Watkins Leigh. (See his *Memoir*, by Dr. J. W. Francis, in Thacher's *Medical Biography*.)

McClurg (Joseph W.), b. in St. Louis co., Mo., Feb. 22, 1818; educated at Oxford College, O.; taught school in Louisiana and Mississippi 1835–37; went to Texas in 1841, and practised law in that republic; settled as a merchant at St. Louis 1844. During the civil war he was colonel of the Osage regiment, and afterwards of a cavalry regiment; was a member of the Missouri State convention 1862, of the Baltimore convention 1864, and delegate to the Philadelphia Loyalist convention of 1866; served in Congress 1863–69, and was governor of Missouri 1869–72.

McColl′ (Evan), b. at Kenmore, Scotland, Sept. 21, 1808; began to write poetry for the *Gaelic Magazine* of Glasgow in 1837; removed in 1850 to Canada, and was employed in the custom-house at Kingston, Ontario. He excels as a song-writer, both in English and Gaelic. His principal publications are *Poems and Songs in Gaelic* and *The Mountain Minstrel*.

MacColl (Malcolm), b. at Glenfinan, Inverness-shire, Scotland, Mar. 27, 1838, was educated in Edinburgh and appointed assistant curate of St. Paul's, Knightsbridge, 1861, chaplain to the British ambassador in St. Petersburg 1862, curate of St. Paul's 1864, and rector of St. George, in the city of London, 1871. He published *Mr. Gladstone and Oxford* (2d ed. 1865), *Science and Prayer* (4th ed. 1866), *The Reformation in England* (2d ed. 1869), *The Ober-Ammergau Passion Play* (6th ed. 1870), *Who is Responsible for the War?* (Franco-Prussian) (1871), *Lawlessness, Sacerdotalism, and Ritualism* (1875), *The Eastern Question: Its Facts and its Fallacies* (1877), *Three Years of the Eastern Question* (1878), besides numerous contributions to periodical literature.

McConnell (John L.), b. at Jacksonville, Ill., Nov. 11, 1826; studied law under his father, Murray McConnell, a prominent politician; graduated at the law school of Transylvania University, Ky.; served in Hardin's regiment in the Mexican war; was twice wounded at Buena Vista; became a captain; has since practised law at his native place, and has written several romances illustrative of Western life and character—*Talbot and Vernon* (1850), *Grahame, or Youth and Manhood* (1850), *The Glenns* (1851), *Western Characters* (1853). He afterwards undertook the preparation of a work to be entitled *History of Early Explorations in America*, with special reference to the labors of the early Roman Catholic missionaries.

MacCon′nellsburg, cap. of Fulton co., Pa. (see map of Pennsylvania, ref. 6–E, for location of county). It has a fine court-house, a machine-shop and foundry, saw- and planing-mill, and tanneries; its mineral resources are fast being developed. Pop. in 1870, 552; in 1880, 584.

MacConnellsville, cap. of Morgan co., O. (see map of Ohio, ref. 6–H, for location of county), on Muskingum River. It has a large tobacco-factory, a foundry, and a woollen-factory. Pop. in 1870, 1646; in 1880, 1473.

McCook (Gen. Alexander McDowell), b. in Columbiana co., O., Apr. 22, 1831; graduated at West Point, and entered the army as brevet second lieutenant of infantry in 1852; after a brief term of service in garrison, he was actively engaged against hostile Indians until 1857, when after a year's leave of absence he was assigned as instructor of infantry tactics at West Point. On the outbreak of civil war he was appointed colonel of the 1st Ohio Vols., which regiment he commanded at the first battle of Bull Run. Reorganizing his regiment on the expiration of its term of service, he was recommissioned colonel in August; appointed brigadier-general of volunteers in Sept., 1861, and assigned to the command of a brigade in the department of the Cumberland; commanded a division at the battle of Shiloh and siege of Corinth, and 1st army corps at the battle of Perryville; 20th army corps at Stone

River and Chickamauga, and the troops for the defence of the capital at the time of Early's attack on Washington, July, 1864. Received the various brevets from major to major-general U. S. A. Resigned his commission as major-general Oct., 1865, and in Mar., 1867, was promoted to be lieutenant-colonel of infantry; colonel in 1880.

McCook (Gen. Dan), b. in Carrollton, O., July 22, 1834; graduated at Florence College, Ala., 1857; served in the war for the Union as colonel 52d Ohio Vols. and as brigadier-general; was at the battles of Perryville, Chickamauga, Mission Ridge, and in the Atlanta campaign, and was killed at Kenesaw Mountain July 17, 1864.

McCook (Gen. Edward M.), b. in Steubenville, O., in June, 1834; educated in a log school-house; accompanied Gov. Medary to Minnesota as private secretary 1856; went to Pike's Peak 1859; was a member of the Kansas legislature 1860; served in the war for the Union, attaining the rank of brigadier-general Apr. 27, 1864, and brevet major-general in 1865; was minister to the Sandwich Islands 1866–69; governor of Colorado Territory 1869–71, and reappointed 1875.

McCook (Gen. Edwin Stanton), fifth son of Maj. Daniel, and brother of Gen. A. McD. McCook, b. in New Lisbon, O., about 1840; took an active part in the war for the Union, attaining the rank of brevet brigadier-general of volunteers; became secretary and acting governor of Dakota Territory; was assassinated at Yankton, Dak., Sept. 11, 1873.

McCook (George William), b. at Carrollton, O., 1822; was educated in the Ohio University, Athens; studied law, and began practising at Steubenville in partnership with E. M. Stanton. In the Mexican war he organized the 1st Ohio regiment, and in the civil war the 157th; and in the mean time, as well as after the close of the war, he was very active both as a lawyer and in the politics of his State. In 1870 he retired on account of ill-health, and lived in Europe from 1871 to 1876. D. in New York Dec. 28, 1877.

McCook (Gen. Robert Latimer), son of Maj. Daniel, b. in Columbiana co., O., Dec. 28, 1827; studied law at Columbus, O.; practised at Cincinnati with great success; raised a regiment of Germans for the war in 1861 (9th Ohio Vols.); commanded a brigade in West Virginia under Gen. Rosecrans; distinguished himself at Rich Mountain, Carnifex Ferry, and Mill Spring, where he was wounded; was appointed brigadier-general of volunteers Mar. 21, 1862, and was in command of a division in Thomas's corps of Gen. Buell's army, when he was shot down in cold blood by guerillas while lying sick in an ambulance near Salem, Ala., dying the next day, Aug. 6, 1862.

McCook (Roderick S.), b. in Ohio Mar. 10, 1839; graduated at the Naval Academy in 1859; became a lieutenant in 1861, a lieutenant-commander in 1865, a commander in 1873; in various engagements on the James River and in the sounds of North Carolina, and in both the Fort Fisher fights; commanded a battery of naval howitzers at the battle of New Berne, Mar. 14, 1862, where he displayed coolness, sound judgment, and gallantry. Highly commended in the official despatches.

Foxhall A. Parker.

Maccord′ (David J.), b. in St. Matthew's parish, S. C., in Jan., 1797; graduated at South Carolina College 1816; admitted to the bar 1818, and became in 1822 law-partner of W. C. Preston. In 1825 he was mayor of Columbia, S. C. In 1836 he became president of the State bank. He reported decisions of the courts of equity and of appeals (2 vols., 1827–29); edited the *South Carolina Statutes* (10 vols., 1839), and published also reports in 4 vols. (1822–30) and 2 vols. (1842). He wrote much on political and economic questions, was for a time editor of a law journal, and after 1840 became a planter at Fort Motte, S. C. D. at Columbia, S. C., May 12, 1855.

Maccord (Louisa S. **Cheves**), daughter of Langdon Cheves, b. at Columbia, S. C., Dec. 3, 1810, and was married in 1840 to David J. Maccord; translated Bastiat's *Sophisms of the Protective Policy* (1848); published a volume of poems, *My Dreams* (1848), *Caius Gracchus*, a tragedy (1851), and other works, and ably discussed many political and social questions in the *Southern* and *De Bow's Review*, and the *Southern Literary Messenger*. She resided at Columbia during the civil war, and rendered distinguished assistance in the hospitals and other relief institutions of the Confederate government.

McCor′mick (Cyrus Hall), b. at Walnut Grove, Rockbridge co., Va., Feb. 15, 1809; removed in 1845 to Cincinnati, O., and in 1847 to Chicago. His father in 1816 invented a reaping-machine. The son invented another in 1831, patented it in 1834, and subsequently greatly improved it. This invention won many gold medals and distinctions for Mr. McCormick. In 1859 he established the Theological Seminary of the North-west at Chicago (Presbyterian), and afterward endowed a chair in Washington and Lee College, Lexington, Va. D. May 13, 1884.

McCormick (Richard C., Jr.), b. in New York City 1832; received a classical education; went into business in Wall street in 1850; travelled in Europe and Asia Minor, and published a *Visit to the Camp before Sebastopol* (1855), *St. Paul to St. Sophia*, etc.; trustee of New York public schools 1857–61; became in 1859 editor of the *Young Men's Magazine*; chief clerk of the dept. of agriculture 1862; sec. of Ariz. 1863; gov. of that Territory 1866–69; was delegate in Congress from Ariz. 1869–75. He was U. S. commissioner-general to the Paris Exposition in 1878, and received there a decoration of the Legion of Honor.

McCosh (James), D. D., LL.D., b. in Ayrshire, Scotland, in 1811; was educated at the universities of Glasgow and Edinburgh; wrote while a student in the latter an essay on the Stoic philosophy, which obtained for him, on motion of Sir William Hamilton, the honorary degree of M. A.; was ordained a minister of the Church of Scotland at Arbroath 1835; removed to Brechin 1839; took an active part in the questions which brought about the disruption of the Scottish Church and in the organization of the "Free Church" 1843; wrote a work on *The Methods of the Divine Government, Physical and Moral* (1850), which was a skilful theological application of Sir William Hamilton's philosophy, and laid the basis of a wide reputation both in Great Britain and America; was appointed professor of logic and metaphysics in Queen's College, Belfast, 1851, where he was distinguished as a lecturer upon philosophy; wrote, in connection with Prof. G. Dickie, *Typical Forms and Special Ends in Creation* (1856), and published *Intuitions of the Mind inductively investigated, being a Defence of Fundamental Truth* (1860), two works which were applications of his metaphysical system to new orders of reasoning, and which received their argumentative complement in *An Examination of Mill's Philosophy* (1866). He was elected president of the College of New Jersey at Princeton 1868, which post he has since filled with great ability and success; wrote as text-books *The Laws of Discursive Thought* and a treatise on *Logic* (1869); delivered a series of lectures on *Christianity and Positivism* (1871) before the Union Theological Seminary in New York, in which he relegated to the scientists the questions of evolution and the origin of life; published *The Scottish Philosophy, Biographical, Expository, and Critical, from Hutcheson to Hamilton* (1874), *The Development Hypothesis* (1876), and *The Emotions* (1880). He has written largely for the *Princeton Review* and other magazines in Great Britain and the U. S.

McCos′kry (Samuel Allen), D. D., D. C. L., b. at Carlisle, Pa., Nov. 9, 1804; studied one year at West Point Military Academy; graduated at Dickinson College; became a successful lawyer, but took orders in the Protestant Episcopal Church; held rectorships in Reading, Pa., and in Philadelphia, and in 1836 was consecrated bishop of Mich. He was deposed from the ministry Sept. 3, 1878.

McCoun (William T.), b. at Oyster Bay, N. Y., in 1786, educated in New York; studied law; was soon a prominent lawyer, and continued in successful practice till May, 1831, when he was appointed vice-chancellor of the first circuit. He was the first incumbent of the office, and held it till Sept., 1846, having then reached the age fixed by the constitution as the limit of judicial service; soon after, under the constitution of 1846, he was elected justice of the supreme court for the second district, and retired at the end of his term. D. July 18, 1878.

McCracken (J. L. H.), b. in New York about 1813, son of a wealthy merchant engaged in trade with Western Africa; bore a distinguished part in society through his fine literary culture and conversational powers; wrote for the *Knickerbocker*, the *American Monthly*, and other magazines, and published in the *Democratic Review* (1849) a comedy of New York life, entitled *Earning a Living*. One of his sketches, entitled *The Art of Making Poetry, by an Emeritus Professor*, displays very high powers as a humorist and literary essayist. (See an extract in Duyckinck's *Cyclopædia American Literature*, vol. ii. p. 592.) Mr. McCracken d. of a fever at Sierra Leone, West Africa, Mar. 25, 1853.

McCrary (George W.). See Appendix.

McCrea (Jane), b. at Leamington, N. J., in 1754; resided at the commencement of the Revolution on the Hudson near Fort Edward; was betrothed to Lieut. David Jones, a loyalist in the British army in Canada; was visiting at Fort Edward in the summer of 1777 when she was carried off by a party of Indians and murdered (July 27), her scalp being carried to Burgoyne's head-quarters. The usual narrative of her death is that these Indians were hired by Lieut. Jones to bring Miss McCrea to the British camp, and that she was tomahawked in consequence of a quarrel between her captors; but the Indians alleged that she was killed by a shot from some Americans in pursuit. The truth was never known, but the murder, related in many ways, and embellished with romantic additions, caused an immense sensation both in the U. S. and in England, where it was narrated by Burke in the House of Commons as an illustration of the horrors of Indian warfare. Lieut. Jones passed a long life in Canada, and always denied having employed the Indians. Miss McCrea was buried on a hill near Fort Edward, afterwards in the old burying-ground, and in 1874 her remains were removed by a niece to the new Union cemetery between Fort Edward and Sandy Hill, where a monument was placed over them.

McCree′ry (Charles), Doctor, b. in Clark co., Ky., June 13, 1785. Though he probably never heard a medical lecture, as there were neither schools nor professors in his day W. of the mountains, he became a successful physician, secured a widespread reputation, and performed (May 4, 1811) a surgical feat which, when repeated years afterwards by the celebrated Dr. Mott of New York City, was called by him his *Waterloo* operation; this was removing the collar-bone. He was one of the most benevolent of men, warm-hearted, genial in disposition, charitable to all about him, and beloved everywhere. D. Aug. 26, 1826.—A grandson of his, Capt. Daniel, a graduate of Yale College and a lawyer, fell at the battle of Chickamauga. Paul F. Eve.

McCrie (Thomas), D. D., b. at Dunse, Scotland, in Nov., 1772; became pastor of a church in Edinburgh 1795; took a prominent part in the agitations within the Scottish Church; author of an esteemed *Life of John Knox* (1811), and of *The Life of Andrew Melville* (1819), important for the history of the Reformation in Scotland. He also wrote a *History of the Progress and Suppression of the Reformation in Italy* (1827), and a *History of the Reformation in Spain* (1829); wrote lives of several Reformers in the *Christian Magazine* (1802–06); vigorously criticised Sir Walter Scott for his treatment of the Covenanters in *Old Mortality;* published several controversial and political tracts and discourses, and left unfinished a *Life of Calvin.* D. at Edinburgh Aug. 5, 1835. A posthumous volume of *Sermons* appeared in 1836, his *Miscellaneous Writings* in 1841, and his *Works* in 4 vols. in 1855–57.—His *Life* was published in 1840 by his son, Thomas McCrie, Jr., D. D., LL.D., professor of systematic theology in the English Presbyterian college at London, b. at Edinburgh in 1798, who also wrote *Sketches of Scottish Church History* (1841), a *Life of Sir A. Agnew,* and edited *The Provincial Letters of Blaise Pascal, a new Translation, with Historical Introduction and Notes* (1846).

McCulloch (Ben), b. in Rutherford co., Tenn., 1814; received but brief schooling, his early years being mostly passed in hunting, in which he became very skilful; and being of an adventurous nature proceeded to Texas to join the expedition of Davy Crockett, but arrived after the death of the latter at the Alamo; served as a private in the battle of San Jacinto, and subsequently in the Mexican war commanded a company of Texan rangers, and was greatly distinguished at Monterey, Buena Vista, and final capture of the city of Mexico; appointed U. S. marshal in 1853, and commissioner to Utah 1857. On the outbreak of the civil war he ardently espoused the Southern cause, and, repairing to Texas, received the surrender of Twiggs at San Antonio. Appointed brigadier-general soon after, he commanded in Missouri at Dug Springs and at Wilson's Creek; and in the batttle of Pea Ridge, while in command of a division, was killed Sept. 7, 1862.

McCulloch (Hugh), b. at Kennebunk, Me., in 1811; educated at Bowdoin College; removed to Indiana in 1835; was president of the State bank of Indiana from May, 1855, till May, 1863, when, at the instance of the then secretary of the U. S. treasury, Mr. Chase, he was called to administer the duties of the newly-created bureau in the treasury department as comptroller of the currency; he succeeded Mr. Fessenden as secretary of the U. S. treasury until Mar., 1869, when he returned to Indiana. In 1870 he engaged in the banking business in London, and was again appointed secretary of the treasury Oct. 28, 1884.

McCulloch (John Ramsay), b. at Whithorn, Scotland, Mar. 1, 1789; became editor of the *Scotsman,* an organ of liberal political opinions at Edinburgh, and one of the editors of the *Edinburgh Review;* wrote the article on political economy in the supplement to the *Encyclopædia Britannica* (1824), in which he anticipated the opinions of the "Manchester school" of advocates of free trade; republished this article in 1825, with additions and modifications, under the title *Principles of Political Economy;* issued in the same year *A Discourse on the Rise, Progress, Peculiar Objects, and Importance of Political Economy;* was professor of that science in the University of London 1828–32; edited Adam Smith's *Wealth of Nations* (1828); published *A Dictionary, Practical, Theoretical, and Historical, of Commerce and Commercial Navigation* (1834); *A Statistical Account of the British Empire* (1836); *A Dictionary, Geographical, Statistical, and Historical, of the Various Countries, Places, and Principal Natural Objects in the World* (1842; revised ed. 1866–67); *The Literature of Political Economy* (1845); and numerous other valuable treatises on economical topics. His great *Dictionaries* were long standard authorities upon their respective subjects. Prof. McCulloch received in 1843 the high honor of an election as one of the eight foreign associates of the French Institute of Moral and Political Sciences. He was appointed in 1838 comptroller of the royal stationery office, and received a pension of £200 for eminent services to literature. D. at Westminster Nov. 11, 1864.

McCul′ly (Jonathan), b. at Nassau, Nova Scotia, July 25, 1809; admitted to the bar in 1835; removed to Halifax in 1849, and became solicitor-general in 1860; was a delegate at the Quebec conferences of 1861 and 1862 on the union of the provinces and the Intercolonial Railway, being chief commissioner of railways for Nova Scotia; was for years connected with the Halifax press, and an influential advocate of colonial union. He was long a member of the legislative bodies both of Nova Scotia and of the Dominion of Canada; was at one time leader of the Liberal opposition in the upper house, and became in 1870 a judge of the supreme court of Nova Scotia.

McCur′dy (Charles Johnson), LL.D., b. at Lyme, Conn., Dec. 7, 1797; graduated at Yale in 1817; became a prominent lawyer; was often in the Connecticut legislature, in which he was Speaker three years; lieutenant-governor 1845–46; U. S. minister to Vienna 1851–52; was 1856–67 upon the bench, first in the superior and then in the supreme court of Connecticut.

McDonald (Charles J.), b. at Charleston, S. C., July 9, 1793; was reared in Hancock co., Ga.; graduated at Columbia College, S. C., in 1816; was admitted to the bar 1817, and settled in Milledgeville; was elected solicitor-general 1822; judge of the circuit court 1825. Having settled in Macon, he was a member of the legislature from Bibb co. 1834, and a member of the State senate 1837; was elected governor of the State 1839, and re-elected 1841. He was a member of the famous Nashville convention in 1850. In 1857 he was elevated to the bench of the supreme court of the State, which position he held with ability and distinction until his death, which occurred at Marietta, Ga., where he then resided, Dec. 16, 1860. Judge McDonald was reared in the State's rights school of politics, and was a most distinguished statesman. A. H. Stephens.

Macdonald (Étienne Jacques Joseph Alexandre), b. at Sancerre, in the department of Cher, France, Nov. 17, 1765, descended from a Scottish family which came to France with the Stuarts; entered the army in 1784; fought as a colonel at Jemappes in 1792, and became general of division in 1795. Having received the command in Central Italy in 1798, he fought with distinction against the Neapolitans, but was beaten by Suwarow on the banks of the Trebbia, June 17, 1799; was wounded; returned to Paris, and took the side of Napoleon in the revolution of 18th Brumaire, but afterwards lost the confidence of the emperor on account of his staunch defence of Gen. Moreau. In 1809, however, Napoleon again gave him a command, and he distinguished himself so much in the battle of Wagram that he was created duke of Tarentum and made a marshal of France. In the campaigns of 1812–14 he rendered distinguished services, but was defeated by Blücher at Katzbach Aug. 26, 1813; and adhered firmly and honestly to Napoleon till his abdication. Having taken service with the Bourbons, he refused to accept any office during the Hundred Days, and lived, much honored, though in retirement, during the second restoration. D. Sept. 24, 1840, at Courcelles, near Guise.

Macdonald (Flora), b. in the island of South Uist, one of the Hebrides, in 1720; became celebrated in 1746 as the heroine of some of the remarkable adventures of Prince Charles Edward, the "young Pretender," whom she assisted in escaping pursuit from South Uist to Skye. She was imprisoned on board vessels of war and at London for several months; released in 1747; married Allan Macdonald in 1750, and settled in Fayetteville, N. C., in 1775. During the Revolutionary war her husband served as a loyalist officer in the British army, and Flora returned to the island of Skye, where she d. Mar. 4, 1790.

MacDonald (George), b. in Huntley, Scotland, in

1825; was educated at the University of Aberdeen; studied for the ministry at the Independent college, Highbury, London; preached in the counties of Surrey and Sussex for some time, but ultimately devoted himself entirely to literature, settling in London. He published volumes of poems in 1855, 1857, 1864, and 1868. He has published several novels: *David Elginbrod* (1862), *Alec Forbes of Howglen* (1865), *Annals of a Quiet Neighborhood* (1866), *Guild Court* (1867), *Robert Falconer* (1868), *Wilfred Cumbermede* (1871), and *Malcolm* (1874); has written several successful juvenile books, and two theological works; published *Castle Warlock* (1882). He has been principal of a ladies' seminary in London, and lectured in U. S. (1872–73).

Macdonald (Sir JOHN ALEXANDER), K. C. B., D. C. L., b. Jan. 11, 1815, in Sutherlandshire, Scotland; removed in 1820 to Kingston, Canada, with his father; was called to the bar 1835; was elected to the provincial Parliament 1844, and successively held the posts of receiver-general and member of the executive council. He was 1847–50 commissioner of crown lands and member of the cabinet. He was 1854–62 attorney-general of Canada, part of the time premier; minister of militia 1862–64; attorney-general 1864–68, holding also from 1865 the ministry of militia. In 1868 he received the title of minister of justice, and became premier 1869, which position he held until Nov. 5, 1873. In 1878 he again became premier and minister of the interior. He is the leader of the conservative party in Canada, and was in 1866 chairman of the commissioners who in London arranged the terms of confederation.

Macdonald (JOHN SANDFIELD), Q. C., b. at St. Raphael, Glengarry co., Ontario, Canada, Dec. 12, 1812; was called to the bar in 1840; was in the provincial Parliament 1841–67, and its Speaker 1852–54; solicitor-general 1849–51; attorney-general of Canada in 1858; and in 1867 became attorney-general of Ontario. D. June 1, 1872.

McDon'nell (Sir RICHARD GRAVES), LL.D., b. at Dublin, Ireland, in 1815; educated at Trinity College, of which his father, Rev. Richard McDonnell, D. D., was provost; called to the bar in Ireland 1838, in England 1840; became chief-justice of the British colony at Gambia, Africa, 1843; governor 1847; conducted several exploring expeditions into the interior of Africa; was governor of St. Vincent 1852, of South Australia 1855, where he zealously promoted the exploration of the interior and the navigation of Murray River; became lieutenant-governor of Nova Scotia Apr., 1864, and was governor of Hong-Kong from Oct., 1865, till 1872. D. Feb. 5, 1881.

MacDonough, on R. R., cap. of Henry co., Ga. (see map of Georgia, ref. 3–G, for location of county). Pop. in 1870, 320; in 1880, 320.

McDonough (Commodore THOMAS), b. in Newcastle co., Del., Dec. 23, 1783; entered the U. S. navy as midshipman in 1800, served in the expedition to Tripoli, under Decatur, 1803–04; became lieutenant 1807, commander July 24, 1813; gained the celebrated victory in Lake Champlain Sept. 11, 1814, over the superior British squadron under Commodore Downie, for which he was promoted to captain; received a gold medal from Congress, and from the State of Vermont an estate on Cumberland Head, in view of the scene of the engagement. While returning from the command of the Mediterranean squadron he d. at sea, Nov. 16, 1825.

McDou'gal (DAVID D.), b. in Ohio Sept. 27, 1809; entered the navy as a midshipman Apr. 1, 1828; became a passed midshipman in 1834, a lieutenant in 1841, a commander in 1857, a captain in 1864, a commodore in 1869; rear-admiral in 1873. On July 16, 1863, at Simonaski, Japan, McDougal, in command of the Wyoming, engaged six land-batteries and three Japanese war-vessels, sinking one of the vessels, exploding the boilers of a second, and seriously crippling the third. D. at San Francisco, Cal., Aug. 7, 1882. F. A. PARKER.

McDou'gall (Gen. ALEXANDER), b. in Scotland in 1731; came to America with his father about 1755, and settled near New York, in which city he engaged in several mechanical avocations; was in 1769 a printer, and imprisoned by the colonial government (1770) for a libellous address. He took an active part in the popular movements preliminary to the Revolution; was appointed colonel of the first New York regiment; brigadier-general Aug., 1776, and major-general Oct. 20, 1777; was engaged in the battles of Long Island, White Plains, and Germantown, and in the New Jersey campaign; commanded the posts on the Hudson 1778–80; was minister of marine for a short time early in 1781; was elected a delegate to Congress from New York in that year, and again in 1784; elected to New York senate 1783. D. in New York June 8, 1786.

McDougall (JAMES A.), b. in Bethlehem, N. Y., Nov. 19, 1817; became in 1837 a lawyer of Pike co., Ill.; attorney-general of Illinois 1842–44; was a civil engineer; went on an exploring expedition to California *viâ* the Rio Grande and the Gila 1849; attorney-general of California 1850; Democratic member of Congress 1853–55; U. S. Senator 1861–67. D. at Albany, N. Y., Sept. 3, 1867.

McDowell (EPHRAIM), M. D., b. in Rockbridge co., Va., Nov. 11, 1771; attended medical lectures in Edinburgh 1793–94; settled as a physician at Danville, Ky., 1795; became the leading surgical operator of the Western States, and performed the first operation in ovariotomy ever known, at Danville, Ky., Dec., 1809. This with other cases was published in 1816 in the *Eclectic Repertory and Analytic Review* by the operator himself. In general surgery Dr. McDowell was distinguished; he cut thirty-two times for stone in the bladder without losing a case. D. at Danville June 25, 1830. PAUL F. EVE.

McDowell (Gen. IRVIN), b. at Columbus, O., Oct. 15, 1818; educated at the Collége de Troyes, France, and at the U. S. Military Academy, from which latter he was graduated July 1, 1838. Appointed second lieutenant of artillery in the army; adjutant at West Point 1841–45; aide-de-camp to Gen. Wool 1845, as adjutant-general of his division, in the war with Mexico, and subsequently of the army of occupation. At the battle of Buena Vista he gained the brevet of captain, and in May, 1847, was appointed brevet captain and assistant adjutant-general. Served as adjutant-general of various departments until 1861, having been promoted to brevet major in 1856. Ordered to Washington in Feb., 1861, he served until May as inspector of troops, in organizing and mustering volunteers. Appointed brigadier-general May 14, he was three days later assigned to the command of the department of North-east Virginia and the defences of Washington on the Virginia side of the Potomac, and on May 27 to the Army of the Potomac, which he commanded at the battle of Bull Run, July 21. On the accession of Gen. McClellan to command, McDowell was placed in command of a division of the Army of the Potomac, and on the reorganization of that army (Mar., 1862) of the 1st corps of that army, and made major-general of volunteers; of the department of the Rappahannock Apr., 1862; of the 3d army corps (Army of Virginia) Aug., 1862, and during Gen. Pope's campaign in Northern Virginia was engaged at Cedar Mountain, Rappahannock Station, and second Bull Run. In July, 1864, placed in command of the dept. of the Pacific; of dept. of Cal. June, 1866, dept. of the East 1868; became major-gen. U. S. A. in Nov., 1872, and in Dec. assigned to the command of the division of the South. Retired Oct. 15, 1882. D. May 4, 1885.

McDuffie (GEORGE), b. in Warren (then Columbia) co., Ga., in 1788; was in youth a mercantile clerk; graduated at South Carolina College, Columbia, in 1813; was admitted to the bar in 1814, and commenced practice at Edgefield, S. C. In 1818 he was elected to the South Carolina legislature, in 1821 to Congress, and continued in the House of Representatives from 1821 to 1835, during which time he took an active and prominent part in all public questions. In debate, he was distinguished for readiness, fluency, eloquence, and power. His speeches were always extemporaneous; the most famous of these were his denunciations of the protective policy, of which he denied the constitutionality. In submitting this and like questions of doubtful power under the Constitution of the U. S. to the decision of the State courts instead of the Federal consisted the so-called doctrine of nullification. As a popular orator or "stump speaker" McDuffie was highly passionate and exceedingly declamatory. His language was terse and strong, his sentences short, his ideas clear and distinct. In 1835 he became governor of the State; was elected in 1843 to the Senate of the U. S., and took an active part in the proceedings of that body until 1846, when he resigned in consequence of failing health. His early political writings (about 1818), collected in a volume called *The Crisis*, were opposed to the views he maintained at a later period. To Gov. McDuffie was due the credit of the reorganization of the College of South Carolina. He was for many years a major-general in the State militia. D. Mar. 11, 1851. A. H. STEPHENS.

Mace [Lat. *macis*], the dried arillus or inner coat investing the shell of the nutmeg, which is the kernel of the nut of *Myristica fragrans*, a tree of the Spice Islands (order Myristicaceæ) now naturalized in other hot regions. Mace of inferior quality is also produced by *Myristica fatua* of the same regions. Mace is used as a spice, and as an aromatic stimulant in medicine. It has also the slight narcotic power of the nutmeg, in a milder degree. It yields a volatile oil upon distillation, and a buttery fixed oil when subjected to pressure. The oil of mace of commerce is, however, generally the fixed oil of the nutmeg, which is harder than the true oil of mace. Mace, in the fresh state fleshy and of a beautiful crimson, appears in commerce as a mass of flat, dry branching plates of an orange-brown color, and a taste and smell resembling those of nutmeg, but rather milder and pleasanter.

Macé (Jean), b. at Paris, France, Apr. 22, 1815; educated at the Collége Stanislaus; served in the army 1842–45; was secretary to Theodore Burette 1845–47; editor of *La République* 1849; retired to Alsace after the *coup d'état;* founded in 1864 *Le Magazin d'Education*, and in 1866 a "League of Instruction" after the Belgian model. His *History of a Mouthful of Bread* (1861), *The Servants of the Stomach* (1866), and *Fairy Book* have been translated into English, and found much favor.

Macedo'nia, an ancient and at one time very famous kingdom of South-eastern Europe, originated from a small and obscure beginning, and comprised, when it first became known to history, the districts extending between Epirus and Illyria on the W., Pæonia on the N., Thracia, from which it was separated by the river Strymon, on the E., and Thessaly on the S. The country was fertile, rich in gold and silver, and produced excellent wheat, wine, and oil. The capital was Pella. The inhabitants were an Illyrian race, which here met and mingled with Thracian and Greek settlers. Greece had very early planted many flourishing colonies in these regions, as, for instance, Potidæa, a colony of Corinth, Chalcidice of Eubœa, and Amphipolis of Athens. Greek became the prevailing language, and Greek civilization the ruling spirit, but the dominant race was not Hellenic, and the Macedonians were never acknowledged by the Greeks as countrymen. When Xerxes invaded Greece he compelled Alexander, king of Macedonia, to follow him as his vassal, but after the battle at Platæa the country once more became independent. A century and a half later, Philip II. (359–336) conquered Greece, and his son, Alexander the Great (336–323), made Macedonia the most powerful empire of his time. But on the death of Alexander his empire dissolved into four kingdoms, and the splendor of Macedonia declined very rapidly. A quarrel between Philip V. and Athens gave the Romans an opportunity of interfering, and Philip was utterly defeated at Cynoscephalæ in 197 B. C., as was Perseus at Pydna in 168 B. C. After an unsuccessful uprising against the supremacy of the Romans, Macedonia was finally made a Roman province in 146, and included as such parts of Illyria, Pæonia, and Thracia. In the Middle Ages the name gradually went out of use, and in the present administrative division of Turkey it has no place.

Macei'o, a seaport town of Brazil, capital of the province of Alagoas, situated on the Atlantic, in lat. 9° 39′ S. Its harbor is protected N. and E. by a small peninsula and by reefs, but it is open to the S., and unsafe from May to September, when the southern winds prevail. In spite of this disadvantage, the commerce of the port increases rapidly, and some manufactures have been commenced. Pop. about 8000.

McEntee (Jarvis), b. in Rondout, N. Y., July 14, 1828; studied painting with F. E. Church; opened a studio in New York in 1858; has been very successful in Northern (especially mountain) landscapes, and more recently in figure-painting, in both of which branches he ranks high among American artists.

Macera'ta, town of Central Italy, in the province of Macerata, about 30 miles N. W. of Fermo. This town, one of the finest in the Marches, is surrounded by strong walls crowned by thirty-three towers, and at one of its six gates stands a triumphal arch. The aspect of the town itself is striking, and the panorama to be seen from it is very beautiful. On one side stretches a wide horizon of sea, on the other an arc of hills, fertile and populous, gradually rising till they end in a lofty mountain-crest. The public buildings are generally spacious and elegant. Among the churches should be mentioned the cathedral, modern, but containing old mosaics and pictures of interest; Santa Maria delle Vergini, of much architectural merit; Santa Maria della Pace, of the fourteenth century, etc. Here is a palace of the thirteenth century, which is one of the finest specimens existing of the architecture of that age, not to speak of other private dwellings of great richness. Macerata was built about 408 A. D. on the ruins of Recina, a celebrated town of the territory of Piceno. It was generally faithful to the pope during the Middle Ages; in 1797 it opened its gates voluntarily to the French, but two years later, the country people having recovered possession of the place, Gen. Monnier took it by assault and gave it over to be sacked. The bishopric of Macerata dates from the suppression of the see of Pecanati in 1320. Murat retired here for a few days in 1815, and here his demoralized troops forsook him. Macerata was among the foremost for popular freedom in 1848–49, and its citizens are distinguished for intelligence. Pop. in 1881, 20,219.

McFar'land (Francis Patrick), D. D., b. at Franklin, Pa., Apr. 6, 1819; was educated at Emmittsburg, Md.; was ordained to the Roman Catholic priesthood in 1845; held professorships at Emmittsburg, Md., and Fordham, N. Y., and pastorates at various places in the State of New York; was consecrated bishop of Hartford, Conn., in 1858. D. Oct. 12, 1874.

McFarland (John), b. in Pennsylvania Sept. 7, 1841; graduated at the Naval Academy in 1861; became a lieutenant in 1862, a lieutenant-commander in 1866. D. in 1874. Served in the Iroquois at the passage of Forts Jackson and St. Philip and the capture of New Orleans, and in the fights at Vicksburg and Grand Gulf in 1862. Highly spoken of in official reports. Foxhall A. Parker.

Macfar'lane (Charles), b. in England early in the nineteenth century; travelled extensively in the East and resided many years in Italy; wrote, among other works, *Constantinople in 1828–29* (1829), *Our Indian Empire* (1844), *The French Revolution* (1845), *The Pictorial History of Scotland*, with G. L. Craik (8 vols., 1849), *Turkey and its Destiny* (1850), *Memoir of the Duke of Wellington* (1851), *Life of the Duke of Marlborough* (1852), and a *History of British India* (1852). D. in 1858.

Macfarlane (Robert), b. in the Highlands of Scotland in 1734; educated at the University of Edinburgh, and is alleged to have assisted Macpherson in the preparation of *Ossian.* He published a Latin translation of *Temora* (1769), one of the Ossianic epics; wrote vols. i. and iv. of a *History of the Reign of George III.* (4 vols., 1770–96); edited the *Morning Chronicle* and the *Morning Packet;* published an *English and Gaelic Vocabulary* (1795) and *The Poems of Ossian in Gaelic, with a Literal Translation into Latin* (1807). He was engaged upon a vindication of the genuineness of *Ossian* at the time of his death, which occurred in 1804.

Macfar'ren (George Alexander), Mus. D., b. in London, England, Mar. 2, 1813; studied at the Royal Academy of Music, where he became professor of harmony in 1838; composed *The Devil's Opera*, produced at the Lyceum Theatre in 1838, and since then has brought out a long series of operas, oratorios, overtures, symphonies, sonatas, cantatas, and anthems, besides some hundreds of songs; wrote the lives of eminent musicians for the *Imperial Dictionary of Universal Biography;* published *Rudiments of Harmony* (1840–60) and *Six Lectures on Harmony* (1867); arranged *Old English Ditties* (13 books, 1857–69), Moore's *Irish Melodies* (1859), and a series of *Scotch Songs.* He has been long connected with the management of the Royal Academy of Music, has lectured on music at the Royal Institution, and was elected Mar. 16, 1875, professor of music at Cambridge University, in place of the late Sir Sterndale Bennett. Prof. Macfarren's songs from Tennyson's *Idyls*, Lane's *Arabian Nights*, Kingsley's *Poems*, and the dramas of Shakspeare have obtained great popularity. He has been blind since the year 1840.

McFer'rin (John Berry), D. D., b. June 15, 1807, in Rutherford co., Tenn.; was admitted as a preacher into the Tennessee conference of the M. E. Church 1825; spent fourteen years in pastoral work, including two years as missionary to the Cherokee Indians; edited the *South-western Christian Advocate* at Nashville, Tenn., for eighteen years (1840–58); was book-agent of the M. E. Church, South, for eight years (1858–66); became corresponding secretary of the board of missions in 1866, which office he still fills (1875). He has written the *History of Methodism in Tennessee* (3 vols.).

McGee' (Thomas D'Arcy), b. at Carlingford, Louth, Ireland, Apr. 23, 1825; came in 1842 to Boston, where he wrote for the Boston *Pilot*, and became its chief editor; became London correspondent of the Dublin *Freeman's Journal*, and afterwards was secretary of the Irish confederation and an editor of the *Nation.* In 1848 he fled to New York, where he was 1848–50 editor of the New York *Nation*, and afterwards of the *American Celt.* Displeased with the "Know-Nothing" movement, he went to Montreal, Canada; edited the *New Era*, disavowed republicanism, became an ardent royalist; entered the provincial Parliament in 1857; became in 1864 president of the executive council, and in 1867 minister of agriculture. He denounced the Fenian movement, and was assassinated by James Whelan at Ottawa, Canada, Apr. 7, 1868. His principal works are *O'Connell and his Friends* (1854), *Canadian Ballads* (1858), *Irish Settlers in America* (1851), *Protestant Reformation in Ireland* (1853), *History of Ireland* (1862), *Catholic History of North America* (1854), *Speeches* (1865).

McGeo'ghan (James), b. near Mullingar, Westmeath, Ireland, in 1698; educated for the priesthood at Rheims, France; became chaplain of the renowned Irish brigade in the French service, and wrote in French, at the request of several Irish officers, a *History of Ireland, Ancient and Modern* (1758), of which an English translation by Patrick O'Kelly appeared in 1835, and was reprinted in New York in 1868, with a continuation by John Mitchel. D. in Paris about 1760.

McGill′ (John), D. D., b. in Philadelphia Nov. 4, 1809; emigrated in childhood to Bardstown, Ky.; graduated at St. Joseph's College; was admitted to the bar at Bardstown; practised law in New Orleans and in Kentucky; studied theology at Baltimore and Rome, and in 1830 took priest's orders in the Roman Catholic Church at Bardstown, Ky.; preached in Lexington, Ky.; edited the *Catholic Advocate*, and in 1850 was consecrated bishop of Richmond, Va. He took a prominent part in the Vatican Council. D. at Richmond, Va., Jan. 14, 1872. Bishop McGill was an able preacher and a distinguished polemical debater and writer.

McGil′livray (Gen. Alexander), a Creek chief, son of Lachlan McGillivray, a Scotch trader, by the half-breed daughter of a French officer, b. on the Coosa River, near the present city of Wetumpka, Ala., about 1740; was well educated at Charleston, and was for some time engaged in commercial pursuits at Savannah, but preferred to return to his tribe, in which at the time of the Revolution he had become a prominent leader and head of the royalist party. After the war, in which he took little part, he induced the so-called "Muscogee Confederacy," embracing Creeks, Seminoles, and other tribes, to become allies of the Spanish colonial government of West Florida; was the commissary of that government among his countrymen, and concentrated their trade at Pensacola. In 1790 he visited New York by invitation of Washington; was received with honor; signed a treaty ceding to the U. S. the disputed territory on the Oconee River, and by a secret article of the same instrument received the appointment of U. S. agent, with the rank and pay of brigadier-general. D. at Pensacola Feb. 17, 1793. McGillivray was a man of culture and political talent, and exercised a splendid hospitality. He was uncle to the celebrated chief William Weatherford.

McGillivray (William), LL.D., b. in the Isle of Harris, Scotland, in 1796; became in 1823 assistant professor of natural history at the University of Edinburgh; was afterwards conservator of the museum of the Royal College of Surgeons in that city, and in 1841 was appointed regius professor of natural history in Marischal College, Aberdeen. He published *Lives of Eminent Zoologists from Aristotle to Linnæus* (1834); *A History of British Birds, Indigenous and Migratory* (5 vols., 1837–62), considered by Audubon the best work on the subject; manuals on geology and botany, and several other useful works. D. at Aberdeen Sept. 5, 1852. He left unfinished a treatise on *The Natural History of Dee-side and Bræmar*, illustrating the vicinity of Balmoral. The manuscript was purchased by Queen Victoria and printed in 1856.

McGrea′dy (James), b. probably in Pennsylvania about 1760; was educated at Jefferson College; became a Presbyterian minister in North Carolina; removed to Southwestern Kentucky in 1796, where he directed a remarkable revival of religion which, begun in 1797, lasted for some years, and organized in July, 1800, the first camp-meeting. The religious movement thus begun was carried on by young men who were ordained to the ministry without a regular education in theology. This step gave rise to opposition, and the ecclesiastical difficulties culminated in 1810 in the organization of a new Church, which took name from the region of its origin. (See Cumberland Presbyterian Church, by Prof. R. Beard.)

MacGreg′or, R. R. junction on Mississippi River, Clayton co., Ia. (see map of Iowa, ref. 3-J, for location of county). It has good schools, carriage, wagon, and other manufactories. Pop. in 1870, 2074; in 1880, 1602.

MacGregor (Charles), b. Jan. 15, 1843; graduated at the Naval Academy in 1863; became a lieut. in 1866, a lieut.-commander in 1868; commander June 5, 1878; served in the Juniata at both attacks upon Fort Fisher, and formed one of the storming-party of Jan. 15, 1865. Highly commended for "bravery and coolness." Foxhall A. Parker.

MacGregor (John), b. in Stornoway, Ross-shire, Scotland, in 1797; emigrated to Canada in youth, and was long engaged in commercial pursuits; published *A Sketch of British America* (1828), *Emigration to British America* (1829), *My Notebook* (1835), *Commercial and Financial Legislation of Europe and America* (1841), *Commercial Statistics of all Nations* (5 vols., 1844–50), *Progress of America from the Discovery by Columbus to 1846* (2 vols., 1847), *Holland and the Dutch Colonies* (1848), *Germany and her Resources* (1848), and a *History of the British Empire from the Accession of James I.* (2 vols., 1852). Returning to England, he was employed on commercial missions to several European governments; was in 1840 a secretary of the board of trade; advocated free-trade measures; was elected to Parliament for Glasgow 1847; was established governor of the Royal British Bank, on the failure of which he retired to Boulogne, France, where he d. Apr. 23, 1857.

MacGregor (John), b. at Gravesend, England, Jan. 24, 1825; graduated with honor from Trinity College, Cambridge; entered at the Middle Temple 1847; made a tour of Europe, the Levant, Egypt, and Palestine 1849–50; was called to the bar 1851; visited Russia and every country in Europe, as well as Algeria, Tunis, the U. S., and Canada; wrote and sketched for *Punch* and other periodicals; made in 1865 a canoe-voyage, of which in the following year he published the logbook, under the title *A Thousand Miles in the Rob Roy Canoe on Rivers and Lakes of Europe*, followed in later years by other voyages, recorded in the volumes *The Rob Roy on the Baltic*, *The Voyage Alone in the Yawl Rob Roy*, and *The Rob Roy on the Jordan*, all of which have been very popular and have found numerous imitators. Mr. MacGregor is captain of the Royal Canoe Club and a prominent member of the London school board.

McGuf′fey (William H.), D. D., LL.D., b. in Washington co., Pa., in 1800; went in youth to Trumbull co., O.; graduated at Washington College in 1825; was a professor in Miami University 1836–39; president of Ohio University 1839–45; professor of moral philosophy in the University of Virginia 1845–74. His well-known series of readers and other school-books had an immense sale. D. at Charlottesville, Va., May 5, 1873.

McGuire (Hugh Holmes), M. D., b. at Winchester, Va., Nov. 6, 1801; graduated in medicine at the University of Pennsylvania 1821; continued his studies under Dr. Physick, and became professor of surgery in the Winchester Medical College from its organization to its destruction during the war. He operated fifteen times for stone in the bladder without losing a case. At the meeting of the American Medical Association at Boston in 1849 he was made a vice-president. D. 1875. Paul F. Eve.

McGuire (Hunter Holmes), M. D., son of Dr. H. H. McGuire, b. in Winchester, Va., Oct. 11, 1835; took his degree of M. D. 1855, and was elected professor of anatomy in the Winchester Medical College, which position he held until 1858. He entered as a private in the Confederate army, was soon promoted to medical director of the 2d army corps of Northern Virginia, and became surgeon to Gen. "Stonewall" Jackson. In 1865 he was elected professor of surgery in the Virginia Medical College at Richmond. Since the war he has performed lithotomy forty-seven times, attended a large general practice, and contributed several valuable articles to the professional journals. Paul F. Eve.

Machæ′rodus [Gr. μάχαιρα, a "sabre," and ὀδούς, a "tooth"], an extinct genus of carnivorous mammals allied to the cats, and distinguished by the enormously developed canines of the upper jaw. These teeth are long, curved, and compressed, with a trenchant and usually serrated edge behind and before, whence the name "sabre-toothed tigers" applied to the group, which has been divided into three genera—*Drepanodon* (from δρεπάνον, a "scimitar"), *Smilodon* (from σμίλη, a "chisel" or "graver"), and *Machærodos*. Many species have been described from the Middle and Later Tertiary and the Quaternary deposits of Europe, Asia, North and South America. *Machærodus primævus*, from the Bad Lands of Dakota, was somewhat smaller than the cougar or American panther, and the skull resembles that of that animal in many respects. The orbit, however, is smaller, as is also the brain-case. The fore part of the lower jaw below the symphysis is prolonged downward for the protection of the projecting upper canines when the mouth was closed. The dental formula is the same as in the cats—viz. incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{3-3}{2-2}$; molars, $\frac{1-1}{1-1}$; 30 teeth in all. The sectorial or flesh tooth is the last premolar in the upper jaw and the true molar of the lower jaw. The true molar of the upper jaw is a tubercular tooth. The lower canines are small. The incisor teeth are larger and longer than in the cats. Another larger species is represented by less perfect remains from the same locality of the Miocene Tertiary. *M. sivalensis* is another Miocene species from the Sewalik Hills, India. *M. cultridens* from the Tertiary of the Val d'Arno is a large species, the upper canines measuring eight and a half inches along the anterior curve. *M. latidens* from the Quaternary of Kent's Hole, England, was scarcely smaller, and equalled the largest living tiger in size, while *M. Neogæus* from the Quaternary of the caverns of Brazil was a still larger species, the canines projecting about eight inches from their sockets. The later species of *Machærodus* were doubtless contemporary with man, but the group became extinct before the beginning of the historic period.

O. C. MARSH.

McHale′ (JOHN), D. D., b. in 1791 at Tubbernavine, Mayo, Ireland; studied for the Roman Catholic priesthood at Maynooth College, where he became professor of theology (1814); was appointed coadjutor bishop of Killala in 1825; became titular bishop in May, 1834, and archbishop of Tuam in August of the same year. He took an active part in the agitation which led to Roman Catholic emancipation, writing two series of letters on the subject; published in 1827 a treatise on the *Evidences and Doctrines of the Catholic Church;* built a cathedral at Ballina; built or rebuilt more than 100 churches; established numerous convents and Roman Catholic parish schools; preached at Rome in 1832 a series of sermons, which were translated into Italian; obtained from the pope in 1848 the condemnation of the "queen's colleges" in Ireland, and in 1869 procured a vote of censure against mixed education from a council of Irish bishops. He did much to revive the literary use of the Irish language, translating in the original metres 60 of Moore's *Irish Melodies*, published Irish translations of six books of the *Iliad* (1861), and of the Pentateuch (1863), to be followed by other books of the Old Testament. D. Nov. 7, 1881.

McHenry (JAMES), b. in Maryland about 1753; served as A. D. C. to La Fayette, with the rank of lieutenant-colonel; member of the old Congress 1783–86, and one of the framers of the Constitution; was secretary of war under Presidents Washington and Adams. Fort McHenry, one of the defences of Baltimore, was named in his honor. D. at Baltimore May 8, 1816.

Machi′as, cap. of Washington co., Me. (see map of Maine, ref. 7–G, for location of county), at the head of navigation of the Machias River, 12 miles from its mouth, contains a machine-shop and foundry, sash and blind factory, a custom-house, court-house, and jail. The people are largely engaged in lumbering and shipbuilding. Pop. of tp. in 1870, 2525; in 1880, 2203.

Machin′ery [Gr. μηχανή; Lat. *machina*]. The study of machinery apart from that of machines has to do solely with the transmission and transformation of movement. It is a term generally applicable to the intermediate organs of machines (see MACHINES), and as such its perfection in project and establishment consists in reducing passive resistances to a minimum; of these, the most notable are friction and vibratory motions or shocks. In the arts but two principal movements are used—namely, rectilinear translation and circular, or rotation about an axis, each of these being either continuous or intermittent. Combinations of the pulley, the muffle, and also the inclined plane, serve to transmit and modify continuous rectilinear motion. Rectilinear and circular continuous motions are combined by the axle, the screw, the rack and pinion, and rollers. Circular continuous motions are combined by friction-drums, gearing-wheels, belts, and endless screws. Continuous circular and intermittent rectilinear motions are combined by eccentrics, cams, cranks, and connecting-rods, balance-beams, and certain kinds of rack and pinion. Continuous circular and intermittent circular are combined by cams, balance-beams, cranks, and connecting-rods. Circular and rectilinear motions, both intermittent, are combined by balance-beams with counterbalance-beam and parallelogram, or balance-beams with sliding bars, and by cylinders rolling in straps. Besides these transformations there may be mentioned the production of epicycloidal or helicoidal movements, which indeed fall within the combination of the foregoing; and finally, in general, the determination of a movement upon any curve requiring special solutions by means of the artifices of higher kinematics, such as represented by Peaucellier's cell and link-work.

But in practice sixteen or twenty transformations are all that are demanded from machinery to change the form or velocity of motion; and supposing the system so far adapted to this end in the drawing that it works smoothly by geometry, it is further only necessary, in order to reduce the passive resistances to a minimum, that it be arranged so as to equalize, if possible, the plus and minus pressures at all times when they are variable; that it be well centred, firmly established, adequately lubricated; and, if the motor and resisting works cannot at all instants balance, as is usually the case in machines, that a supplementary mass, such as a fly-wheel, be added to regulate the movement, unless it may happen that the rotating parts of the machinery itself are massive enough to render such an addition unnecessary, under which supposition it ought to be dispensed with.

F. L. VINTON.

Machines. Machines in their most general definition might be studied from three different points of view: First, by considering forces alone produced in a state of equilibrium, as is done in discussing the wedge, the lever, and all machines destined rather to exercise great pressure than to entertain movement. Secondly, by considering displacements or transformations of motion only by means of machinery. The first consideration is in the domain of statics, the second in that of geometry. Finally, by studying force and movement at the same time, as is done with regard to all machines calculated for the transmission of work, and in which the economy of the motor is one of the prime conditions to satisfy; this study is in the domain of dynamics, and it alone is at present distinctively called the study of machines. A motor force multiplied by its path is its work, and a machine is a system of material organs destined to transmit and present this work conveniently and economically for the overcoming of certain resistant works. In all cases a machine is composed of several organs, and is submitted to several forces. These last are—first, the motor, such as a steam or water pressure, or an animate motor; second, the useful or industrial resistance, such as the resistance of iron which is to be rolled, grain to be ground; third, the secondary or passive resistances, which are friction of sliding and rolling, stiffness of cordage, resistance of media, and movements of vibration. The organs are—the receptor, which is the locus of application of the motor, such as a piston, a bucket, a bar; next, the intermediate organs or transmitters, such as cranks, connecting-rods, cords, belts, gearing; and finally the operator or tool, shears, millstone, needle. Every machine transmits exactly as much work as it receives, and no more; but as a considerable portion is transmitted no farther than to the points of application of the passive resistances, it follows that in no machine can the industrial work equal the motor work; and finally that the perfection of a machine consists only in the perfection of its organs—such, namely, that the motor be not wasted on the receptor, that the intermediates be arranged so as to reduce the passive resistances to their natural minimum, and that the tool be adapted to the form of resistance which it has to meet. The principal motor machines to which the foregoing applies are water-wheels, water-pressure engines, turbines, steam-engines, hot-air engines, gas-engines, windmills, and powers for man or horse.

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Machray′ (ROBERT), D. D., LL.D., b. in England about 1830; graduated at Cambridge 1855; became dean and fellow of Sidney-Sussex College and vicar of Madingley, and in 1865 was appointed bishop of Rupert's Land, a diocese which includes the Hudson's Bay settlements.

Mac′Ilvaine (CHARLES PETTIT), D. D., LL.D., D. C. L., b. at Burlington, N. J., Jan. 18, 1798; graduated at Princeton in 1816; took orders in the Protestant Episcopal Church 1820; officiated at Georgetown, D. C.; was chaplain at West Point, N. Y., and professor of ethics and history 1825–27; became rector of St. Anne's, Brooklyn, N. Y., in 1827; professor of the evidences of revealed religion in the University of the City of New York in 1831; was consecrated bishop of Ohio in 1832; was president of Kenyon College 1832–40, and afterwards president of the theological seminary at Gambier, O. His *Evidences of Christianity* (1832) has gone through many editions. Among his other numerous works are *Oxford Divinity* (1841), *The Holy Catholic Church* (1844), *Valedictory Offering* (1853), *The Truth and the Life* (1855). D. at Florence, Italy, Mar. 12, 1873.

McIntosh (Col. JAMES S.), son of Gen. John, b. in Liberty co., Ga., June 19, 1787; entered the U. S. army as lieutenant in Nov., 1812; served on the Canada frontier and through the Creek war; became major 1836, lieutenant-colonel 1839, and brevet colonel for gallantry at Palo Alto and Resaca de la Palma 1846; commanded a brigade in the Valley of Mexico; was distinguished at Churubusco, and mortally wounded at the head of his column in the assault upon Molino del Rey. D. in the city of Mexico Sept. 26, 1847.—His son JAMES, who graduated at West Point in 1849, became a general in the Confederate service, and was killed at the battle of Pea Ridge, Ark., Nov. 7, 1862.

McIntosh (Gen. JOHN), brother of Lachlan, b. in Georgia about 1745; distinguished himself in the war of the Revolution in the Southern States, attaining the rank of lieutenant-colonel; settled in Florida after the war; was imprisoned by the Spaniards at St. Augustine and at Havana, and was major-general of Georgia militia in the service of the U. S. at Mobile 1814–15. D. on his plantation in McIntosh co., Ga., Nov. 12, 1826.

McIntosh (Gen. JOHN B.), b. in Florida about 1838; entered the U. S. army as second lieutenant of cavalry June, 1861; was engaged in the campaign in Virginia, Maryland, and Pennsylvania 1862–65, attaining the rank of brigadier-general July 21, 1864, and brevet major-general 1865; lost a leg at Opequan; was made lieutenant-colonel of the 42d Infantry 1866, and retired with the rank of brigadier-general July 30, 1870.

McIntosh (Gen. Lachlan), b. at Borlam, near Inverness, Scotland, Mar. 17, 1727. His father, John More McIntosh, the head of the Borlam branch of the clan McIntosh, accompanied Oglethorpe to Georgia in 1736 with 100 of his tribesmen, and settled at New Inverness (now Darien), in what is now McIntosh county. Lachlan had few opportunities for education, but, aided by Gov. Oglethorpe, studied mathematics and surveying; became a clerk at Charleston in the counting-house of his friend Henry Laurens; was afterwards a surveyor in the Altamaha region; studied military tactics; became colonel of the 1st Georgia regiment and brigadier-general in the war of the Revolution (1776); killed Button Gwinnett in a duel May, 1777; commanded the Western department 1778, and led an expedition against the Indians of the Ohio Valley; was actively engaged in the siege of Savannah 1779, and in the defence of Charleston 1780, where he became a prisoner of war. He was a member of the Continental Congress 1784, and commissioner to treat with the Southern Indians 1785. D. at Savannah Feb. 20, 1806.

McIntosh (Maria J.), grand-niece of Gen. Lachlan, b. at Sunbury, Ga., in 1803; educated at Sunbury Academy; removed to New York in 1835; suffered a reverse of fortune in the financial crisis of 1837, when she determined to earn a support by authorship, and under the *nom-de-plume* of "Aunt Kitty" produced a juvenile story entitled *Blind Alice*, which did not find a publisher until 1841. It immediately became popular, was followed by four other juveniles (1843), and the whole series was issued in 1847 in one volume as *Aunt Kitty's Tales*. By the recommendation of the eminent tragedian Macready they were republished in London, as also her later works. *Conquest and Self-Conquest* (1844), *Woman an Enigma* (1844), *Praise and Principle* (1845), though published as "Aunt Kitty's," were written for maturer readers than the earlier volumes. *Two Lives, or to Seem and to Be* (1846), was the first work bearing her name, and was followed by *Charms and Counter-Charms* (1848), *Evenings at Donaldson Manor* (1849), *Woman in America, her Work and her Reward* (1850), *The Lofty and the Lowly* (1853), *Violet, or the Cross and the Crown* (1857), *Meta Gray* (1858), *Two Pictures* (1863).

McIntosh (Gen. William), b. at Coweta, Ga., about 1775, son of Capt. William McIntosh by a Creek Indian woman; was well educated; became a principal chief of his nation, and commanded the friendly Creeks in alliance with the U. S. during the second war with England; was distinguished in the battles of Antossee and Horseshoe Bend under Gen. Floyd, and later in the Florida campaign. Having taken part in the treaty of Indian Springs 1825, which ceded a considerable tract of land to the U. S., he became obnoxious to a party of his own nation, by whom he was murdered at his residence near Coweta Falls, on the Chattahoochee, Apr. 29, 1825.

McIntosh (William), b. in Georgia about 1796; was an educated Cherokee Indian, who became a Methodist minister; was one of the best interpreters the Cherokees ever had, and was an efficient missionary. He joined the Arkansas conference in 1841, and was a highly-esteemed member of the Indian mission conference at the time of his death, which occurred at Tahlequah, Ind. T., Dec., 1858. T. O. Summers.

Mackar'ness (John Fielder), D. D., b. in England Dec. 3, 1820; educated at Merton College, and became a fellow of Exeter College, Oxford; took holy orders in 1845; was vicar of Tardebigge, Worcestershire, 1845–55; rector of Honiton, Devonshire, 1855–58; prebend of Exeter 1858; proctor in convocation for the clergy of the diocese of Exeter 1865; favored the disestablishment of the Irish Church, and was appointed in Dec., 1869, bishop of Oxford.—His brother, George Richard Mackarness, D. D., late vicar of Ilam, Staffordshire, was consecrated bishop of Argyll and the Isles Mar. 25, 1874. D. Apr. 20, 1883.

Mackay' (Charles), LL.D., b. in Perth, Scotland, in 1812; was educated in London, Brussels, and Aix-la-Chapelle; was employed on the staff of the London *Morning Chronicle* 1834–43; editor of the Glasgow *Argus* 1844–47; was long editorially connected with the *London Illustrated News;* founded the *Review* in 1860; lectured in the U. S. in 1858, and was a war-correspondent of the London *Times* in the U. S. 1862–65. Is best known by his songs, some of which were set to music composed by himself. His principal works are—*Songs and Poems* (1834), *History of London* (1837), *The Thames and its Tributaries* (1840), *The Hope of the World* (1840), *Longbeard*, a romance (1840), *Memoirs of Extraordinary Popular Delusions* (1841), *The Salamandrine* (1842), *Legends of the Isles* (1845), *Education of the People* (1846), *The English Lakes* (1846), *Voices from the Mountains* (1847), *Town Lyrics* (1848), *Egeria* (1850), *The Lump of Gold* (1856), *Under Green Leaves* (1857), *A Man's Heart* (1860), *Studies from the Antique* (1864), *Under the Blue Sky* (1871), *Lost Beauties of the English Language* (1874).

McKay (Donald), b. in Shelburne, Nova Scotia, in 1809; learned shipbuilding in New York; commenced that business at Newburyport, Mass., and in 1845 established a famous shipyard at East Boston, where he constructed many fast clippers for the Australian and California trade. He launched Oct. 4, 1853, the magnificent ship Great Republic, of 4500 tons burden. D. Sept. 20, 1880.

McKay (James J.), b. in Bladen co., N. C., in 1793; became a lawyer; was State senator 1815–31; was at one time U. S. district attorney for North Carolina; was a representative in Congress 1831–49; became chairman of the committee of ways and means, and leader of the Democratic party in the House of Representatives, and received the vote of his State delegation in the Baltimore convention of 1848 as candidate for the Vice-Presidency of the U. S. D. at Goldsboro', N. C., Sept. 14, 1853.

McKean (Thomas), LL.D., a signer of the Declaration of Independence, b. at Londonderry, Pa., Mar. 19, 1734; admitted to the bar 1757, and early held important public trusts in Delaware and Pennsylvania. He was sent to the general Congress of 1765, where he took a bold stand for popular rights. He became in 1765 judge of the quarter sessions and the orphans' court, and sole notary and tabellion public for Delaware. In 1771 he was made collector of the port of Newcastle, and was 1774–83 a member of Congress from Delaware, president of Congress in 1781; president of Delaware 1777, although he had for some years been a citizen of Pennsylvania. He wrote the constitution of Delaware in a single night, with no book for reference, and it was adopted unanimously on the following day. He was (1777–99) chief-justice of Pennsylvania, and its governor 1799–1808. He was one of the ablest and most determined of the Revolutionary patriots. D. at Philadelphia June 24, 1817.

MacKee, cap. of Jackson co., Ky. (see map of Kentucky, ref. 4–I, for location of county), 30 miles E. of Stanford. Pop. in 1880, 88.

Mackees'port, R. R. centre, Alleghany co., Pa. (see map of Pennsylvania, ref. 5–B, for location of county), 14 miles from Pittsburg, on the left bank of the Monongahela and at the mouth of the Youghiogheny River, both of which are navigable for steamboats. It is the centre of an extensive coal-mining district, having one of the largest manufactories of lap-welded iron tubes in the U. S., iron manufactories, foundries, locomotive and car works, steam saw-mills, a window-glass manufactory, marine docks, and a number of repair-shops. Principal business, mining and manufacturing. Pop. in 1870, 2523; in 1880, 8212.

McKee'ver (Commodore Isaac), b. in Pennsylvania Apr., 1793; entered the navy as midshipman in 1809; became a lieutenant in 1814; commanded a gunboat in the flotilla of Lieutenant (afterwards Commodore) Jones; captured by the British on Lake Borgne in Dec., 1814, on which occasion he was severely wounded; became a commander in 1830, a captain in 1838; was in command of the South Atlantic squadron 1851–54, and of the Norfolk navy-yard 1855. D. at Norfolk, Va., Apr. 1, 1856.

MacKel'lar (Thomas), b. at New York Aug. 12, 1812; entered at the age of sixteen years the printing establishment of the Harpers; while employed as a proofreader obtained a considerable acquaintance with literature, and wrote verses for the periodicals; removed to Philadelphia in 1833; became proofreader in the great stereotype foundry of Lawrence Johnson & Co.; rose to be foreman, and ultimately a partner. He has published three volumes of poetry—*Droppings from the Heart* (1844), *Tam's Fortnight Ramble* (1847), and *Lines for the Gentle and Loving* (1853), which have received high commendation from Willis, Bryant, Duyckinck, and Allibone. He published a typographical manual, entitled *The American Printer*, in 1866.

McKen'dree (William), D. D., b. in King William co., Va., July 6, 1757. He early entered the army of the Revolution; was an adjutant and commissary, and witnessed the surrender of Cornwallis. He joined the Methodist itinerant ministry in 1778. In 1801 he was sent over the Alleghanies into Kentucky, and became one of the principal founders of his denomination in the West. His travels were extensive, his labors extraordinary, his eloquence remarkable, his success general, and his endurance of privation and suffering heroic. In 1808 he was elected bishop; his subsequent course embraces a large portion of the history of American Methodism, especially in the West, where he was venerated as one of the most able and saintly men in the annals of his denomination. McKendree College, founded at Lebanon, Ill., in the year of his death, will cause his name to be long remembered. D. near Nashville, Tenn., Mar. 5, 1835. Abel Stevens.

Mackenzie (Sir Alexander), b. at Inverness, Scotland, about the middle of the eighteenth century; came to Canada when young; entered the service of the Northwest Fur Company; passed eight years at Fort Chippewyan on Lake Athabasca, where he formed a project of an exploring expedition to the Northern Ocean; spent a year in England in the study of astronomy and navigation; set out from Fort Chippewyan June 3, 1789, with four canoes and a party of twelve persons; discovered and explored to lat. 69° the great river to which he gave his name; and in a second expedition from Fort Chippewyan, begun in Oct., 1792, reached the Pacific Ocean at Fort Menzies in July, 1793. Returning to England in 1801, he published *Voyages from Montreal through the Continent of North America to the Frozen and Pacific Oceans in the Years 1789 and 1793* (4to, with maps); was knighted in 1802, and d. at Dalhousie, Scotland, Mar. 12, 1820.

Mackenzie (Alexander **Slidell**), originally named Slidell, brother of Senator John, b. in New York Apr. 6, 1803; entered the navy in 1815; cruised in the Mediterranean and on other stations; became lieutenant 1825, commander 1841, serving on the West Indian, Brazilian, Pacific, and Mediterranean squadrons, and took in 1837 the name of Mackenzie in honor of a maternal uncle. In 1842, Com. Mackenzie was placed in charge of the U. S. brig Somers, sent to the W. African coast, manned chiefly by naval apprentices, and on the return voyage an intention of mutiny said to have been discovered on board led, by decision of a council of officers, to the hanging from the yardarm (Dec. 1, 1842) of three young men, one of whom, a midshipman, was a son of the secretary of war, John C. Spencer. This tragical event naturally created a great sensation, and Mackenzie's conduct was severely criticised and warmly defended. Though his conduct was approved by a court of inquiry, and he was acquitted of blame by a court-martial, the difference of opinion was not set at rest, and the affair embittered the subsequent life of Com. Mackenzie. He was ordnance officer at the siege of Vera Cruz during the Mexican war, and commanded the artillery division which stormed the town of Tabasco June 16, 1847. D. at Tarrytown, N. Y., Sept. 13, 1848. Com. Mackenzie had considerable literary ability, and published *A Year in Spain* (1829; revised ed. 1836), *Popular Essays on Naval Subjects* (1833), *The American in England* (1835), *Spain Revisited* (1836), *Life of John Paul Jones* (1841), *Life of Oliver Hazard Perry* (1841), and *Life of Stephen Decatur* (1846).

Mackenzie (Lieut.-Com. Alexander Slidell, Jr.), b. Jan. 24, 1842, in New York; graduated at the Naval Academy in 1859; became a lieutenant in 1861, a lieutenant-commander in 1865; served in the Kineo at the passage of Forts Jackson and St. Philip in 1862, and in the Ironsides at the first attack upon Fort Sumter in 1863; commanded the boats of the squadron off Charleston in the joint army and navy expedition of July 10, 1863, which resulted in the capture of the greater part of Morris Island, and fell mortally wounded, June 13, 1867, while leading a charge against the savages of the island of Formosa, China. A tablet in the chapel of the Naval Academy tells the story of his death, but that of his life is recorded in the hearts of his brother-officers, who, knowing him to have been virtuous, courageous, and accomplished, cordially endorse the opinion expressed by Rear-admiral Bell, that "the navy could boast no braver spirit, no man of higher promise, than Lieut.-Com. Alexander S. Mackenzie." Foxhall A. Parker.

Mackenzie (Charles Frederick), D. D., b. in Peebleshire, Scotland, Apr. 10, 1825; graduated at Cambridge in 1848; took orders in the Church of England; labored for some time as a parish minister; obtained a fellowship and lectured at Cambridge; went to South Africa in 1854 with Bishop Colenso, and officiated as archdeacon of Natal until 1859, when he returned to England to urge the establishment of other African missions; was consecrated bishop of Central Africa at Cape Town Jan. 1, 1861; sailed for the Zambesi with a corps of missionaries, and commenced operations at a village named Magomero, where the climate soon undermined his constitution, and he d. Jan. 31, 1862.

Mackenzie (Sir George), b. at Dundee, Scotland, in 1636; educated at the universities of Aberdeen and St. Andrew's; studied law three years at Bourges, France; was admitted to the bar at Edinburgh in 1656, and soon became celebrated as an advocate; warmly but unsuccessfully defended the marquis of Argyle on his trial for treason 1661; became judge of the criminal court, member of Parliament, and king's counsel (1677), in which capacity he maintained the doctrine of passive obedience. His conduct as criminal prosecutor in the persecution of the Covenanters caused him to be stigmatized by the title of "Bluidy Mackenzie." He was also memorable for the witchcraft trials over which he presided. Mackenzie was a friend of Dryden and other poets, was himself an elegant scholar, and one of the first Scotchmen to write the English language correctly. He published *Religio Stoici* (1663), *A Moral Essay upon Solitude* (1665), *Moral Gallantry* (1667), a *Discourse on the Laws and Customs of Scotland in Matters Criminal* (1678), and *Institutions of the Laws of Scotland* (1684), besides *A Vindication of the Government of Charles II.* He was the chief founder of the Advocates' Library at Edinburgh. D. at London May 2, 1691. His complete *Works* were published in 1716.

Mackenzie (Henry), b. at Edinburgh, Scotland, in Aug., 1745; educated at the university of that city; became an attorney of the Scottish court of exchequer; published anonymously in 1771 a novel, *The Man of Feeling*, which enjoyed great popularity, and led to the composition of a second part, which was issued under the author's name in 1773 as *The Man of the World*. Another novel, *Julia de Roubigné*, appeared in 1777. In 1779–80 Mackenzie edited a weekly literary paper, *The Mirror*, for which he wrote a series of admired essays; in 1785–87 he conducted *The Lounger*, a paper of a similar character; wrote several political tracts espousing Tory principles; made a report to the Highland Society adverse to the genuineness of the Ossianic poems; wrote three tragedies and biographical sketches of Thomas Blacklock, John Home, Lord Abercromby, and William Tytler, besides various minor publications. In 1804 he received the lucrative appointment of comptroller of taxes for Scotland; gave to the world his collected works in 8 vols. (1808), and during his declining years made his house in Edinburgh the centre of the most distinguished literary and political society. His novels and essays, now little read, were highly commended by Scott, Talfourd, Mackintosh, Allan Cunningham, and Wilson. D. at Edinburgh Jan. 14, 1831.

Mackenzie (Robert Shelton), M. D., LL.D., D. C. L., b. at Drew's Court, co. Limerick, Ireland, June 22, 1809; educated at Fermoy; studied medicine in Cork and Dublin; became a school-teacher at Fermoy; was in 1829 an editor in Staffordshire, England; was 1830–52 a highly successful *littérateur* of London; came in 1852 to New York, and was connected with various journals, and became in 1857 the foreign and literary editor of the Philadelphia *Press*. He published annotated editions of various British and other authors, and was author of *Lays of Palestine* (1829), *Titian*, a novel (1843), *Partnership en Commandité*, a law treatise (1847), *Bits of Blarney* (1855), *Life of Charles Dickens* (1870), *Life of Sir Walter Scott* (1871); edited Sheil's *Sketches of the Irish Bar* (1854), the *Noctes Ambrosianæ* (1854), Curran's *Life*, by his son (1855), and the writings of Dr. W. Maginn (5 vols., 1855–57), besides numerous minor publications. D. Nov. 21, 1881.

Mackenzie (Ranald S.), b. in New York Aug., 1840; graduated from the U. S. Military Academy June, 1862, and appointed second lieutenant of engineers; engineer of 9th corps, and wounded at second battle of Bull Run; of Sumner's grand division at Fredericksburg, Dec., 1863; engaged at Chancellorsville and in constructing and laying bridges in advance of the army, following the Confederate forces through Maryland into Pennsylvania, and engaged at the battle of Gettysburg; subsequently in providing bridges for pursuit of Lee, and continuously employed on engineering duty until opening of Richmond campaign, May, 1864, when in command of his company through battles of the Wilderness; wounded before Petersburg June, 1864, while in command of regiment; returning, commanded regiment during Early's attack on Washington, July, 1864, and in command of brigade in subsequent pursuit and battles of Opequan, Fisher's Hill, and Cedar Creek, where again wounded. Appointed brigadier-general of volunteers, and resumed command before Petersburg, Nov., 1864; at Five Forks he commanded a division of cavalry which rendered important service; brevetted from first lieutenant to major-general for gallantry. In Jan., 1866, he returned to duty with his corps, in which he had attained the rank of captain, and in Mar., 1867, was appointed colonel of infantry; transferred to the cavalry 1870, and served efficiently on the Mexican frontier. Promoted to brigadier-general U. S. A. Oct. 26, 1882. Retired Mar. 24, 1884.

Mackenzie (William Lyon), b. at Springfield, Forfar, Scotland, Mar. 12, 1795; became a resident of Toronto, Canada, and afterwards (1824–33) editor of the *Colonial Advocate* of Niagara, where his press was destroyed by a mob in 1826. In 1828 he was sent to the provincial Parliament, whence he was five times expelled, and five times re-elected. He published *Sketches of Canada* (1833). In 1836 he was the first mayor of Toronto. In 1837–38, as leader of the rebellion of Upper Canada, he proclaimed a new provisional government, but was outlawed, and escaped to the U. S., where he was arrested and confined in jail for eighteen months at Rochester, N. Y. He was for a long time after connected with the New York *Tribune*, and for a time published Mackenzie's *Gazette*. In 1845 he published a pamphlet against W. L. Marcy, Jacob Barker, and others, which caused great excitement in New York. In 1850 he was pardoned and returned to Canada, where he again entered public life. D. Aug. 26, 1861. His agitation did much for the reform of the government of Canada.

Mackenzie River, one of the largest streams on the globe, rises in Great Slave Lake, and flows in a N. N. W. direction to the Frozen Ocean. It is navigable in the open season from its mouth to Fort Simpson, where there are rapids; above which it is again navigable to Great Slave Lake. Its three great head-streams are the Peace, Athabasca, and English rivers. Its extreme length is 2300 miles; its area of drainage, 590,000 square miles. Lignite-beds occur upon its banks, and a large part of its upper basin is fertile and habitable land.

Mack'erel [Old Eng. *mackerel;* Fr. *maquereau*, a "pander," because it was once believed to bring together male and female fishes of other species], a name of various salt-water fishes of the genus *Scomber* (family Scombridæ). The most important species are the *S. vernalis* of North American Atlantic waters, and *S. vulgaris* of European seas. The above kinds are caught in immense numbers, both by hooks and nets. They are very delicate fishes for the table when fresh, and are also salted in great quantities for market. Gloucester and Yarmouth, Mass., are the great American centres of the mackerel fishery. Their fleets visit all parts of the coast from the Carolinas to the Bay of Chaleurs, according to the season of the year. Spain, Spanish America, and the South and West of the U. S. are the great markets for salted mackerel. The European mackerel is extensively caught in French and English vessels, but with nets more frequently than with the hook, which is more commonly employed in the U. S. (See also SCOMBRIDÆ.)

Mack'ey (ALBERT GALLATIN), M. D., b. at Charleston, S. C., in 1809; graduated in 1832 at the Medical College of South Carolina, where he became demonstrator of anatomy in 1838, but in 1844 devoted himself wholly to literature, chiefly in connection with Masonry. He wrote for several periodicals in Charleston; published a *Lexicon of Freemasonry* (1845), *The Mystic Tie* (1849), *Principles of Masonic Law* (1856), *The Book of the Chapter* (1858), *Textbook of Masonic Jurisprudence* (1859), *Cryptic Masonry* and *Masonic Ritualist* (1867), *The Symbolisms of Freemasonry* (1868), and *Manual of the Lodge* (1870). He also edited the *Ahiman Rezon, or Book of Constitutions of the Grand Lodge of Ancient Freemasons of South Carolina*. He established a Masonic monthly at Charleston in 1850, a quarterly in 1858; learned several ancient languages by private study; has lectured upon the Middle Ages, and taken an active part in politics since the war. A new and much-enlarged edition of the *Lexicon* appeared in 1875, under the title *Encyclopædia of Freemasonry*.

Mack'ie (JOHN MILTON), b. at Wareham, Mass., in 1813; graduated in 1832 at Brown University, where he was tutor 1834–38; travelled in Europe; published a *Life of Leibnitz* (1845), *Life of Samuel Gorton* in Sparks's *American Biography* (1848), *Cosas de España* (1848), *Life of Schamyl* (1856), *Life of Tai-Ping-Wang* (1857), *From Cape Cod to Dixie* (1864), and has frequently contributed to the columns of the *North American Review*.

McKim (JAMES MILLER), b. in Carlisle, Pa., about 1810; graduated at Dickinson College, and entered the Presbyterian ministry, but abandoned his pastoral work and devoted his whole time to the antislavery cause. He was a zealous lecturer in favor of emancipation, and was for a time corresponding secretary of the Pennsylvania Antislavery Society, and in later years was connected with the Freedman's Aid Society. Died at Llewellyn Park, Orange, N. J., June 13, 1874.

Mackinac, Mackinac co., Mich. (see map of Michigan, ref. 2–I, for location of county), is situated on Mackinac Island in Lake Huron, just N. E. of Mackinaw Strait, which connects it with Lake Michigan. It is 300 miles by water from Detroit. The island is 2 miles wide by 3 in length, and is high, well wooded, and rocky. Here is Fort Mackinac, a U. S. post, lat. 45° 54′ N., lon. 84° 30′ W. Mackinac (formerly Michilimackinac) was an important point during the colonial period. It was settled by the French at an early date; became a missionary station in 1669; was captured and its inhabitants murdered by Pontiac in 1763; and was occupied by British troops in 1812. Mackinac is a delightful summer resort, has a good harbor, and exports large quantities of fish. Pop. in 1880, 720.

McKin'ney, on R. R., cap. of Collin co., Tex. (see map of Texas, ref. 2–I, for location of county). It contains an academy and extensive flouring-mills. It is in a rich grain and stock-raising section. Pop. in 1870, 503; in 1880, 1479.

McKin'stry (Commodore JAMES P.), b. in New York Sept. 6, 1809; entered the navy as a midshipman Feb. 1, 1826; became a passed midshipman in 1832, a lieutenant in 1837, a commander in 1855, a captain in 1862, a commodore in 1866. D. in 1873. He commanded the Monongahela at the passage of Port Hudson, Mar. 4, 1863, and was severely injured by "the bridge" on which he was standing being shot away, so that he was thrown with great violence to the deck. FOXHALL A. PARKER.

Mack'intosh (Sir JAMES), M. D., LL.D., F. R. S., b. at Aldourie, Inverness-shire, Scotland, Oct. 24, 1745; graduated M. A. in 1784 at King's College, Aberdeen, and M. D. at Edinburgh 1787; went to London, and in 1791 published his *Vindiciæ Gallicæ*, an eloquent defence of the French Revolution against the strictures of Burke's *Reflections*, which at once won him the favor of the Whig leaders; supported himself by literary work, and in 1795 was called to the bar at Lincoln's Inn; delivered in 1799–1800 at Lincoln's Inn his brilliant *Lectures on the Law of Nature and of Nations;* won a splendid fame at the bar; was knighted 1809, and was recorder of Bombay 1804–06; judge of admiralty 1806–11; returned to England after a highly honorable career in the East, and entered Parliament in 1813 from Nairn; was professor of law and general politics at Haileybury College 1818–24, still taking an important place in parliamentary business; in 1830 became a commissioner of Indian affairs. D. in London May 30, 1832. Among his more important works are a brief *History of England* (1830), extending only to the reign of Elizabeth, but completed by Wallace and Bell (10 vols.); a *Dissertation on the Progress of Ethical Philosophy* (1830), written for the *Encyclopædia Britannica;* a *Life of Sir Thomas More*, and a great number of miscellaneous articles, chiefly published in the *Edinburgh Review*, containing a mass of valuable criticism, especially regarding questions of psychology and ethics. They have been collected into volumes and published in America in the well-known series of *Modern British Essayists*. He had long projected an extended history of England from the time of James II. to the French Revolution, of which a fragment appeared after his death, comprising an account of the Revolution of 1688. Sir James Mackintosh enjoyed during his later years a literary renown for which the present generation can hardly find sufficient warrant in his extant works. His vast reputation was, however, made up of several very distinct elements, not the least of which was his power as a conversationalist, in which department he has had no equal in the present century. As a parliamentary orator he did not fill the expectations based upon his forensic achievements, among which the memorable defence of Peltier (Feb. 21, 1803) was perhaps the greatest effort of British eloquence at the bar. (See his *Memoirs*, by his son, containing journals, letters, autobiography, and many fragmentary writings (1835).)

MacKnight' (JAMES), D. D., b. at Irvine, Ayrshire, in 1721; studied at the universities of Glasgow and Leyden; became minister of a Scotch church at Maybole, Ayrshire, in 1753, at Jedburgh in 1769, and in Edinburgh in 1772. He published in 1756 a *Harmony of the Gospels*, in 1763 *The Truth of Gospel History*, and in 1795 *A New Translation of the Apostolical Epistles, with Commentary and Notes*. These works, especially the *Harmony*, were long highly esteemed and several times reprinted. D. at Edinburgh Jan. 13, 1800.

Mack von Leiberich (KARL), BARON, b. at Neuslingen, Franconia, Aug. 25, 1752, in humble circumstances; entered the Austrian army; rose rapidly on account of his eminent talents; was ennobled and made a field-marshal-lieutenant in 1794. In 1798 he accepted the command of the Neapolitan army, and fought with success against the French in the Papal States; but being compelled afterwards to retreat, and endangered in his position by an insurrection in Naples, he fled with his German staff to the French army, and was sent as prisoner of war to Paris. In 1800 he escaped, and was made commander in Tyrol. Having been defeated by Napoleon (Oct. 14 and 15, 1805) on the banks of the Iller, he retreated into the fortress of Ulm, but surrendered himself on the following day with an army of 23,000 men and an enormous quantity of war-materials. He was placed before an Austrian court-martial and sentenced to death, but the sentence was commuted to imprisonment for life, and in 1819 he was entirely pardoned. D. at St. Pölten, near Vienna, Oct. 22, 1828.

McLane' (Col. Allen), b. Aug. 8, 1746; removed to Kent co., Del., in 1774. He was present as a volunteer at the Great Bridge fight, near Norfolk, Va., 1775; became a lieutenant in Rodney's Delaware regiment; his large estate in Philadelphia was sacrificed in the war. He was distinguished at Long Island, White Plains, Trenton, Princeton, Monmouth, Paulus Hook, Stony Point, and Yorktown; was afterwards a judge of the common pleas; U. S. marshal 1790–98; collector of the port of Wilmington, 1808–29. D. at Wilmington, Del., May 22, 1829.

McLane (Louis), son of Col. Allen McLane, b. at Smyrna, Del., May 28, 1786; entered the navy as midshipman at the age of twelve years, and cruised a year in the Philadelphia, Com. Decatur; pursued studies at Newark College; studied law with James A. Bayard, and was admitted to the bar 1807; served as a volunteer in 1814 in a company commanded by Cæsar H. Rodney, which marched to the defence of Baltimore from the threatened attack by the British; was Representative in Congress 1817–27, voting against the admission of slavery in Missouri or in the Territories; was chosen Senator 1827; sent by Pres. Jackson as minister to England May, 1829; returned in 1831 to accept the post of secretary of the treasury; was transferred in 1833 to the department of state in consequence of his refusal to sanction the removal of the deposits from the Bank of the U. S.; retired to private life June, 1834, settling in Maryland; was president of the Baltimore and Ohio Railroad during its completion and early management 1837–47; accepted the mission to London to settle the Oregon difficulty June, 1845; was a delegate to the constitutional convention of Maryland 1850–51, and d. Oct. 7, 1857.

McLane (Robert Milligan), son of Louis, b. in Delaware June 23, 1815; resided with his father at London, 1828–31; studied in colleges at Washington, D. C., and Baltimore, Md.; graduated at West Point Military Academy 1837; served in the army in Florida, in the Cherokee country, and in the North-west; resigned 1843; was admitted to the bar at Baltimore the same year; was a member of the Maryland legislature 1845–47; member of Congress 1847–51; minister to China 1853–55, and minister to Mexico, residing near the government of Juarez at Vera Cruz from Mar., 1859, to Nov., 1860. While in Mexico he negotiated a treaty giving President Juarez the benefit of an American loan and other substantial advantages, and purchasing Lower California for a sum of several millions of dollars. The treaty was never ratified, but the policy of intervention in Mexican affairs was carried out by the U. S. navy in capturing several vessels of war belonging to the reactionary government of Miramon. After his return from Mexico he practised at the Baltimore bar. Governor of Maryland 1884–85; became U. S. minister to France Mar. 23, 1885.

McLaren (Edward William), A. B., A. M., S. T. D. See Appendix.

Maclau'rin (Colin), b. at Kilmadan, Argyleshire, in Feb., 1698; educated at the University of Glasgow; became in 1717 professor of mathematics in Marischal College, Aberdeen, and in 1725 at the University of Edinburgh, where he d. June 14, 1746. He wrote *Geometria Organica* (1720), treatises on *The Percussion of Bodies* (1724), on *Fluxions* (1742), on *Algebra*, and an *Account of Sir Isaac Newton's Discoveries*, the two latter posthumous publications (1748).

McLaws (Lafayette), b. in Georgia Jan., 1821; graduated from the U. S. Military Academy in 1842, and appointed brevet second lieutenant of infantry; served (1845–48) in the war with Mexico; subsequently on frontier duty until 1860, having meanwhile attained the rank of captain; resigned Mar. 23, 1861, to join the Southern Confederacy, being speedily appointed major-general in that service, and throughout the civil war rendered important service as division commander, mainly in Longstreet's corps.

Maclay' (Archibald), D. D., b. at Killearn, Scotland, May 14, 1778; entered the ministry of the National Kirk in 1802; came in 1805 to New York, and until 1808 was pastor of the Presbyterian church in Rose street; became a Baptist, and was founder of the Mulberry street (now Tabernacle) church, and its pastor 1808–37; agent of the American and Foreign Bible Society 1837–50; president of the American Bible Union 1850–56. D. May 2, 1860.

Mac'le [Lat. *macula*, "spot"], a synonym for *chiastolite*, a variety of *andalusite*, which, owing to the presence of symmetrically disposed impurities, shows on sections of the prismatic crystals dark figures (crosses, etc.) on a light ground, or *vice versâ*. The name chiastolite is in allusion to the form of such figures, resembling the Greek letter χ.

Maclean (John), D. D., LL.D. See Appendix.

McLean (John), LL.D., b. in Morris co., N. J., Mar. 11, 1785; settled with his parents in Warren co., O., in childhood; worked on a farm until the age of sixteen; commenced studying law at Cincinnati in 1803; was admitted to the bar, and began practice in 1807 at Lebanon; served in Congress from 1813 to 1816, when he became a judge of the supreme court of Ohio; was commissioner of the general land-office in 1822, postmaster-general in 1823, associate justice of the U. S. Supreme Court in 1829; was distinguished for the eloquence and ability of his charges to grand juries, of which a notable example was one delivered in Dec., 1838, concerning unlawful combinations against a foreign government, elicited by certain aspects of the Canadian "patriot war." His decision in the celebrated "Dred Scott case" (1857) was given to the effect that slavery has its origin in force, not in right, nor in general law, to which it is opposed, but in local law, which cannot be respected by the national courts. In 1848 his name was brought before the Buffalo "Free Soil" convention as a candidate for the Presidential nomination, and in 1856 he was the leading competitor of Fremont for the Republican nomination at Philadelphia. Many Republicans believe that if Judge McLean had then been nominated he would have been elected, in which case the later history of the U. S. would have been very different from what has been witnessed by the present generation. He again received some votes in the Chicago convention of 1860, and d. at Cincinnati, O., Apr. 4, 1861. He published 2 vols. of *Reports of U. S. Circuit Court* (1829–42).

MacLean (John), D. D., b. at Portsoy, Banffshire, Scotland, in 1828; studied at the University of Aberdeen; became curate at London, Ontario, 1853; archdeacon of Manitoba and professor of divinity in St. John's College in 1866, and bishop of the new diocese of Saskatchewan in 1873.

Maclean (Letitia Elizabeth **Landon**), b. at Brompton, England, in 1802; acquired considerable reputation by a number of poems published in 1820 in the *Literary Gazette* over the signature "L. E. L.," by which she was thenceforth known. She soon became a regular contributor of reviews, essays, poems, and miscellaneous articles to the *Gazette* and other newspapers, and to the annuals, and for fifteen years supported her family by her pen. She published several volumes of poems and four novels, all of which were successful, many having been reprinted in the U. S. In June, 1838, she married Mr. George Maclean, appointed governor of Cape Coast Castle, West Africa, and accompanied him to that place, where she d. Oct. 15, 1838, from an overdose of prussic acid. (See the *Life and Literary Remains of L. E. L.* (1841), by Laman Blanchard.)

MacLeans'boro', R. R. junction, cap. of Hamilton co., Ill. (see map of Illinois, ref. 10–F, for location of county. It has a high school. Principal industry, agricultural pursuits. Pop. in 1870, 683; in 1880, 1341.

MacLel'lan (Isaac, Jr.), b. at Portland, Me., in 1810; graduated at Bowdoin College 1826; engaged in the practice of law at Boston, where he published volumes of poems in 1830, 1832, 1843, and 1844, and a *Journal of a Residence in Scotland* (1834), compiled from the papers of H. B. MacLellan, probably his brother. He ultimately settled on Long Island, and devoted himself to agriculture.

McLeod (Alexander), D. D., b. in the inland of Mull, Scotland, June 12, 1774; emigrated to the U. S. in 1792; graduated at Union College in 1798; became in the following year pastor of the First Reformed Presbyterian church in New York City; wrote *Negro Slavery Unjustifiable* (1802), *Lectures on the Book of Revelation* (1814), *Sermons on the War* (1815), besides several doctrinal treatises, and assisted Dr. John M. Mason in the editorship of the *Christian Magazine*. He was the chief organizer of the American Colonization Society in 1816, and wrote its constitution. D. at New York Feb. 17, 1833. (See his *Memoir*, by Rev. S. B. Wiley, D. D. (1855).)

McLeod (Henry Dunning), b. in Edinburgh, Scotland, in 1821; was educated at Eton and the University of Cambridge; was admitted to the bar in 1849; published *Theory and Practice of Banking* (1856), *Elements of Political Economy* (1858), and a *Dictionary of Political Economy* (1859). He was employed by the British government 1868–70 in the codification of the laws relating to bills of exchange.

McLeod (Hugh). See Appendix.

McLeod (John Niel), D. D., son of Alexander, b. in New York City Oct. 11, 1806; graduated at Columbia College 1826; studied theology with his father, to whom he became assistant in the pastorate of the First Reformed Presbyterian church 1828, and his successor 1833. Dr. McLeod was for many years the stated clerk of the General

Synod of his Church, professor in its theological seminary at Philadelphia, and leader of that part of the Church which was unwilling to unite with other branches of the Scottish Church, cherishing very rigid opinions upon the subject of singing miscellaneous hymns and membership of secret societies. D. in New York Apr. 27, 1874.

Macleod (Norman), D. D., b. at Campbelton, Scotland, June 3, 1812; educated at Edinburgh, Glasgow, and in Germany; became minister of the National Kirk; parish minister of Loudoun (1838–43), of Dalkeith (1843–51), in Glasgow (Barony parish) 1851, a very large and difficult field; established schools and meetings for the working-men, and labored with zeal and success; became chaplain to the queen for Scotland; edited the Edinburgh *Christian Magazine* 1850–60, *Good Words* 1860–72; was author of *The Earnest Student* (1847), *Parish Papers* (1862), *Eastward* (1866), and *Peeps at the Far East*, a narrative of travels in India, and several other works. D. at Glasgow June 16, 1872. Dr. McLeod made *Good Words* an important educational organ and a great literary success. He was a man of great breadth and versatility. (See *Memoirs*, by his brother, Rev. Donald Macleod, 2 vols., 1876.)

McLeod (Xavier Donald), son of Alexander McLeod, D. D., b. in New York Nov. 17, 1821; graduated at Columbia College; took orders in the Episcopal Church in 1845; preached for a short time in a country parish; went to Europe in 1850; became a Roman Catholic, and returning to New York in 1852 engaged in literary pursuits; wrote *Lives* of Sir Walter Scott (1852), Mary Queen of Scots (1857), and Fernando Wood (1856); wrote for several magazines; produced some poems of considerable merit and three or four novels; became connected with the *Leader*, a newspaper of St. Louis, in 1857, and in the same year was chosen professor of rhetoric and belles-lettres at Mount St. Mary's (Roman Catholic) College near Cincinnati; was ordained a priest, and was killed in a railway accident near Cincinnati July 20, 1865.

Maclise′ (Daniel), b. at Cork, Ireland, Jan. 25, 1811; at the age of sixteen left the bank where he had been placed, and devoted himself to art, in which he early displayed a remarkable versatility of talent, combining the finest gifts of the caricaturist with the grasp of the historical painter and the sentiment of the poet. His first successes were gained by sketches of Irish scenery and life taken on a pedestrian excursion among the peasantry of Wicklow. He studied anatomy in the studio and the dissecting-room. In 1828, Maclise came to London, was admitted to the Royal Academy, gained a medal in the antique school, and was made a member of the life school, where he also gained a medal for the best copy of a painting by Guido; was a contributor of drawings and verses to *Fraser's Magazine*; studied a year in Paris; won the gold medal of the Academy in 1831, by his historical painting, *The Choice of Hercules*, and from that time devoted his pencil mainly to subjects of a blended historical and romantic character—*All-Hallow Eve, Henry VIII. and Anne Boleyn, Francis I. and Diana of Poictiers, Charles I. and Cromwell, Robin Hood and Richard Cœur de Lion, Puck Disenchanting Bottom, Macbeth and Witches, Banquet Scene in Macbeth, Bohemian Gypsies, Gil Blas Dressing as a Cavalier, The Sleeping Beauty, Hunt the Slipper, Origin of the Harp, Alfred in the Danish Camp*, and many others, ranging in size of canvas from six to fourteen feet. But these are only a part, and not the best part, of his work. His sketches, illustrations, caricatures, satirical and humorous drawings are too numerous to mention. They are to be found in annuals, keepsakes, books of design. Bulwer's *Pilgrims of the Rhine* was illustrated by Maclise. His volume of outline portraits of the distinguished literary characters of his day is very interesting. Maclise was elected associate of the Academy in 1835, and academician in 1840. In 1866 he declined the presidency. Previous to his death, which occurred in London Apr. 26, 1870, he was engaged on frescoes for the houses of Parliament.

O. B. Frothingham.

Maclure′ (William), b. in Ayr, Scotland, in 1763; visited New York in 1782; settled in London soon after as partner in a commercial house; gained a considerable fortune; emigrated to the U. S. in 1796; was one of the commissioners on the French spoliation claims in 1803; became interested about this time in geology, which he studied in Europe, and conceived the plan of making a geological survey of the U. S., in which undertaking he crossed the Alleghanies fifty times and visited nearly every State of the Union, travelling chiefly on foot. He presented geological memoirs to the American Philosophical Society in 1809 and 1817, the latter accompanied by the first geological map of the U. S., thereby gaining the title of "father of American geology." Settling in Philadelphia, he gave his books and collections to the Academy of Natural Sciences of that city, of which institution he was president from 1817 until his death. He resided in Spain 1819–24; engaged in an unsuccessful attempt to establish a college on an agricultural basis; made an attempt of the same kind at New Harmony, Ind., where he bought a large tract of land and resided several years; went to Mexico for his health in 1827, returned there in 1828, and resided there until his death, which occurred at San Angel, near the city of Mexico, Mar. 23, 1840. He left $20,000 to the Academy of Natural Sciences, besides his library as already mentioned, and was a liberal benefactor of the American Geological Society, of which he was president in 1828. While in Mexico he wrote a work entitled *Opinions on Various Subjects* (2 vols., New Harmony, 1837).

MacMahon′, de (Marie Edme Patrice Maurice), duke of Magenta, marshal of France, president of the French republic, b. at the château of Sully, near Autun, June 13, 1808, descending from an Irish family which took refuge in France after the fall of the Stuarts; entered in 1825 the military school of St. Cyr; served in Algeria; returned after the July revolution to France, and was present at the siege of Antwerp. Once more transferred to Africa, he distinguished himself as a captain at the storming of Constantine; received the command first of a battalion, then of a regiment, of the foreign legion; became colonel in 1845, and brigadier-general in 1848. As such he stood at the head of the administration, first of the province of Oran and then of that of Constantine. In 1852 he became general of division, and in 1855 he was recalled in order to assume the command of a division in the Crimean war. He arrived just in time to take part in the storming of Malakof, and distinguished himself so much on this occasion that he was created a senator. In this position he evinced a rare independence of character; he was the only senator who refused to vote for the Safety bill which was proposed in consequence of the Orsini conspiracy (June 14, 1858), and which placed France under an intolerable reign of the bayonet. In 1857 he fought again in Algeria, and in 1859 he made his name famous in the campaign against Austria. He commanded the 2d corps, and led the left wing of the army in the battle of Magenta, June 4, 1859; Napoleon commanded the centre. At the head of the guard the emperor was very hard pressed by the enemy, and there was danger of his being driven into the Ticino, but MacMahon came to his support, and by throwing himself on the right flank of the Austrian corps, which threatened the French centre, he won the battle. For this brilliant exploit the emperor made him on the battlefield marshal of France and duke of Magenta. In the battle of Solferino (June 24, 1859) he also played a conspicuous part. After the war he received the command of the division stationed at Lille, and in 1864 he succeeded Pelissier in the important position of governor-general of Algeria, where great reforms were to be introduced. As far as the reigning system allowed the administration of MacMahon was beneficial. During the famine of 1867–68 he took good care of the poor people, and defended them with great energy against the clergy, who tried to use the aid which was given to the Arabs as a means by which to convert them. At the beginning of the war against Germany in 1870 the marshal received the command of the 1st corps, consisting chiefly of African troops, and forming the right wing of the first line, nearest to the frontier, with head-quarters at Strasbourg. When (on Aug. 4) his advanced body, the division of Douay, was defeated at Weissenburg by the crown prince of Prussia, he drew reinforcements from other corps, and occupied an excellent position at Wörth in order to detain the enemy. In spite of his brilliant valor, he was defeated in the bloody battle, and his army was almost completely routed in consequence of the long and obstinate resistance it made. The remnants he gathered at Chalons, and here he formed out of the 1st, 5th, 7th, and 12th corps the army of Chalons, to which the emperor repaired after the defeat at Metz. From the regency in Paris he received repeatedly orders to push on towards Metz by a circuitous way, in order to extricate Bazaine. He understood the futility of this plan, and remonstrated, but at last he obeyed. Soon, however, his army was driven by the Germans out of its direction and towards Belgium, and at Sedan it was compelled to give battle. At the commencement of the contest, in which the French army, together with the emperor, was surrounded and taken prisoner, early in the morning (Sept. 1, 1870), MacMahon was severely wounded in the thigh, and gave up the command. While a prisoner of war in Germany he was almost the only superior officer who was not accused of treason by his countrymen; both the purity of his character and his brilliant valor were generally acknowledged. Immediately after the conclusion of the armistice in the spring of 1871 he was entrusted by Thiers with the command of the army of Versailles, the only organized army of France at that moment. In political respects he enjoyed perfect confidence. He seemed to be nothing but a soldier, indifferent to politics, and without those qualities which make a man a blessing or a danger to his country. Nevertheless, the events soon raised him to the most important political position. Having put down the revolution of the Commune in Paris in 1871, after which he published *L'Armée de Versailles depuis sa Formation jusqu'à la complète Pacification de Paris*, he became the man on whom those parties of the National Assembly which feared radicalism and revolution rested their hopes, and in May, 1873, the Legitimists, clericals, and Bonapartists agreed in overthrowing Thiers, and MacMahon accepted the presidency of the republic, which was offered him by a deputation from the National Assembly. The hopes, however, which the Bonapartists entertained of a restoration of the dynasty of Napoleon, and the Legitimists and clericals of a complete suppression of all liberty were not realized. His government was one of order, aiming at the re-establishment of the power of France: and although the influence conceded to the Church was larger than the liberals considered sound, yet the stability of his own power seemed in his eyes the principal means of reaching his aim. On Nov. 19, 1873, his term of office was prolonged by the National Assembly to seven years. He resigned Jan. 30, 1879. AUGUST NIEMANN.

McMahon (WILLIAM), D. D., b. at Dumfries, Va., Dec. 16, 1785 (or 1786); was licensed to preach as an itinerant of the M. E. Church in Indiana in 1801; rose to distinction, and filled important stations in Kentucky, Tennessee, Alabama, and Mississippi. His reputation was great, and so was his success, as thousands were brought into the Church by his instrumentality. He was a revered member of the Memphis conference at his death, which occurred in 1870. T. O. SUMMERS.

McMas'ter (GILBERT), D. D., b. in Ireland Feb. 13, 1778; came in infancy with his parents to Franklin co., Pa.; graduated at Jefferson College in 1803; studied theology; was ordained to the Presbyterian ministry in 1808; was a pastor at Duanesburg, N. Y., thirty-two years, and at Princeton, Ind., 1840–46; published several religious treatises, chiefly doctrinal, many sermons and addresses, and wrote largely for periodicals. D. at New Albany, Ind., Mar. 17, 1854.—His son, ERASTUS D. MCMASTER, D. D., b. in Pennsylvania in 1806; graduated at Union College 1827; was president of South Hanover College, Ind., 1838–45, of Miami University 1845–49, professor of theology in the New Albany Seminary 1849–66, and author of several religious treatises. D. at Chicago Dec. 10, 1866.

McMi'chael (MORTON), b. in Burlington co., N. J., Oct. 20, 1807; became a journalist and magazine writer in Philadelphia in 1824, and was from 1844 editor-in-chief of the *North American*, a successful journal of that city. His poetical talents were highly commended, though he rarely published verse. As an orator and a politician he enjoyed a wide reputation. Was mayor of Philadelphia 1865–68. D. at Philadelphia, Pa., Jan. 6, 1879.

MacMil'lan (HUGH), D. D., LL.D., b. at Aberfeldy, Perthshire, Scotland, Sept. 17, 1833; educated at the Univ. of Edinburgh; became minister of the Free Church at Kirkmichael 1859, and of St. Peter's, Glasgow, 1864; has written *Bible Teachings in Nature* (1866), which was translated into Danish, Swedish, German, and other continental languages; *First Forms of Vegetation*, *Holidays on Highlands*, *The True Vine*, *The Ministry of Nature*, *The Garden and the City*, and *Sun-glints in the Wilderness*, besides numerous contributions to quarterly reviews, etc. He became a fellow of the Royal Society of Edinburgh in 1871.

McMil'lin (THOMAS), b. in Kentucky in 1840; was commissioned assistant surgeon U. S. A. Aug. 19, 1862, when twenty-two years of age. During the war he received rapid promotion for meritorious services; was advanced from captain to major, and then lieutenant-colonel. D. Apr. 6, 1873. PAUL F. EVE.

McMinnville, on R. R., cap. of Warren co., Tenn. (see map of Tennessee, ref. 6–G, for location of county). It has the MacMinnville Female Academy, an iron-foundry, cotton-mills, woollen-mill, a library belonging to Cumberland Female Academy, and a park. Pop. of v. in 1870, 1172; in 1880, 1244.

McMur'rogh (DERMOT), became king of Leinster, Ireland, in 1140; was expelled by his subjects in 1168; applied unsuccessfully for aid to Henry II. of England; obtained the services of Richard de Clare, earl of Pembroke (surnamed Strongbow), by whom he was restored to power in 1170. Dermot gave Strongbow his daughter Eva in marriage, and dying in the same year was succeeded by the invader as a vassal to the English king, this being the foundation of the English claim of supremacy in Ireland.

McNab' (SIR ALAN NAPIER), BART., b. at Niagara Feb. 19, 1798; became a midshipman in 1813; served under Sir James Yeo in the naval expedition against Sackett's Harbor and other American ports of Lake Ontario; joined the army as ensign of the 100th regiment; was present at the capture of Fort Niagara and at the battle of Plattsburg; studied law; practised at Hamilton; was journal-clerk to the assembly of Upper Canada; elected a member of that body in 1829; became its Speaker at a later period; commanded the Canadian militia on the Niagara frontier during the insurrection of 1837–38, with the rank of colonel; routed the insurgents near Toronto Dec. 7, 1837; seized, burned, and sent over Niagara Falls the steamer Caroline; was knighted July 14, 1838; became Speaker of the legislature of the united provinces of Canada in 1844; was prime minister 1854–56; made a baronet Feb., 1858, and d. at Toronto Aug. 8, 1862.

McNagh'ten (SIR WILLIAM HAY), BART., b. in Scotland about 1794; accompanied his father to India in 1809; entered the civil service of the East India Company in a diplomatic capacity; acquired a vast experience at the courts of the native princes; accompanied the Afghan expedition of 1838–39 as envoy to the new monarch, Shah Soojah, having virtually in his hands the direction of affairs; was made a baronet for his skilful management in a difficult situation, and was murdered by Akbar Khan, the insurgent prince, at a conference in Cabool Dec. 25, 1841.

McNair' (A. R.), b. in Louisiana Sept. 15, 1839; graduated at the Naval Academy in 1860; became a lieutenant in 1862, a lieutenant-commander in 1866; retired in consequence of physical disability in 1872. Served in the Seminole at the battle of Port Royal, Nov. 7, 1861, and in the Powhatan in both the Fort Fisher fights, and commanded the boats of the latter in the successful attack on Morris Island, Aug. 9, 1863. Commended for "gallantry." FOXHALL A. PARKER.

McNair (FREDERICK V.), b. in Pennsylvania Jan. 13, 1839; graduated at the Naval Academy in 1857; became a lieut. in 1861, a lieut.-commander in 1864, a commander in 1872, a capt. in 1883; served on board the Iroquois at the passage of Forts Jackson and St. Philip and capture of New Orleans, and in most of the battles on the Mississippi in 1862; served as executive officer of the Juniata in both the Fort Fisher fights, and is thus handsomely mentioned in the official report of her commanding officer, Lieut.-Com. Thomas S. Phelps: "Where all behaved so well it seems invidious to make a selection, but I must call your especial attention to the cool, gallant, and able manner in which Lieut. McNair performed his whole duty." FOXHALL A. PARKER.

McNeil' (JOHN), b. at Hillsboro', N. H., 1784; appointed captain 11th U. S. Infantry in 1812; promoted to be major the following year. At Chippewa (July 5, 1814), on the fall of his colonel, he commanded his regiment, which contributed largely to the success of that day; and again at Lundy's lane (July 25), where he was severely wounded. For these actions he was brevetted lieutenant-colonel and colonel. At the close of the war he was retained as major 5th Infantry, and in 1826 attained a colonelcy, having been brevetted brigadier-general two years previous. In 1830 he resigned, and was appointed surveyor of the port of Boston, which position he held the remainder of his life. D. at Washington, D. C., Feb. 23, 1850.

McNeil (Gen. JOHN), b. in Canada of American parents about 1820; learned the hatter's trade in Boston, and carried on that business in St. Louis, Mo., for twenty years; took an active part in Gen. Lyon's campaign; became colonel of the 19th Missouri Vols. Aug. 3, 1861; took command of a cavalry regiment early in 1862; cleared N. E. Missouri of guerillas, hanging or shooting a number of bridge-burners—an act which created a great sensation at the time, and was denounced by all the sympathizers with the Confederacy, as well as by some staunch Unionists; defeated Gen. Porter at Kirkeville Aug. 6; was made a brigadier-general Nov. 29, 1862, and was employed during the remainder of the war in the campaigns in Southern Ohio.

McNeile' (HUGH), D. D., b. at Ballycastle, Ireland, in 1795; graduated at Trinity College, Dublin, 1815; entered as a law-student at Lincoln's Inn; took orders in the Church of England 1820; became curate in Donegal, Ireland; rector of Albury, Surrey; minister of St. Jude, Liverpool, 1834; honorary canon of Chester 1845; minister of St. Paul, Prince's Park, Liverpool, 1848; residentiary canon of Chester 1860, and dean of Ripon 1868. Dr. McNeile was celebrated for his eloquence in the pulpit and for his successful evangelical labors in Liverpool. He published several volumes of sermons, lectures, and letters on ecclesiastical topics. D. Jan. 28, 1879.

McNeill' (SIR JOHN), G. C. B., D. C. L., LL.D., b. at

Colonsa, Scotland, in 1795; was appointed assistant envoy at court of Persia in 1831, and envoy in 1836, in which capacity he became prominent through his prediction of aggressive designs on the part of Russia, a subject to which a great part of his career was devoted, and which he treated in numerous pamphlets and essays in the English and Indian periodicals, as well as in a volume entitled *Progress and Position of Russia in the East* (1854). Returning from Persia in 1844, Sir John was employed in many civil and military commissions in England and Scotland (as, for instance, in that inquiring into the administration of the commissariat of the army in the Crimea, 1857), and became a member of the privy council (1857) and chairman of the poor-law board. D. May 16, 1883.

McNeill (William Gibbs), b. in North Carolina about 1800; graduated at West Point 1817, and entered the artillery, serving on topographical duty until 1823, when transferred to the corps of topographical engineers with rank of brevet captain. His name is intimately identified with the early engineering works of our country, particularly as a pioneer in railroad surveys and construction. He was one of the engineers of the Baltimore and Ohio R. R., and a member of the board of engineers to determine the route of that road; and chief engineer of many other railroads, until in 1837 he resigned from the army to pursue the profession of civil engineer. In this capacity he was prominent in the construction of railroads in all parts of the country; was chief engineer of the dry dock in the Brooklyn navy-yard; president of the Chesapeake and Ohio Canal Co., on the early surveys of which work he was engaged; and was constantly consulted on important public works in this and other countries; was major-general of the Rhode Island militia during the Dorr excitement. D. at Brooklyn Feb. 16, 1853.

McNev'en (William James), M. D., b. in Galway, Ireland, Mar. 26, 1763; educated at the colleges of Prague and Vienna, graduating in 1784; engaged in revolutionary movements in Ireland as a member of the society of United Irishmen; was imprisoned four years; became captain in an Irish brigade in the French service; came to the U. S. 1804; was professor in the College of Physicians and Surgeons or in the Medical School of Rutgers College more than twenty years; was twice appointed resident physician; was a member of the medical council during the cholera season of 1832, and d. in New York July 12, 1841. He published an *Exposition of the Atomic Theory*, *Pieces of Irish History* (1807), and other works, and edited Brande's *Chemistry*.

MacNish' (Robert), M. D., b. in Glasgow, Scotland, Feb. 15, 1802; studied medicine in Glasgow and Paris; contributed to *Blackwood* and other magazines over the signature of "A Modern Pythagorean," and published *The Anatomy of Drunkenness* (1827), a remarkable book; *The Philosophy of Sleep* (1830), a *Book of Aphorisms* (1833), and an *Introduction to Phrenology* (1835). D. at Glasgow Jan. 16, 1837.

McNutt (Alexander G.), b. in Rockbridge co., Va., in 1801; was educated at Washington College, Va.; removed in 1824 to Jackson, Miss., and afterwards became a lawyer of Vicksburg. In 1835 he was sent to the State senate, and was governor of Mississippi 1837–41. D. in De Soto co., Miss., Oct. 22, 1848.

Macomb, city, on R. R., cap. of McDonough co., Ill. (see map of Illinois, ref. 5–C, for location of county), 200 miles from Chicago, contains the McDonough Normal College, excellent schools, a fine court-house, foundry, etc. Pop. in 1870, 2748; in 1880, 3140.

Macomb (Gen. Alexander), b. in Detroit, Mich., Apr. 13, 1782; appointed a cornet of cavalry in 1799; transferred to the infantry in 1801, and to the engineers in 1802, in which latter corps he attained a lieutenant-colonelcy in 1810, and at the time of the declaration of war with Great Britain (June, 1812) was acting adjutant-general of the army; but preferring active field-service, he was appointed in July colonel of the 3d Artillery, and was distinguished at Fort Niagara and Fort George; promoted to be brigadier-general in Jan., 1814. On Sept. 11, with 1500 men and a small number of militia from New York and Vermont, he fought the battle of Plattsburg, defeating a largely superior force of British veterans under Sir George Prevost, for which service he received the thanks of Congress and a gold medal; was also brevetted major-general and commanded a military department in the North-west 1815–21. Upon the reorganization of the army in the latter year, he was retained as chief engineer of the army, with the rank of colonel. In May, 1828, he succeeded Gen. Brown as major-general in command of the army. D. at Washington June 25, 1841. Author of a *Treatise on Martial Law* and *Courts-Martial as practised in the U. S.* (1809).

Macomb (Commodore Wm. H.), b. in 1820 in Michigan; entered the navy as a midshipman Apr. 10, 1834; became a passed midshipman in 1840, a lieutenant in 1847, a commander in 1862, a captain in 1866, a commodore in 1870. D. at Philadelphia Aug. 12, 1872. While attached to the U. S. S. Plymouth in 1856 he took part in the bombardment and capture by assault of the Barrier Forts, China; was in various actions on the Mississippi in 1863, and in the sounds of North Carolina in 1864, and on Oct. 31, 1864, in command of a squadron of gunboats, captured the town of Plymouth, N. C., after a spirited fight, in making his dispositions for which he displayed decided ability. For this victory Macomb received the thanks of the department, and was advanced ten numbers in his grade; and Rear-admiral Porter in his official report of it says: "This was a very gallant affair, and reflects great credit on the commander of the expedition and all concerned." Foxhall A. Parker.

Macon' [anc. *Matisco*], town of France, capital of the department of Saône-et-Loire, on the river Saône, which is lined with beautiful quays and crossed by a bridge of thirteen arches, built by Cæsar. Otherwise the town is ill built, with narrow, crooked, and dirty streets, but its trade in timber and Burgundy wine is considerable, as also its manufactures of watches. It is the birthplace of Lamartine and a railway centre of considerable importance, the lines from Paris, Marseilles, and Mont Cenis meeting here. Pop. in 1881, 19,567.

Macon, city and important R. R. centre, cap of Bibb co., Ga. (see map of Georgia, ref. 4–H, for location of county), situated at the head of navigation on the Ocmulgee River, 80 miles S. E. of Atlanta, is beautifully located, well laid out with very wide streets lined with shade trees, has a magnificent city park and fair grounds, important manufactures, iron-foundries, and railway machine-shops, and is the seat of Mercer University (Baptist) and of the Wesleyan Female College. Rose Hill Cemetery on the banks of the Ocmulgee, half a mile below the city, is one of the most beautiful in the U. S. Pop. in 1870, 10,810; in 1880, 12,749.

Macon, cap. of Noxubee co., Miss. (see map of Mississippi, ref. 6–H, for location of county), on the Mobile and Ohio R. R., 198 miles N. of Mobile. It has the machine-shops of the Mobile and Ohio R. R., and one of the finest court-houses in the State. Pop. in 1870, 975; in 1880, 2074.

Macon, city and R. R. centre, cap. of Macon co., Mo. (see map of Missouri, ref. 2–G, for location of county), 170 miles N. W. of St. Louis, has an academy, an extensive wagon-factory, and a flourishing trade. Pop. in 1870, 3678; in 1880, 3046.

Macon (Nathaniel), b. in Warren co., N. C., in 1757; studied at Princeton, and afterwards served as a private soldier of the Revolution under Col. John Macon, his brother; was in the State legislature, 1780–85; opposed the U. S. Constitution, and twice declined the office of U. S. postmaster-general; was in Congress 1791–1815, and was Speaker 1801–06; U. S. Senator 1816–28, being (1825–28) acting president of the Senate. In 1835 he was president of a State constitutional convention, and in 1836 a U. S. elector. He was a warm personal friend of Madison, Jefferson, and John Randolph. Though now nearly forgotten, the number of counties, cities, and towns in the Southern and Western States which bear his name show the extent of his popularity among his contemporaries. His term of consecutive service in Congress, thirty-seven years, exceeds that of any other American statesman. D. in Warren co., N. C., June 29, 1837.

Macoy'a, called also **Macahuba Palm** and **Great Macaw Tree,** the *Acrocomia sclerocarpa*, a South American and West Indian palm tree which yields a pleasantly perfumed palm oil used in soapmaking, and which in its native regions is employed as an unguent in rheumatism.

MacPherson, R. R. junction, cap. of MacPherson co., Kan. (see map of Kansas, ref. 6–G, for location of county), 36 miles S. of Salina, has several flouring-mills. Principal occupation, farming and sheep-raising. Pop. in 1880, 1590.

McPherson (Edward), LL.D., b. at Gettysburg, Pa., July 31, 1830; graduated at Pennsylvania College in 1848; was for a time a journalist of Harrisburg, Pa.; was a member of Congress 1859–63; clerk of the U. S. House of Representatives 1863–69; secretary of the Union national committee 1860–64; he became a journalist at Gettysburg, Pa. He has published a *Political History of the U. S.* (1864) during the civil war, a *Political Manual*, and other works, including some admirable literary and other papers; was afterward editor of Philadelphia *Press*, and was clerk of the House of Representatives in 1882 and 1883.

Macpherson (James), b. at Ruthven, Inverness-shire, in the Highlands of Scotland, in 1738; entered King's College, Aberdeen, 1752; studied also at Marischal College, Aberdeen, and at the University of Edinburgh, where he gave evidence of his literary taste by the publication of a "heroic poem" in six cantos entitled *The Highlander* (1758), which is admitted to be beneath criticism. He is said to have studied for the ministry, but was never ordained. After teaching the Ruthven school he became a tutor in the family of Mr. Graham of Balgowan, and made some essays in versification, which he showed to the celebrated John Home as translations of Gaelic poetry which he alleged to be preserved by memory from a remote period by the Highland minstrels. The circumstance was communicated by Home to Drs. Hugh Blair and Alexander Carlyle, and by their advice Macpherson published a small volume of *Fragments of Ancient Poetry collected in the Highlands of Scotland, and translated from the Gaelic or Erse Language* (1760). An enthusiasm on Celtic subjects then pervaded the literary atmosphere of Scotland; the little book met with great success, and a subscription was raised to enable the "editor" to travel through the Highlands and recover all extant remains of early minstrelsy. Thus encouraged by the ready belief of his dupes, Macpherson, whose knowledge of Gaelic was never more than a smattering, produced in quick succession *Fingal, an Ancient Poem in Six Books, together with Several other Poems composed by Ossian, Son of Fingal, translated from the Gaelic Language* (1762), and *Temora, an Ancient Epic Poem, in Eight Books*, etc. (1763), by which he gained £1200 and a European reputation. These so-called "poems" were received with the utmost enthusiasm in Scotland, and even on the Continent they were immediately translated into the chief modern languages, and the mythical bard, Ossian the son of Fingal, at once took his place in biographical dictionaries as the rival of Homer and Virgil. Not long after the English critics began to call for the original Gaelic of Ossian in order to test the correctness of the translation, but it was not forthcoming, and the flimsy excuses put forth for its absence were sufficient evidence to impartial inquirers that, as Dr. Johnson said, the poems "never existed in any other form than that which we have seen." The Scotch enthusiasts, who had staked their reputation upon the genuineness of Ossian, took up the cudgels in behalf of Macpherson, and the battle raged with great bitterness for fifty years; nay, there has appeared in the present year (1875) an elaborate vindication of Ossian's genuineness. Macpherson found it expedient after the publication of *Temora* to absent himself for a time from Scotland, and gladly accepted the post of private secretary to Gov. Johnstone of West Florida, and spent nearly two years at Pensacola and in travelling through the American colonies; took up his residence in London (1766), wrote an *Introduction to the History of Great Britain and Ireland* (1771), and issued a prose translation of the *Iliad* of Homer (1773) cast in Ossianic mould, which was received with coldness by his friends and with contempt by his adversaries. Shortly afterwards Dr. Johnson's uncomplimentary treatment of Ossian in the *Tour to the Hebrides* (1774) led Macpherson to threaten the literary autocrat with personal violence, but only elicited a letter written in terms of withering contempt. In 1775, Macpherson published a *History of Great Britain from the Restoration to the Accession of the House of Hanover* (2 vols. 4to, 1775), in which he attacked the motives of the statesmen who effected the revolution of 1688. The copyright of this work brought Macpherson £3000. He was employed by the government to write a pamphlet, *The Rights of Great Britain asserted against the Claims of the Colonies* (1776), and another entitled *A Short History of the Opposition during the Last Session of Parliament* (1779). Macpherson was an able pamphleteer, and in reward for his services he obtained the lucrative agency for the nabob of Arcot in his negotiations with the government. He wrote several pamphlets on Indian affairs, sat in Parliament for Camelford 1780–90, and built a handsome residence at Belleville, Inverness, where he resided for several years until his death, Feb. 17, 1796. At his own request he was buried in Westminster Abbey, the monument being erected at the expense of his estate. Upon the Ossianic controversy the standard work is that by Malcolm Laing, under the title *The Poems of Ossian, containing the Poetical Works of James Macpherson, with Notes and Illustrations* (1805), in which the memory of Macpherson is handled without gloves by a brother Scotchman. This masterly criticism disposed of the more or less plausible theories of Blair, Kames, Gregory, *et id omne genus*, but did not prevent Sir John Sinclair from publishing *Ossian in the Original* (1806), from the posthumous papers of the "translator," all of which, however, were in the handwriting of Macpherson himself or of his secretaries. Notwithstanding some modern counter-pleas, the verdict of the Highland Society of London, that no poems of the kind could be found to exist in the memories of the Highlanders, ought to be conclusive. At the same time, candid criticism must admit that a work which elicited the unbounded admiration of such dissimilar minds as Dr. Parr, Sir Walter Scott, Klopstock, and Napoleon Bonaparte must have in it elements of poetic excellence which escaped the prejudiced judgment of Macaulay and Sir James Mackintosh.

Porter C. Bliss.

McPherson (Gen. James Birdseye), b. in Sandusky co., O., Nov. 14, 1828; graduated at the U. S. Military Academy at the head of his class July 1, 1853, and was appointed brevet second lieutenant corps of engineers; his superior qualifications caused him to be retained at the Academy as assistant instructor of engineering till Sept., 1854, when he was assigned to duty in New York as assistant engineer on the defences of that harbor and of the improvement of the Hudson River; in 1857, having previously (Dec., 1854) been appointed full second lieutenant of engineers, he was placed in charge of the construction of Fort Delaware, and subsequently of the defences on Alcatraz Island, San Francisco harbor, Cal.; in 1858 was promoted to be first lieutenant, and in 1861 was ordered to Boston, Mass., where he was engaged in organizing a corps of engineer troops; in Aug., 1861, he was made captain of engineers, and in November of that year was chosen by Gen. Halleck as aide-de-camp and assistant engineer of the department of the Missouri, with the rank of lieutenant-colonel; in May, 1862, was promoted to be colonel and A. D. C., brigadier-general U. S. volunteers, and major-general in Oct., 1862; his brilliant career from the capture of Fort Henry in 1862 up to the surrender of Vicksburg in 1863 is fittingly told by Gen. Grant in his letter recommending McPherson to be a brigadier-general in the regular army; he says of him: "He has been with me in every battle since the commencement of the rebellion, except Belmont. At Forts Henry and Donelson, Shiloh, and the siege of Corinth, as a staff officer and engineer, his services were conspicuous and highly meritorious. At the second battle of Corinth his skill as a soldier was displayed in successfully carrying reinforcements to the besieged garrison when the enemy was between him and the point to be reached. In the advance through Central Mississippi, Gen. McPherson commanded one wing of the army with all the ability possible to show, he having the lead in the advance, and the rear retiring. In the campaign and siege terminating with the fall of Vicksburg he has filled a conspicuous part. At the battle of Port Gibson it was under his direction that the enemy was driven, late in the afternoon, from a position they had succeeded in holding all day against an obstinate attack. His corps, the advance always under his immediate eye, were the pioneers in the movement from Port Gibson to Hawkinson's Ferry. From the N. fork of the Bayou Pierre to Black River it was a constant skirmish, the whole skilfully managed. From Hawkinson's Ferry to Jackson the 17th army corps marched on roads not travelled by other troops, fighting the entire battle of Raymond alone, and the bulk of Johnston's army was fought by this corps entirely under the management of Gen. McPherson. At Champion Hill the 17th corps and Gen. McPherson were conspicuous. In the assault of the 22d of May on the fortifications of Vicksburg, and during the entire siege, Gen. McPherson and his command took unfading laurels. He is one of the ablest engineers and most skilful generals." Upon this recommendation Gen. McPherson was (Aug. 1, 1863) appointed a brigadier-general in the regular army, and soon after surprised the Confederate camp at Canton, Miss.; in Feb., 1864, he accompanied Gen. Sherman's famous raid to Meridian as second in command, and in March was assigned to command the department and army of the Tennessee, to the reorganizing of which he devoted several weeks, preparatory to the invasion of Georgia; during this famous campaign his services were invaluable; at Resaca, Dallas, and the almost daily severe fighting up to and including Kenesaw Mountain, he was conspicuous and greatly distinguished himself; in the battles before Atlanta he commanded the left grand division, and it was here on the 22d of July, 1864, he was shot, and almost instantly killed.

G. C. Simmons.

McPherson (John Roderic). See Appendix.

McRae, on R. R., cap. of Telfair co., Ga. (see map of Georgia, ref. 5–I, for location of county). Pop. unknown.

McRae′ (John J.), b. in Wayne co., Miss., about 1810; graduated at Univ. of Miss. in 1834; served in both branches of the legislature; U. S. Senator 1851; gov. of Miss. 1854–58; in Congress 1858–61. D. May 30, 1868.

Macrauche′nia, an extinct genus of ungulate mammals from the tertiary deposits of Southern South America. (See Macraucheniidæ.)

Macraucheni'idæ [from *Macrauchenia*—μακρός, "long," and αὐχήν, "neck"—and the family ending], a family of mammals of the order Ungulata, and sub-order Perissodactyli, including a single extinct species from the Eocene pampas deposits of Buenos Ayres and Patagonia. It had the body of a tapir, but a long neck and somewhat horse-like head; the skull had a basi-occipital which was widened forward; the supramaxillary bones were nearly rectilinear above, arched, and approximated to each other in front of the nasal aperture, but separated by the extension upward of a median septum; the nasal bones were rudimentary, and above or behind the orbits; the dental series was almost uninterrupted; the posterior upper molars (M. 2 and 3) had each a shallow valley extending inward from the anterior portion of the inner wall, and two or three deep depressions in the inner half; the lower molars (P. M. 3, M. 3) had two (an anterior and a posterior) crescent-shaped ridges; the canines were small. In these characters the type contrasted with the Palæotheriidæ, which it resembled in the length of the neck. It may also be added that, while belonging to the perissodactyl (or odd-toed) division of the ungulates, it presents, especially in the skeleton, many points of resemblance to the even-toed camels and llamas. Thus, in the elongated cervical vertebræ the canal for the vertebral artery instead of perforating the transverse processes, as in most mammals, is confluent with the neural canal in the posterior part of the vertebræ, and anteriorly perforates the walls of that canal. The zygapophyses closely resemble those of the llama in form, as do also the articular faces of the cervical vertebræ, which are much more flattened than is usual among the ungulates. The radius and ulna are ankylosed together. The bones of the feet resemble those of the odd-toed ungulates, and, as in the rhinoceros, there were three toes both before and (probably) behind. These toes, in the fore feet at least, were nearly equal in size. The femur is long, and has a third trochanter. The fibula is entire, but confluent with the tibia. The astragalus is of the characteristic perissodactyl type, and the facet for articulation with the cuboid is apparently absent. Further evidence of the affinities of these animals with the perissodactyls, and especially the *Palæotherium*, is afforded by the six upper incisors and the nearly continuous dental series. The canines were small. The single known species (*Macrauchenia patachonica*) has been made the subject of an elaborate monograph by Burmeister, who has almost completely restored the skeleton. It was originally described by Prof. Owen from remains brought by the great naturalist Charles Darwin from Patagonia, and on account of peculiarities of the cervical vertebræ compared with the camels. By Burmeister it was supposed to have had quite a long, slender proboscis, but without sufficient reason. The *Macrauchenia* equalled in size the largest hippopotamus, but probably had a less broad and bulky body, and the neck was elongated.

O. C. MARSH.

Macrea'dy (WILLIAM CHARLES), b. in London, England, Mar. 3, 1793; d. at Cheltenham Apr. 27, 1873. His father, a theatrical manager and lessee, sent his son to Rugby to be liberally educated, but his projected career was cut short by pecuniary embarrassments, and at the age of seventeen the youth essayed the stage, making his first appearance at Birmingham in *Romeo* (June 7, 1810). He first undertook Hamlet in 1811; played with Mrs. Siddons at Newcastle in *The Gamester* and *Douglas;* played at Glasgow, Bath, Berwick, and Dublin; was seen in London at Covent Garden as Orestes (Sept. 16, 1816). His success was slow, but steady, and was due to hard work, rather than to genius. In 1822 his engagement began at Covent Garden, and his reputation rose in parts like Virginius and Mirandola till 1826, when he went to Drury Lane. From this time he took rank with the illustrious of his profession. The same year he visited America; the next year made a continental tour; in 1828 played in Paris; returned to England, and for several years played in London and all the chief cities of the kingdom; revisited America in 1843–44, and made a successful professional tour through the States; made another engagement in Paris, and performed in *Hamlet* at the Tuileries before Louis Philippe; revisited the U. S. again in 1849, during which the Astor Place riot in New York occurred; in 1850 began the long series of "farewells" to the theatres in England, which terminated at Drury Lane Feb. 26, 1851. Till 1860, Mr. Macready lived in retirement at Sherborne, enjoying society, taking an interest in public institutions, and occasionally giving readings. The last years of his life were spent at Cheltenham. Mr. Macready was one of the last of the great Shakspearean actors, a good scholar, a man of fine literary taste, of high professional ambition, of elevated character, generous, humane, modest, and just. (See *Reminiscences and Diaries*, 1875.)

O. B. FROTHINGHAM.

McRee' (Col. WILLIAM), b. at Wilmington, N. C., 1788; graduated at the U. S. Military Academy 1805, and appointed second lieutenant of engineers; first lieutenant 1806, captain 1808, major 1812, lieutenant-colonel 1818. Prior to 1812 was engaged in the survey and construction of fortifications on the South Atlantic coast; during the war with Great Britain he served as chief of artillery of Gen. Hampton's Northern army, and later, as chief engineer of Gen. Brown's army, achieved distinction at the capture and defence of Fort Erie and the battles of Chippewa and Niagara, winning the brevets of lieutenant-colonel and colonel. At the close of the war, with Major Thayer, he visited Europe, under orders of his government, for professional observation and provided with funds for the purchase of professional works; returning in 1816, he was placed on a board of engineers to prepare a system of defences for the Atlantic coast, on which he continued until 1819, when, sharing with other officers of his corps the feeling of the injustice of the appointment of the French engineer, Gen. Bernard, to the position especially created by Congress for him, that of "assistant engineer of the U. S.," with rank of brigadier-general, he resigned Mar. 31, 1819. In 1825 he was appointed surveyor-general of Illinois, Missouri, and Arkansas, rendering important services. D. of cholera at St. Louis Sept. 10, 1832.

Macri'nus (M. OPELIUS), Roman emperor from Apr., 217, to June, 218, b. in 164 of humble parentage at Cæsarea, in Mauritania; entered the service of Plautianus, the favorite of Septimius Severus; received different appointments in the imperial household; became prefect of the prætorians, and was chosen emperor by them after the assassination of Caracalla. Shortly after his accession he was defeated by the Parthians, and lost his influence with the army. The prætorians rose in rebellion, instigated by Elagabalus, and the emperor fled in disguise, but was discovered and put to death.

Macro'bius (AMBROSIUS AURELIUS THEODOSIUS), a Latin grammarian, flourished in the fifth century, but of his personal life nothing is known. Of his writings are still extant *Saturnaliorum Conviviorum Libri VII.*, containing much valuable historical and mythological information; *Commentarius ex Cicerone in Somnium Scipionis*, a series of philosophical discourses based on Neoplatonic views; and an extract or abridgment of *De Differentiis et Societatibus Græci Latinique Verbi.* Macrobius is the first pagan writer who mentions the massacre of the children of Bethlehem by Herod. The best editions of his works are those by Jan (1848–52) and Eyssenhardt (1868). There is no English translation.

Macropod'idæ [from *Macropus*, the typical genus; μακρός, "long," and πούς, "foot," and the family suffix], a family of mammals of the order Marsupialia and sub-order Syndactyli, containing the kangaroos and kangaroo-rats of Australia and New Guinea. They have immensely enlarged hind limbs, by means of which they progress by great leaps, and much reduced fore limbs, while the large thick tail serves as a fulcrum for support, etc.; the head is comparatively small, and somewhat deer-like; the teeth in the full series are as follows: molars, $\frac{5}{5}$; canines, $\frac{0}{0}$ or $\frac{1}{0}$; incisors, $\frac{3}{1}$; the second molar in each jaw in the young is deciduous, and followed by a permanent successor; all except the first are two-ridged; the canines are small or absent in the upper jaw, always absent in the lower; the incisors of the upper jaw (3 + 3) trenchant and nearly vertical, of the lower (1 + 1) large and horizontal; the stomach is large and sacculated, and a long simple cæcum is developed; the marsupial pouch opens forward. The family is peculiar to Australasia and the islands of the Papuan Archipelago, and is quite rich in genera and species. It has been divided by systematists into two families and many genera. (I.) The Macropodinæ are those forms in which the œsophagus enters the stomach near the cardiac end, and embraces the genera (1) *Macropus*, including the typical kangaroos, weighing up to 200 pounds; (2) *Halmaturus*, including the brush-kangaroos or wallabies, weighing from 10 to 50 pounds; (3) *Petrogalea*, or the rock-kangaroos, weighing up to 30 pounds; (4) *Lagorchestes*, or the hare kangaroos, weighing from 6 to 8 pounds; (5) *Onychogalea*, including the silky-haired or rail-tail kangaroos, weighing from 8 to 10 pounds; (6) *Dorcopsis*, or New Guinea kangaroos, weighing 7 or 8 pounds; and (7) *Dendrolagus*, including the tree-kangaroos or wallabies, weighing about 30 pounds. (II.) The Hypsiprymninæ are forms in which the œsophagus enters the stomach near the pyloric end, and embrace the genera (1) *Hypsiprymnus*, or rat-kangaroos, weighing from 4 to 5 pounds; (2) *Bettongia*, or jerboa kangaroos, weighing from 2 to 5 pounds; and (3) *Æpryminus* (Garrod, 1875), until very recently confounded with the bettongs. The *Dendrologi*, or genera *Dendrolagus*, and *Dorcopsis* are represented in New Guinea and Mysol; the *Macropi*, or all the rest, in Australia, Tasmania, Ary, and the Ké Islands. Dr. Kreft, one of the latest writers on the family, admits 44 species as natives of Australia and Tasmania. Prof. Owen has recently (1873) described some gigantic species from late Tertiary caves and other deposits in Australia, some of which, according to Garrod, are most nearly related to the New Guinea types. (See also Kangaroo and Marsupialia. Theo. Gill.

Macroscelidæ. See Appendix.

Macruridæ. See Appendix.

McSpar'ran (James), D. D., b. in the N. of Ireland about 1695, came to Narragansett, R. I., in 1721, as an Episcopal missionary of the Society for the Propagation of the Gospel in Foreign Parts; was intimate with Berkeley at Newport; visited England in 1736; was an eloquent preacher, and wrote a historical and geographical treatise entitled *America Dissected* (Dublin, 1753), which was reprinted in Updike's *History of the Episcopal Church in Narragansett, R. I.* (1847), in which several of Dr. McSparran's sermons may also be found. D. Dec. 1, 1757.

McTyeire' (Holland Nimmons), D. D., bishop of the Methodist Episcopal Church, South, b. in Barnwell co., S. C.; graduated at Randolph-Macon College, Va.; joined the Virginia conference in 1845; in 1846 took charge of St. Francis street church, Mobile; served the churches at Demopolis, Ala., and Columbus, Miss.; was then transferred from the Alabama to the Louisiana conference, and was stationed in New Orleans; in 1854 was elected editor of the New Orleans *Christian Advocate;* in 1858 was elected editor of the Nashville *Christian Advocate.* During the war he was transferred to the Montgomery conference, and was pastor in Montgomery, Ala., when in 1866 he was elected to the episcopate. He became president of the board of trust of the Vanderbilt University. He is the author of *Manual of the Discipline* and *Duties of Masters.* T. O. Summers.

McVeagh (Wayne), b. at Phœnixville, Pa., Apr. 19, 1833; educated at Yale College; admitted to the bar 1856; became dist. atty. of Chester co., Pa.; capt. of cavalry 1862, when invasion of Pa. was threatened; chairman of Republican central committee of Pa. 1863; appointed by Pres. Grant minister to Constantinople 1872, resigned 1873; leading member of U. S. "McVeagh commission" to La. 1877, to investigate political affairs; appointed U. S. attorney-gen. by Pres. Garfield Mar. 5, 1881; resigned same year.

MacVey'town, Mifflin co., Pa. (see map of Pennsylvania, ref. 5–E, for location of county), on the Pennsylvania R. R. Principal business, farming, and mining iron ore, of which immense quantities are found in the immediate vicinity. Sand for glassmaking is also found here in abundance. Pop. in 1870, 685; in 1880, 679.

McVick'ar (John), D. D., b. in New York Aug. 10, 1787; graduated at Columbia College in 1804; took orders in the Protestant Episcopal Church in 1811; became professor of moral philosophy and rhetoric in Columbia College in 1817, which post he retained nearly half a century, until 1864. Wrote *Outlines of Political Economy* and *Professional Years of Bishop Hobart.* D. in New York Oct. 29, 1868. His *Life* appeared in 1873, edited by his son, William A. McVickar, D. D., who was b. in New York Apr. 24, 1827, and d. Sept. 24, 1877.

McWhor'ter (Alexander), D. D., b. in Newcastle co., Del., July 15, 1734; graduated at Princeton 1757; studied theology under William Tennent; was installed pastor of the Presbyterian church at Newark; went on a mission to North Carolina in 1764, and was sent there again in 1775 by Congress to persuade the royalists of the western counties to join with their brethren in the Revolution; became in 1778 chaplain of Knox's artillery brigade; accepted in 1779 the pastorate at Charlotte, Mecklenburg co., N. C., and the presidency of Queen's Museum College, then called Liberty Hall; lost his library by the invasion of Cornwallis; returned to Newark 1781; aided in drawing up the constitution of the American Presbyterian Church in 1788; was for thirty-five years a trustee of Princeton College; took a leading part in collecting funds in New England for rebuilding the college after the conflagration of 1802; published a centennial sermon at Newark in 1800, and two volumes of sermons in 1803. D. at Newark July 20, 1807.

MacWhorter (Alexander), A. M., b. in New York Jan. 1, 1822; graduated at Yale 1842; studied divinity at New Haven 1842–45; was prof. of English literature and metaphysics at the Univ. of Troy, N. Y., 1856–60; author of *Yahveh Christ, or the Memorial Name.* D. July, 1880.

McWil'lie (William), b. near Liberty Hill, Kershaw district, S. C., Nov. 17, 1795; served in the war of 1812 as adjutant to his father, Col. Adam McWillie; graduated at South Carolina College 1817; studied law, and was admitted to the bar 1818; served for many years in both houses of the State legislature; settled in Mississippi as a planter 1845; was member of Congress from that State 1848–51, and governor 1858–60; took an active part in the political agitations of the Confederate movement, and d. at Kirkwood, Miss., Mar. 3, 1869.

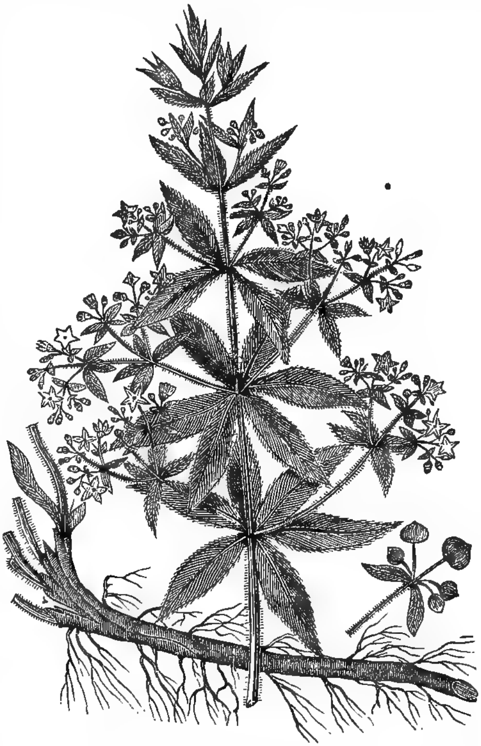
Madagas'car, the largest of the African islands, 1030 miles long, 250 miles broad, and comprising an area of about 230,000 square miles, is situated in the Indian Ocean, between lat. 11° 57′ and 25° 42′ S., and between lon. 43° 10′ and 50° 25′ E., and separated from Africa by the Mozambique Channel, 250 miles broad. The coast, much indented on the western side, and, although more regular, affording several good harbors also on the eastern side, is generally low, presenting a belt of sand-plains or swamps, and containing many lagoons and lakes. From the coast the surface rises in the same manner as on the African continent, in terraces, broader and more gently sloping on the western, narrower and divided by wall-like cuts on the eastern side. The interior forms a plateau from 3000 to 4000 feet high, traversed from N. to S. by a mountain-chain whose peaks rise from 6000 to 12,000 feet, and which in the north-eastern part of the island separates into many ranges, and forms mountainous regions of considerable extension. Of the rivers flowing down the eastern slope, none is navigable, but of those descending the western slope, the Tsidsubu (or Menabe) and the Mangooka (or St. Vincent's) are navigable, the former to the foot of the mountains. The climate is very different in the low coast-regions, where the heat is intense and a fever prevails, dangerous not only to Europeans, but even to the natives of the interior; and in the more elevated parts, where the thermometer seldom rises above 85°. The rainy season lasts from December to April. Iron and rock-salt abound; coal is said to exist in some places. Generally the soil is clayey and very productive; the vegetation is exceedingly rich. Peculiar to the country are the ravenala or "traveller's tree" (*Urania speciosa*), whose trunk yields a sweet and wholesome beverage when an incision is made; the zozoro, a kind of papyrus; and a lichen growing in the south-western regions and yielding a powerful dyestuff. Ebony, mahogany, different kinds of gum trees, figs, cocoanuts, bread-fruit trees, plantains, and bananas are frequent. Rice is extensively cultivated, and forms the principal article of food; also yams and arrowroot. The cotton-plant has been introduced from the Feejee Islands, the sugar-cane from Mauritius, and the coffee tree from Java, and they thrive well; the cultivation, however, was started by Europeans, and is still carried on by foreign labor. The silkworm is indigenous, and is reared on the *Tapia edulis;* the cocoon is often used by the natives as an article of food. The aye-aye is peculiar to the island; cattle, both wild and tame, and generally humped as in India; sheep with fat tails and covered with hair, as in the Cape of Good Hope; swine, wild-hogs, dogs and cats, small leopards, monkeys; large but generally not venomous serpents; immense crocodiles, venerated by the natives; excellent oysters, etc. are numerous. The inhabitants, numbering about 5,000,000, fall, ethnologically, into two groups —the black on the western slope, and the olive on the eastern; and politically into four sections—the Hovas, Sakalavas, Betsileos, and Betsimasarakas. Of these, the Hovas are the ruling tribe, a race of middle height, but well proportioned, with black straight or curled hair, and hazel eyes, well gifted and active. The government is a military despotism. The religion is idolatry, and Christianity, although adopted by many, especially among the Hovas, has not succeeded in eradicating certain old customs, such as infanticide and polygamy. The Madagascan language (or Malagasy) belongs to the Malayo-Polynesian family, and is spoken in several dialects. The island was mentioned in the thirteenth. century by Marco Polo, but not actually known to the Europeans until the beginning of the sixteenth century, when in 1506 it was visited by Lorenzo de Almeida, the first Portuguese viceroy of India. Not long afterward the Portuguese formed a colony on the river Franchere, in the province of Anosy, on the eastern coast, but the settlers were massacred by the natives. In 1642 the French, and in 1644 the English, planted colonies on the eastern coast, but these too failed, and for a long time Madagascar was known to the Europeans chiefly as the hiding-place of pirates and buccaneers, whom it took considerable force to finally suppress. In 1745 the French East India Company founded a colony on the island of St. Mary, and in 1768 another at Fort Dauphin. These succeeded better, but a lively and efficacious intercourse with European civilization did not begin until the reign of Radama I. (1808–28). He received the British missionaries and artisans well who came to the country. The native language was reduced to writing, the Bible was translated and printed, a large number of the inhabitants were taught to read and converted to Christianity, the slave-trade, infanticide, and polygamy were abolished, at least nominally, etc. Under his successors the progress of civilization was several times stopped, and the people threatened to relapse into paganism and barbarity. Such was the case under the successor of Radama, one of his wives, Ranavalona I., 1828–61. In 1835 the profession of the Christian religion was declared illegal, and in the following year the missionaries were compelled to leave the country. Christian worship was to cease, Christian books were to be burnt, etc. The time of persecution, however, ceased with the accession of Radama II., and under Queen Ranavalona II., who ascended the throne in 1868, Christianity was not only legally recognized, but became the state religion. The queen herself was baptized, the royal idols were burnt, and a chapel was built in the palace. About 1200 congregations have been formed in the island, and about 900 schools, with nearly 50,000 scholars, are in operation. The greatest danger to the progress and prosperity of the country now arises from the jealousy between the French and the English influences, more especially from the intrigues of the French Jesuits, though the two governments have come to an agreement respecting the independence of the country. The capital city is Tananarivo, situated in the interior, in the province of Ancova, in lat. 18° 56′ S. It is well built, has manufactures of gold and silver ware, of carpets, etc., and 80,000 inhabitants. Tamatave, situated on the eastern coast, in the province of Batanimena, in lat. 18° 10′ S., carries on trade with Muscat, Zanzibar, and the Cape of Good Hope. The U. S. have a consular agent here. Gum-copal, India-rubber, ebony, beeves and swine, hides and arrowroot, are exported; cotton goods, rum, hardware, firearms, and powder are imported. In the last six months of 1882, 116 vessels visited the harbor. (See Rev. William Ellis, *History of Madagascar* (1838); *Three Visits to Madagascar* (1858); *The Martyr Church* (1870); McLeod, *Madagascar and its People* (1865); S. P. Oliver, *Madagascar and the Malagasy* (1866); W. Ellis, *Madagascar Revisited* (1867); J. Sibree, *Madagascar and its People* (1870); and W. Ellis, *Ten Years' Review of Mission Work in Connection with the London Missionary Society* (1880).) CLEMENS PETERSEN.

Madar′, or **Mudar**, the *Calotropis* (*Asclepias*) *gigantea*, a large plant of the East Indies, now naturalized in the West Indies also. Its fibre is used for making cloth and cordage, and the bark of its root is employed with apparent advantage in leprosy, elephantiasis, syphilis, etc.

Maddalo′ni (*Magdalonum*), town of Southern Italy, in the province of Caserta, about 18 miles N. from Naples. Its chief interest for the visitor is the grand Carolino aqueduct, built about 1755, which brings the waters of the Tiburno to Caserta (3 miles from Maddaloni), where they form a fine cascade that supplies the lakes and fountains of the royal palace gardens. The whole length of this aqueduct is 30 miles, the tunnels and bridges being very numerous, the latter alone having cost nearly $1,000,000. The longest, the Ponte della Valle, consists of three tiers of arches, the upper of 43 arches; the second, 28; the lower, 19. There is a military school in this town, with about 500 cadets; also the Giordano Bruno Institute for boys, with 100 pupils. It was at Maddaloni that Gen. Bixio in 1860 met the flying Bourbon troops after the battle of Volturno, and drove them into the fortress of Capua. Pop. 18,767.

Mad′den (Sir FREDERICK), F. R. S., b. at Portsmouth, England, in 1801; was from 1826 to 1866 an employé of the British Museum in the library department, to which he rendered good service by his attainments in bibliography; was knighted in 1832; became in 1834 an editor of the *Collectanea Topographica et Genealogica;* published several rare English MSS. illustrating the language, history, and archæology of the fourteenth and fifteenth centuries. D. at London Mar. 8, 1873.

Madden (RICHARD ROBERT), M. D., b. at Dublin, Ireland, in 1798; travelled in Turkey, Asia Minor, and Egypt in 1824–27; became a fellow of the Royal College of Surgeons; was sent to Jamaica in 1833 as a special magistrate to supervise the working of the Emancipation act; became superintendent of liberated Africans at Havana in 1835; was commissioner of arbitration in the mixed court of justice at Havana 1836–39; member of the commission of inquiry into the slave-trade on the W. coast of Africa 1840; colonial secretary of Western Australia 1847, and secretary of the loan-fund board at Dublin Castle 1850. He published some volumes of travels in Turkey and the West Indies, *Lives* of Savonarola (1854) and Galileo (1863), and several works upon Ireland, of which the most important are *The Lives and Times of the United Irishmen* (1842–46; republished 1874), *Historical Notice of the Penal Laws against Roman Catholics* (1865), and *History of the Irish Periodical Literature* (1867).



Rubia tinctorum.

Mad′der [Sax. *mæddere;* Fr. *garance;* Ger. *Krapp, Krappwurzel*], the root of different species of *Rubia,* chiefly *Rubia tinctorum.* The main supply of commerce is from Holland, though the plant was originally a native of Southern Europe and Asia Minor, where it is still cultivated to a large extent. In Ohio and Delaware, and elsewhere in the U. S., its cultivation has been somewhat followed. Hindoo madder, called *munjeet,* is the root of *Rubia munjista,* and gives the bright colors to the East India chintzes and calicoes. The term *Turkey red,* applied to one of the tints produced from this material, arose out of its importation from the Levant, where a common species, *Rubia peregrina,* has the popular name *alizari,* whence we get our chemical name for the chief tinctorial principle of madder, *alizarine.* (For a full account of the chemistry of ALIZARINE, see under that head, by PROF. CHANDLER.) Next to this valuable principle, *alizarine,* which, as now produced by artificial chemical means from coal-tar, is largely driving madder out of commerce, the most important compound derived from madder is PURPURINE (which see).

(For the applications of madder in the arts of DYEING and CALICO-PRINTING, reference may be made to the articles under those heads, by PROF. CHANDLER.) Besides the alizarine and purpurine, there are yellow coloring-matters in madder which are useless or injurious in the operations of dyeing, etc. It has been maintained, however, that under the influence of a peculiar albuminous ferment which is present, a yellow bitter substance, which was called by Schunck—one of the most distinguished investigators of madder—*rubian,* undergoes a gradual change into alizarine, and that thus madder improves in its tinctorial power by age for several years. This rubian seems to bear to alizarine relations approaching to those of a glucoside. In the air it oxidizes to *rubianic acid,* which is an unquestionable glucoside. (See ALIZARINE.) *Garancine* is a commercial product obtained from madder, containing its coloring principles in a more concentrated form. The method consists in boiling with sulphuric acid somewhat diluted, which abstracts much useless material; and the residue constitutes but about one-third of the original madder. There are several varieties of garancine, known by different names. *Madder-Lakes.*—These costly preparations are little used except for pigments by artists. They are prepared by dissolving alum in a solution of madder, and then precipitating with an alkaline carbonate. (See RUBIACEÆ, RUBERYTHRIC ACID, RUBIAN, MUNJEET, and ANTHRACENE.)

H. WURTZ.

Madei'ra, an island belonging to Portugal, and situated in the North Atlantic Ocean, between lat. 32° 36′ and 32° 53′ N., and between lon. 16° 40′ and 17° 20′ W. It is about 360 miles from the coast of Africa, 535 from Lisbon, 1215 from Plymouth, 240 from Teneriffe, and 480 from Santa Maria, the nearest of the Azores. By the Brazilian submarine telegraph, which touches it at Funchal, it is connected with Lisbon and Rio Janeiro. Area, 345 square miles. The island is of volcanic origin, though earthquakes occur very seldom. The ground is high, the average elevation being 2000 feet, and the surface mountainous. The coasts are steep, precipitous, and afford but few harbors. In the interior the land rises still higher until it reaches its greatest height in Pico Ruivo, 6050 feet. But it is everywhere intersected, by deep, well-watered, and fertile valleys, which, however, it has cost, and still costs, an immense amount of labor to cultivate, as the ground has to be terraced and the soil prevented by walls or other devices from being washed away by the rain, while the limited supply of water makes necessary a very intricate and expensive system of irrigation. The climate is very equable, average heat in the summer being 74° and in the winter 64°. In the valleys tropical plants are grown—rice, sugar, coffee, bananas, pineapples, and oranges; on the more elevated fields vines, chestnuts, and wheat are cultivated, and the table-land is covered with fine forests and extensive pastures. The inhabitants, numbering 131,906, are a mixture of Portuguese, Moors, and negroes, and described as a vigorous, healthy, and industrious race. Since the grape disease in 1852 the vine-cultivation, which formerly made the island celebrated, has declined very much, but the coffee tree has taken the place of the vine, and succeeds very well. There is, however, still produced excellent wine in the vineyards of Madeira (Bual, Sercial, and Malmsey, strong in body and with a fine bouquet); about 300,000 gallons are annually exported. Sugar is also cultivated with success. The capital is FUNCHAL (which see). Madeira was discovered in 1416, and soon after colonized by the Portuguese. The conjecture that the Phœnicians discovered Madeira at a very early date has been formed on insufficient evidence, though the position in which Pliny places the Mauritanian Islands with reference to the Canaries seems to indicate the Madeiras. The romantic story of the two lovers cast on the shores of the island in 1346 is hardly anything more than fiction. But it seems probable that Genoese captains had visited Madeira before the Portuguese came.

Madeira, or **Madera,** a great navigable river of Brazil, South America, is formed by the confluence of the Beni and Marmora, rising in Bolivia, flows N. E. 700 miles, and enters the Amazon in lat. 3° 25′ S. and lon. 59° 45′ W.

Madeira-nut. See WALNUT.

Madeira Wine. See WINE.

Made'lia, on R. R., Watonwan co., Minn. (see map of Minnesota, ref. 11–D, for location of county), 23 miles S. W. of Mankato, on the Watonwan River, has a flouring-mill, etc. Pop. in 1880, 489; in 1885, 561.

Ma'dia [Chinese, *madia*] **Oil,** the fixed oil expressed from the seeds of *Madia sativa*, a composite-flowered annual herb of Chilian origin, now cultivated in Europe. The oil is of excellent quality, is not easily thickened by cold, and is valued as a lubricant. The oil-cake is used as food for live-stock.

Madison, on R. R., cap. of Lake co., Dak. (see map of Dakota, ref. 7–G, for location of county). Pop. in 1880, 96.

Madison, on R. R., cap. of Madison co., Fla. (see map of Florida, ref. 1–D, for location of county), 56 miles W. of Tallahassee, has a cotton-mill, etc. Pop. in 1870, 924; in 1880, 756.

Madison, on R. R., cap. of Morgan co., Ga. (see map of Georgia, ref. 3–H, for location of county), 103 miles W. of Augusta and 68 miles from Atlanta, has steam cotton-gins and steam saw-mill. Principal business, the cotton-trade, its annual receipts being about 12,000 bales. Pop. in 1880, 1974.

Madison, city, cap. of Jefferson co., Ind. (see map of Indiana, ref. 9–G, for location of county), on the Ohio River, 90 miles below Cincinnati, the terminus of a division of the Jeffersonville Madison and Indianapolis R. R., regularly laid out and well built, does a large business in pork-packing and the provision-trade, has graded public-schools, a library of 4000 volumes, and numerous mills, foundries, machine-shops, tanneries, and breweries. It has daily communication by steamer with Cincinnati and Louisville. Pop. in 1870, 10,709; in 1880, 8945.

Madison, cap. of Madison co., Neb. (see map of Nebraska, ref. 9–F, for location of county), on Union Creek, 28 m. N. of the Union Pacific R. R., has a flouring-mill, a park, etc. Principal business, farming and stock-raising. Pop. in 1880, 417; in 1885, 903.

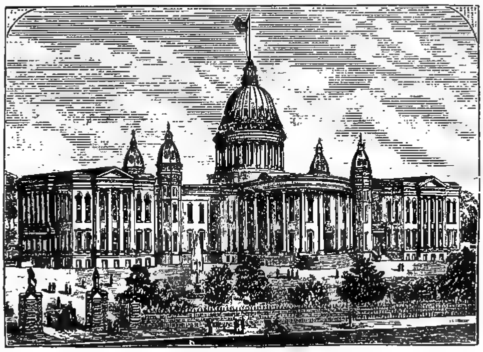
Madison, on R. R., Morris co., N. J. (see map of New Jersey, ref. 2–D, for location of county), 28 miles W. of New York, finely situated, is largely inhabited by business-men of New York, and is the site of Drew Theological Seminary (Methodist Episcopal), attached to which is a beautiful park of 95 acres. Madison has a manufactory of screws and other industries. Pop. in 1880, 1756.

Madison, Rockingham co., N. C. (see map of North Carolina, ref. 2–F, for location of county), at the junction of the Dan and Mayo rivers, has several tobacco warehouses and tobacco factories. Pop. in 1870, 295; in 1880, 361.

Madison, post-v. and tp. of Lake co., O. (see map of Ohio, ref. 1–I, for location of county), on the Lake Shore and Michigan Southern R. R., 40 miles E. of Cleveland and 4 miles from Lake Erie, has a graded public school and a seminary, and several mills and factories. Principal pursuit, raising potatoes, the annual yield being from 200,000 to 250,000 bushels. Pop. in 1870, of v. 757; of tp. 2913; in 1880, of v. 793; of tp. 2720.

Madison, cap. of Boone co., W. Va. (see map of West Virginia, ref. 5–C, for location of county). Pop. not in census.

Madison, city and R. R. centre, cap. of Wisconsin and seat of justice of Dane co. (see map of Wisconsin, ref. 7–D, for location of county), in lat. 43° 4′ 2″ N. and lon. 89° 21′ W., 75 miles W. of Milwaukee, is located upon an undulating isthmus between Lakes Mendota and Monona, 788 feet above the sea and 210 feet above Lake Michigan. Two other lakes, Waubesa and Kegonsa, are located near the city. The capitol is beautifully situated in a park of 13 acres. All the leading railroads centre here, giving outlet in seven different directions, thus making direct connection with all important points. The city contains the State University, a commercial college, 6 excellent ward schools, with a superior high school; also several select schools. There are 12 churches, 1 national and 3 State banking-houses, 2 daily, 1 tri-weekly, and 7 weekly newspapers, and 1 educational monthly publication; 2 manufactories of general agricultural implements, reapers, mowers, sugar-mills, ploughs, bicycles, etc.; several iron foundries and machine-shops, a printing-press manufactory, a knitting-factory, a corset-factory, an extensive flouring-mill, several carriage- and wagon-factories, a stereotype foundry, excellent hotels, numerous stores, shops, etc. The city is supplied with a first-class system of waterworks, gas, etc. A system of street-railroads was put in operation in 1884. Near the city is located the State Hospital for the Insane. Madison is noted for the healthfulness and beauty of its location and as a delightful summer resort. The free mail-delivery system has just been established. It has no superior in these respects in the Northwest. Pop. of city in 1870, 9176; in 1880, 10,324; in 1885, about 13,000. DAVID ATWOOD, ED. "STATE JOURNAL."


State Capitol (Madison, Wis.).

Madison (JAMES), D. D., b. near Port Republic, Va., Aug. 27, 1749, was a second cousin of Pres. Madison; graduated at William and Mary College 1768; studied law, and was admitted to the bar, but abandoned that profession for the ministry of the Protestant Episcopal Church. In 1773 he was chosen professor of mathematics in William and Mary College, and became president of that institution in 1777. He visited England in 1775, and again in 1777, where he pursued a course of study at London in several advanced branches of science, kept the college open during the war of the Revolution, became professor of natural and moral philosophy 1784, was consecrated first bishop of Virginia by the archbishop of Canterbury in Lambeth Palace Sept. 19, 1790, and continued to discharge his duties as collegiate president and professor until his death, Mar. 6, 1812. He published several occasional addresses, a *Eulogy on Washington* (1800), a large map of Virginia, and some papers in Barton's *Journal* and in the *Transactions* of the American Society, vols. ii., iii., and iv.

Madison (JAMES), fourth President of the U. S., b. at Port Conway, Prince George co., Va., the residence of his maternal grandparents, Mar. 16, 1751, was the eldest of the seven children of a wealthy planter, Col. James Madison of Montpelier, Orange co., by his wife, Eleanor Conway; studied Latin, Greek, French, and Italian under the tutorship of the parish minister, Rev. Thomas Martin; entered the College of New Jersey at Princeton in 1769, and graduated in 1771, but remained for several months pursuing a course of reading under the guidance of Pres. Witherspoon. At this time he seriously and permanently injured his health by allowing himself but three or four hours of sleep; returned to Virginia in 1772, and continued for two years an incessant study, nominally directed to the law, but really including extended researches in theology, philosophy, and general literature. His attention was then absorbed by the impending struggle for independence, with which was closely connected in Virginia a local controversy on the subject of religious toleration. The Church of England was the established state religion in the Old Dominion, and other denominations labored under serious disabilities, the enforcement of which was rightly or wrongly characterized by them as persecution. Madison took a prominent stand in behalf of the removal of all disabilities, repeatedly appeared in the court of his own county to defend the Baptist nonconformists, was elected from Orange co. to the Virginia convention in the spring of 1766, and signalized the beginning of his public career by procuring the passage of an amendment to the Declaration of Rights as prepared by George Mason, substituting for the term "toleration" a more emphatic assertion of religious liberty. In the same year he was elected to the Virginia assembly; was chosen in Nov., 1777, a member of the council of state, and in Mar., 1780, took his seat in the Continental Congress, where he first gained prominence through his energetic opposition to the issue of paper money by the States. He was made chairman of the committee on foreign relations, and as such wrote an able memorandum for the use of the American ministers in France and Spain, establishing the claims of the young republic to the territories between the Alleghany Mountains and the Mississippi, and to the free navigation of that river. In 1783 he was chairman of the committee on ways and means, was the principal author of the system of revenue then adopted, and wrote on that subject the address to the States adopted by Congress. As a member of the Virginia legislature 1784–86, Madison rendered important service by promoting and participating in that revision of the statutes which effectually abolished the remnants of the feudal system subsistent up to that time in the form of entails, primogeniture, and state support given to the Anglican Church; and his *Memorial and Remonstrance* on the latter subject was one of his ablest state papers. In Jan., 1786, he took the initiative in proposing a meeting of State commissioners to devise measures for more satisfactory commercial relations between the States; represented Virginia at the Annapolis meeting which issued the call for the national constitutional convention (Sept., 1786); was a delegate to that convention, which met at Philadelphia May, 1787; was one of the chief framers of the Constitution of the U. S., and perhaps its ablest advocate in the pages of the *Federalist*. He was a member of the first four Congresses, 1789–97, in which he maintained a moderate opposition to Hamilton's financial policy; declined the mission to France and the secretaryship of state, and, gradually identifying himself with the Republican party, became from 1792 its avowed leader, and in 1796 was its choice for the Presidency as successor to Washington, but declined to be a candidate. During the stormy administration of John Adams, Madison remained in private life, but was the author of the celebrated "Resolutions of 1798" adopted by the Virginia legislature, in condemnation of the Alien and Sedition laws, as well as of the "Report" (1800) in which he defended those resolutions, which is by many considered his ablest state paper. The great reaction in public sentiment which seated Jefferson in the presidential chair was largely owing to the writings of Madison, who was consequently well entitled to the post of secretary of state, which he filled during the whole administration of his friend with such ability as to make him the natural successor in the chief magistracy. Chosen President by an electoral vote of 122 to 53, Madison was inaugurated Mar. 4, 1809, at a critical period, when the relations of the U. S. with Great Britain were becoming embittered, and his first term was passed in diplomatic quarrels, aggravated by the act of non-intercourse of May, 1810, and finally resulting in a declaration of war, June 18, 1812. In the autumn Madison was re-elected to the Presidency by 128 electoral votes to 89 in favor of George Clinton. The war was prosecuted three years, marked by alternate success and defeat in Canada, by glorious victories at sea, by the burning of the national capitol at Washington, Aug., 1814, by the opposition movement in New England, which culminated in the Hartford convention (1814), and by the celebrated battle won at New Orleans (Jan. 8, 1815) after a peace had been signed at Ghent (Dec. 24, 1814), which left the original cause of dispute in abeyance. Few will maintain at the present day that any real glory was won in the indecisive conflict of 1812–15, and the check received by the Western States in their openly declared intention of annexing Canada by right of conquest might furnish a motive of humiliation, as well as a valuable lesson, had not the popular historians of the war conveniently forgotten to chronicle that original intention. In 1815 a commercial treaty was negotiated with Great Britain, and in Apr., 1816, a national bank was incorporated by Congress, the germ of a financial conflict not yet decided. Madison yielded the Presidency Mar. 4, 1817, to his secretary of state and intimate friend, James Monroe, and retired to his ancestral estate at Montpelier, where he passed the evening of his days surrounded by attached friends and enjoying the merited respect of the whole nation. He took pleasure in promoting agriculture as president of the county society, and in watching the development of the University of Virginia, of which he was long rector and visitor. In extreme old age he sat in 1829 as a member of the convention called to reform the Virginia constitution, where his appearance was hailed with the most genuine interest and satisfaction, though he was too infirm to participate in the active labor of revision. He d. at Montpelier June 28, 1836. James Madison, while not possessing the highest order of talent and deficient in oratorical powers, was pre-eminently a statesman of a well-balanced mind. His attainments were solid, his knowledge copious, his judgment generally sound, his powers of analysis and logical statement rarely surpassed, his language and literary style correct and polished, his conversation witty, his temperament sanguine and trustful, his integrity unquestioned, his manners simple, courteous, and winning. By these rare qualities he conciliated the esteem not only of friends, but of political opponents, in a greater degree than any American statesman of the present century.—He had a worthy helpmate in his wife, DOROTHY PAYNE (b. in Virginia 1767), whom he married at Philadelphia in 1794, she being then Mrs. Todd, a widow lady celebrated in society for beauty and accomplishments. During her long residence at Washington, Mrs. Madison was a conspicuous ornament of the "republican court" over which she ultimately presided; she returned to Washington after her husband's death, survived until July 12, 1849, and is even now (1885) admiringly remembered in Washington as "Dolly Madison."—A valuable diary kept by Madison at the time of the formation of the Federal Constitution was purchased from his heirs for $30,000, and printed by order of Congress as *Reports of the Debates in the National Convention of 1787* (3 vols., 1840); his *Complete Works* have been published in 6 vols. (See his *Life and Times*, by W. C. Rives, 3 vols., 1859–69, unfinished, and the *Letters and other Writings of James Madison*, 4 vols., 1865.) PORTER C. BLISS.

Madison Court-house, post-v., cap. of Madison co., Va. (see map of Virginia, ref. 5–G, for location of county), is situated 15 miles S. W. of Culpeper Court-house. Pop. in 1880, 461.

Madison University, situated at Hamilton, N. Y., has two distinct corporations—an educational society and a university—which supplement each other; and three schools—an academy, a college, and a theological seminary. It has sent out 2300 pupils, of whom about 1900 are still living.

The SEMINARY, an institution of the Baptist Church, was opened May 1, 1820, with Prof. Daniel Hascall as teacher in ancient languages and Dr. Nathaniel Kendrick as teacher in theology. In the first class, which graduated in 1822, went out two well-known missionaries—Rev. Jonathan Wade, D. D., and Rev. Eugenio Kincaid, D. D. The present number of professors is five.

COLGATE ACADEMY was of a subsequent growth. It was opened in 1832 as a preparatory school, and in 1853 was duly chartered as the "Grammar School of Madison University." It has a drill course of three years in classical and scientific study. It has graduated on an average 25 a year for forty years, or about 1000 in all. It has a principal and four associate teachers. A new academy building, 100 by 60, three stories high, was opened Oct. 1, 1873, when it took its present title.

The College, which by way of eminence is Madison University, was organized in 1832, but was not chartered till Mar., 1846. It has all the usual courses of college study—a classical course for candidates for the degree of A. B., a scientific course for candidates for B. Ph., and eclectic and special courses to meet the wider wants of students. The first class was graduated in 1835, and since then, for forty years, a class has been graduated, averaging 20 per year, or about 800 in all. The removal agitation of 1848–50 much disturbed all departments, and reduced the number of students. But in three years the rebound filled the classes to more than their average number. The class of 1873 numbered 38. Besides the regular graduates from these schools, about 1600 non-graduates have taken courses of study varying from one to five years. Three presidents have preceded the present incumbent, Rev. Ebenezer Dodge, D. D., LL.D.—viz. Rev. Nathaniel Kendrick, D. D. (1836); Stephen W. Taylor, LL.D. (1851); Rev. George W. Eaton, D. D., LL.D. (1856), who was succeeded by Rev. Dr. Dodge in 1868. The commencement takes place on the third Wednesday of June. Twenty prizes, $10 to $70, are awarded, amounting to $500 annually. The fall term begins in September.

In 1850 the university had no endowment, it having been the policy to rely on annual gifts and collections. But the removal controversy brought new issues and made a change of policy necessary. Yet up to the close of the war in 1864 only $52,000 had been secured. Since that date a debt of $15,000 has been paid, the college buildings have been reconstructed at a cost of $10,000, a college museum collected at a cost of $13,000, a president's house and 65 acres of land purchased at $15,000, the endowment increased to $530,000: so that the whole value of property is over $750,000, and no debt.

Besides a president's house, professors' houses, gymnasium, and university boarding-hall, there are five edifices of stone strictly used for college purposes. A fine stone laboratory has been erected for chemistry and physics, $25,000, and a fire-proof building is in process of erection for the library and museum, to cost from $70,000 to $100,000.

F. Dodge.

Mad'isonville, on R. R., cap. of Hopkins co., Ky. (see map of Kentucky, ref. 4–D, for location of county), in the great tobacco-growing district and in the centre of large coal-fields, has flouring and planing-mills, a cotton-gin, wagon and carriage manufactories, tobacco-stemmeries, and a pearl and potash factory. Pop. in 1870, 1022; in 1880, 1544.

Madisonville, cap. of Monroe co., Tenn. (see map of Tennessee, ref. 7–I, for location of county), 10 miles E. of Sweet Water R. R. Station. It is the seat of Hiawassee College (Lutheran). Pop. in 1870, 324; in 1880, not in census.

Madisonville, cap. of Madison co., Tex. (see map of Texas, ref. 4–J, for location of county), 35 miles E. of Nashville Station. Pop. in 1870, 98; in 1880, not in census.

Mäd'ler (Johann Heinrich), b. at Berlin, Prussia, May 29, 1794, early became a proficient in astronomy. While holding a position in the normal school of his native city he made astronomical observations together with M. Beer, an elder brother of the composer, Meyerbeer, and they published in 1829–36 the celebrated chart of the moon, in four leaves, and in 1837 the explanation of the chart (*Allgemeine vergleichende Selenographie*, 2 vols.). In 1836 he obtained an appointment at the observatory of Berlin, and in 1840 he was made director of the observatory of Dorpat, in Russia. While there he published a long series of *Untersuchungen über das Fixsternensystem*, setting forth his hypothesis of the existence of a great central celestial body. An eye-disease compelled him to resign in 1865. He returned to Germany, and d. at Hanover Mar. 14, 1874. Among his other works are *Popular Astronomy* (often reprinted), *Leitfaden zur mathematische und allgemeinen physischen Geographie* (Stuttgart, 1844), etc.

Ma'doc, one of the county-towns of Hastings co., Ontario, Canada, has one weekly paper and a large trade in potash. Iron, gold, and marble are obtained near by. The water-power is good. The town is 28 miles N. of Belleville. Pop. in 1881, 1065.

Madoc, a Welsh prince, son of Owen Gwynnedd, who according to some annalists sailed westward with a fleet A. D. 1170, discovered a vast and fertile continent, returned to Wales, sailed again with ten vessels, and was never after heard of. The story forms the subject of one of Southey's poems, and is believed to be purely legendary.

Madon'na [It., originally equivalent to *madame*], a title of the Virgin Mary, and given especially to artistic representations of her. In mediæval times the Madonna was the symbol of glorified womanhood and maternity, and feelings of chivalric devotion, blended with religious reverence, made her a prominent subject of Christian art. (See Mrs. Jameson, *Legends of the Madonna*, 1852.)

Mado'qua (*Neotragus saltiana*), an Abyssinian antelope, about two feet long and barely fourteen inches high. It is very slender, and is perhaps the smallest horned animal in existence.

Madoz' (Pascual), b. at Pamplona, Spain, May 17, 1806; studied at the University of Saragossa; volunteered for the defence of the castle of Mouzon against the French in 1823; was taken prisoner and held for seventeen months, when he resumed the study of law at the university, but was expelled soon after for liberal opinions; resided several years in Tours, France; went to Barcelona and edited a *Universal Geographical Dictionary* in 10 vols. (1829–34), a *Collection of Celebrated Trials* (20 vols.), and a liberal newspaper, *El Catalano;* became a lawyer and a judge; fought against the Carlists as colonel of a battalion of volunteers; was elected to the Cortes, and published a *Geographical, Statistical, and Historical Dictionary of Spain* (Madrid, 16 vols., 1848–50). He became governor of Barcelona 1854; was leader of the *Progresista* party in the Cortes, minister of finance 1855, exiled by O'Donnell 1856, took part in the revolution of 1868, became governor of the province of Madrid, and deputy to the Constituent Cortes, and d. in 1870, on the journey to offer the crown of Spain to Amadeo.

Madras', one of the three presidencies of British India, extends from Cape Comorin, lat. 8° 4′ N., to Nagpoor, lat. 21° 10′ N., and is bounded N. by the presidency of Bombay and the Nizam and Berar dominions, N. W. by Bengal, E. and S. E. by the Bay of Bengal, S. by the Indian Ocean, and W. by the Arabian Sea. Area, 138,856 square miles. Pop. 31,672,613. The surface forms a plateau sloping down from the centre on both sides, enclosed E. and W. by the Ghaut, and S. by the Neilgherry Mountains, and traversed by three large rivers, the Godavery, Kistnah, and Cavery, besides several minor ones. The rivers, which flow westward to the Arabian Sea, expand at their mouths, become shallow, and form lakes. The soil is sandy along the coast, and much mixed with salt in the interior; there are, nevertheless, many very fertile districts; as, for instance, Tanjore, which is rich in grain. The great forests, which since 1859 have been under regular cultivation, yield teak and many other valuable kinds of wood. Sugar, cocoanuts, tobacco, indigo, and cotton are produced. Considerable quantities of iron, copper, lead, manganese, silver, and coal are found.

August Niemann.

Madras, capital of the presidency of the same name, has 397,552 inhabitants, and is situated on the Coromandel coast, extending for a distance of about 7 miles along the shore of the Bay of Bengal. Its location is very unfavorable—extremely hot, much exposed to cold winds, with no harbor, and with no navigable river to bring the products of the interior to the sea. Nevertheless, as it is the seat of the highest government authorities, it has attained great importance. In the centre of the straggling town, immediately on the sea, stands Fort St. George, a strongly fortified citadel. To the N. of this fort, separated from it by a large esplanade, the so-called Black Town is situated, the most populous part of Madras and the seat of the European wealth. The Black Town, which is surrounded with bastioned fortifications, is 1 mile long, 1½ miles broad, and bounded W. by the Cochrane Canal; to the E., along the shore, it is lined with handsome public buildings, having colonnades to the upper stories. On the other side of the fort, to the S., and separated from it by the Kuam River, the Mohammedan part of the city is situated, the so-called Triplikam, with the Chepák Gardens and the palace of the former núwábs of the Carnatic. W. of the palace stands the government-house. The suburbs, inhabited by the Hindoos, consisting of narrow streets with miserable houses, extend along the W. side of these principal parts of the city; farthest to the N., Rayapuram, Attapuram, and Tandiavudu; to the W., Veperg and Parsawakam, Chintadripet, and Egmore; to the S. W., Pudupak and Namgambákam; and to the S., Kishnahpéta, Royapéta, Pascheri, St. Thome, Quibble Island, and Alvárpéta. The Adyar River to the S., and the Long Tank and Namgambákam Tank to the W., form the boundaries of the southern half of the city. Thus, the suburbs form a half circle of great breadth around the kernel of Madras, consisting of the Black Town, the Triplikam, and the citadel situated between them. Fort St. George, with its system of bastions, is built in the form of a half circle, the coast forming the diameter. Twice the French troops entered it victoriously (Sept. 10, 1746, and Dec. 14, 1758); also in the wars with Hyder Ali and other Indian princes it several times played an important part. Besides several barracks and other military institutions, it contains the council-house, in front of which, and exactly in the centre of the fort, stands the marble statue of Lord Cornwallis, the arsenal, St. Mary's church, more than 100 years old, and other public and military buildings. To the N. W. of the fort the Kuam forms an island, in the centre of which stands the statue of Sir Thomas Munro. The beautiful lighthouse, 128 feet above the level of the sea, is situated between the citadel and the Black Town. Other noteworthy buildings are the church of St. Andrew's, near the Kuam, founded Apr. 6, 1818; the mint, in the northwestern corner of the Black Town; the observatory; the Military Orphan Asylum; the university, and the palace of the núwâb. The numerous residences of the European officials, civil and military, are generally palatial structures; the peculiar Indian lime employed in their construction has an architectural effect like that of marble. Parks and gardens generally surround the houses, and contribute much to the beauty of the aspect of the city, which else has no rich vegetation, as the soil is sandy. The hotels are insignificant, as the Madras Club, the largest private building of the city, generally offers accommodation to travelling Europeans; of late, however, the increasing railway traffic has made some change in this respect. In spite of its low position and the absence of good river-water, the city is well provided with water from a number of wells, noteworthy among which are the so-called Seven Wells, a series of large reservoirs built in the form of immense quadrangular towers, and filled from draw-wells. A peculiar feature of Madras is the difficulty of landing. Large vessels are often compelled to anchor several miles off the shore, and the peculiar boats of the natives, held together by strings instead of nails, are the only means of reaching land through the surf; the so-called catamarans, a sort of raft, consisting of three logs tied together, are important also for this purpose. The imports of Madras consist principally of cotton goods, corn, wine, spirits, metals, sugar, silk, horses, and jewelry; the exports of cotton, saltpetre, and pepper. AUGUST NIEMANN.

Mad'repore, a name applied in a wide sense to radiate animals of the class Polypi and order Madreporaria, which includes simple and compound coral polyps, usually broad, with simple tentacles, and forming solid coral in the dermal covering, and often in the radiating septa. They are mostly found in warm seas. The order is divided into four groups—Stauracea, Astræacea, Fungacea, and Madreporacea. The latter group (the true madrepores) is of four families, of which the Madreporidæ are the typical madrepores. They have a definite number of simple, well-developed tentacles (twelve or more), and are generally compound. As usually employed, the name "madrepore" belongs to this family, and especially to the genus *Madrepora*. The madrepores are popularly termed tree-corals, from the form of their coral.

Madrid', the capital of Spain and of the province of Madrid, a part of New Castile, is situated nearly in the centre of the country, in lat. 40° 25′ N., lon. 3° 42′ W., on the left bank of the Manzanares, a small stream which joins the Jamara and flows to the Tagus. The site offers no commercial or industrial advantages, nor has it any special military importance; and the surrounding plateau —2200 feet high, and once covered with forests, but now, with the exception of the immediate neighborhood of the city, naked and arid—suffers from a very harsh climate. In the streets of Madrid the thermometer sometimes falls in the winter to 18°, and rises in the summer to 105° in the shade. Changes are frequent, sudden, and violent, and the difference in temperature between the sunny and shady sides of the street often amounts to 20°. Thus, it seems to have been a mere whim which made this place the capital of the realm. It is first mentioned in history as a Moorish outpost, called *Majerit*, but was captured in 1083 by Alfonso VI. of Castile. Henry III. of Castile resided there often for the pleasure of hunting; Charles V. went there occasionally, and in 1560 Philip II. made the place his capital. From this time it grew rapidly into a magnificent city, and became the centre of the history of the Spanish people, politically and literary. Pop. 397,690.

The city is surrounded by a brick wall 20 feet high and pierced by fifteen gates, of which the most remarkable is Puerta de Alcalá, 72 feet high, built in the form of a triumphal arch with five openings in 1759; it stands at the foot of the street of Alcalá, which, three-fourths of a mile long, traverses the city from N. E. to S. W., and forms one of the most magnificent streets in Europe. The south-western (or old) part of the city contains many narrow, crooked, and ill-kept streets, but the central and eastern parts consist of straight, broad, well-kept streets, lined with handsome houses, magnificent palaces, and elegant public buildings. Among the public squares, of which Madrid numbers 72, the most interesting, at least at present, is Puerta del Sol, once forming the eastern entrance of the city, but now occupying nearly its centre. The government palace, the post-office, and other public buildings are situated here; also the best hotels, clubs, and reading-rooms; and thus the place has become a general rendezvous both for business and pleasure. Plaza Oriente, situated between the royal palace and the royal theatre, contains an equestrian statue in bronze of Philip IV., nineteen feet high, designed by Montañes; in the promenade skirting the place stand forty-four colossal statues of kings and queens. Plaza Mayor, 398 feet long by 306 feet wide, contains an equestrian statue in bronze of Philip III.; here the so-called *autos-da-fe* were formerly celebrated, and from the Real Casa de la Panaderia the king and the court used to witness the burning of heretics. The bull-fights take place in Plaza de Toros, just outside Puerta de Alcalá, but the old building, erected by Philip V., and accommodating 12,400 persons, was taken down in 1874, and a new one was commenced a little farther to the N. In Plaza de las Cortes stands a fine bronze statue of Cervantes. Among the numerous promenades and gardens, the Prado is the most remarkable; 2½ miles long, divided into parts—the Prado proper, the Salon, the Fuente Castellana, formerly the Delicias de Isabel—finely laid out, planted with beautiful trees, and in part adorned with magnificent fountains and statues. The view which these grounds present on a fine evening, when thronged with people, is very brilliant and characteristic.

Although Madrid is one of the handsomest modern cities, it contains, properly speaking, only one striking building —namely, the royal palace. It has no cathedral. It forms only a suffragan bishopric of Toledo. Many of its churches, of which it numbers between 60 and 70, are beautifully decorated with paintings of the old masters, but none of them has any architectural merit. The same is the case with the convents and monasteries, which formerly were so numerous in Madrid, but which now mostly are used for other purposes; 44 monasteries were suppressed in 1836. The royal palace was built between 1737 and 1750, of granite and white marble, forming a square 470 feet long, 100 feet high, enclosing a court 240 feet square, occupying an area of 220,900 square feet, and surrounded with magnificent gardens. It contains a library of 100,000 volumes, an interesting collection of arms, consisting of 2533 specimens, among which are the armor of Columbus, Gonsalvo de Cordova, and Don John, a numismatic collection of 150,000 pieces, and a great number of magnificent pictures, though most of these have been transferred to the royal museum in the Prado. This collection of pictures is said to be the largest and richest in Europe, and contains 65 pictures by Velasquez, 58 by Ribera, and 46 by Murillo, besides numerous and excellent works of the Italian and Dutch schools. The educational institutions of the city are good, from the elementary schools, among which the Protestant Sunday schools begin to play a conspicuous part, to the learned societies. There are, besides the national library, containing about 400,000 volumes, several minor libraries accessible to the public, an observatory, a botanical garden, a medical school, military and engineering schools, a theological seminary, normal schools, and schools of art, law, etc. Its hospitals and other charitable and benevolent institutions are also good.

The industry of the city is not considerable. Besides the manufacture of certain necessary articles, such as chocolate, beer, shoes, and hats, only those of plated ware, coaches, gloves, and fans have acquired prominence. But the commerce is important. The retail business is mostly in the hands of foreigners, especially Frenchmen. But wholesale transactions are mostly made by native houses, and are very large, the city forming the entrepôt for all the interior provinces. CLEMENS PETERSEN.

Mad'rigal [Fr. *madrigal*; It. *mandriale*], in music, the name of a certain species of composition, originally of a light, airy, joyous, and pastoral character. The old madrigals are often of complex and elaborate structure, usually for voices alone, and consist of four, five, or more parts, in which the skill of the composer exhibits itself in fugues, canons, imitations, and other highly labored styles of writing. Compositions of this kind abounded in the sixteenth and seventeenth centuries, and in their production the best masters appear to have found a congenial field for the exercise of their ability. It is supposed by some writers that the madrigal originated in Flanders, was subsequently taken up with success by the Italians, and finally became popular in England about the middle of the sixteenth century. Numerous collections of these compositions were published in that century and the following, and these give evidence not only of the popularity of the madrigal in England, but also of the high rank attained by the English masters in this style of composition. In

1741 the well-known Madrigal Society was founded in London—an institution which has had a wide influence in the cultivation of a taste for madrigal music, and incidentally for glees, canons, rounds, catches, and national airs. The derivation of the name "madrigal" is merely conjectural. By some it has been traced to *mandra*, a sheepfold, as the early madrigal was of a pastoral character; Dr. Burney derives it from *Alla madre*, "the first words of certain hymns addressed to the Virgin;" Sir John Hawkins connects it with the name of a town in Spain; but no satisfactory etymology has yet been reached. WM. STAUNTON.

Madstone. See APPENDIX.

Madu'ra, an island of the Malay Archipelago, N. E. of Java, comprising an area of 1300 square miles, and belonging to the Netherlands. The inhabitants, numbering 768,992, are Mohammedans, and live in three kingdoms governed by native princes under Dutch superintendence. They are brave and honest, but, although they cultivate sugar, indigo, rice, and tobacco to some extent, they have no disposition for agriculture, and the island is a possession of inferior importance. Its chief product is salt, the manufacture of which is a government monopoly. Petroleum is found in small quantities in all the departments. The principal industry is cattle-rearing. The breed of oxen is small, but very highly esteemed in Java, and consequently exported in considerable numbers. The island contains some hot springs and a mud-volcano called Banju Ening. Among the most important towns of Madura are Kamul, Bangkalang, the flourishing chief town of Madura proper, Arisbaya, Ajermata, named from its salt springs, Pamakasan, containing the residence of the regent, Sampang, an important market-town, Sumenep, and the European town of Maringan.

Madura, a city of British India, in the presidency of Madras, capital of the district of Madura, which, comprising an area of 9502 square miles, with a population of 2,256,615, occupies the south-eastern part of Hindostan. The city is fortified, carries on a considerable trade in cotton and tobacco, and contains some of the most remarkable Hindoo buildings, among which are the magnificent Pandiyan palace, the great temple of Mahadeva, and a celebrated choultry or inn for pilgrims, 312 feet long and 125 feet broad, resting on six rows of columns of gray granite and 25 feet high. A Roman Catholic mission was started here in 1606 by the Portuguese Jesuit Roberto de Nobili, and labored with great success till the middle of the eighteenth century, when the wars between France and England stopped and nearly annihilated the work. It was resumed in 1837, and in 1834 a Protestant mission was established by the American Board of Foreign Missions, which in 1873 numbered 30 churches, 149 congregations of natives, 100 schools—of which 93 were free—besides two dispensaries. Pop. 51,987.

Mad'vig (JOHANN NICOLAI), b. Aug. 7, 1804, at Svanike, a small town of the island of Bornholm; was educated at Frederiksborg, and studied philology and history at the University of Copenhagen, where he became professor of the Latin language and literature in 1829. From 1848 to 1852 he was minister of public worship and education, and since 1854 has taken part very actively in Danish politics. One of his first writings, *Epistola critica ad Orellium* (Copenhagen, 1828), made quite a sensation on account of the acuteness of its critical remarks and its solid and comprehensive learning. He has since published critical editions of several of the works of Cicero, which have become standard, and a great number of corrections and illustrations to Lucretius, Juvenal, and Livius. Several points of Roman archæology and history are very ably treated in his *Opuscula Academica*, but his celebrity rests principally on his *Latin Grammar* (Copenhagen, 1841), which has not only been translated into most European languages, and generally introduced in schools, but has exercised a decided influence on the whole study of grammar. Less eminent are his essays on the philosophy of language; in spite of much acuteness in the details, the standpoint is antiquated. CLEMENS PETERSEN.

Mæan'der (now *Meinder*), a river of Asia Minor, rises in Anatolia, and flows into the Ægean Sea after a course of 200 miles. It is noted for its winding and tortuous course, on account of which it gave name to one of the most beautiful patterns of Greek ornamentation. There was in antiquity a story of a subterraneous connection between the Mæander and the Alpheus in Elis, although there is apparently nothing in the physical aspect of the river which could furnish a foundation for such a story. It has in all nine tributaries. It is narrow and deep, and carries with it a large quantity of mud, which, being deposited at the mouth, has extended the coast many stadia farther into the sea, and connected it with some adjacent islands. It is navigable only for small craft.

Mæce'nas (CAIUS CILNIUS), b. before the middle of the first century B. C. of a family of Etruscan origin, and belonging to the equestrian order; appears for the first time in history after the assassination of Cæsar as the friend and adviser of Octavian, who confided to him many difficult negotiations. Later, however, he seems to have lost his political influence, and to posterity he became known only as the great patron of literature and art. His magnificent house on the Esquiline Hill was the centre of literary society in Rome. He had amassed an enormous fortune, and he was lavish in his hospitality. Virgil and Horace were his friends, and both received most substantial services from him. Even in antiquity his fame as a supporter of genius and talent was very great, and from the Middle Ages up to the beginning of this century his name became proverbial. Nevertheless, it must be remembered that he showed the same enthusiasm and the same patronage to cookery, warm swimming-baths, mimic dances, and the lowest sensuous enjoyments; and there is nothing whatever which indicates that he considered poetry and art as anything more than a pleasure. Even the relation between him and Horace, which excited so much admiration in former days, impresses our time much less favorably, and the picture which modern criticism has drawn of Mæcenas, his usuries, his dissipations, gloom, and sleepless nights, is very little attractive. He d. 8 B. C., and being childless he left his fortune to Augustus.
CLEMENS PETERSEN.

Maelstrom, or **Malström,** according to legend, a tremendous whirlpool on the western coast of Norway, immediately S. of Moskõe, the southermost island of the Lofoden group, in lat. 67° 48′ N. The name, literally translated, means "grinding stream," and legend tells us that whales, men-of-war, etc., when caught by the vortex, are ground to pieces as fine as dust. There is, however, no whirlpool at all, as we are informed by Prof. Edward Erslew, president of the Royal Geographical Society of Copenhagen, but the currents, which run here for six hours from N. to S., and then for six hours from S. to N., are very strong; and when, as often happens, the wind blows from just the opposite direction to that of the current, the agitation of the sea may become very heavy, and even dangerous to small vessels. The origin of the legend is unknown, but it has grown with greatest luxuriance in English soil; in Norway it is laughed at.

Mæsa (JULIA), sister of Julia Domna (the wife of Septimius Severus), and grandmother of the Roman emperors Elagabalus and Alexander Severus, b. at Emesa, a city of Syria, about 150 A. D. She was a daughter of Bassianus, a Roman citizen of humble position, but married Julius Avitus, a Roman of consular rank. On the accession of her brother-in-law to the throne, Julia Mæsa seems to have lived in splendor at Rome and to have accumulated a large fortune, but on the death of Severus retired to her native city, Emesa (her husband being apparently dead), and caused her two grandsons to become priests to the Phœnician sun-god *Elagabal* in that city. On the death of Caracalla, Mæsa soon perceived the unpopularity of his successor, Macrinus, and by representing to the Roman garrison at Emesa that her elder grandson, Elagabalus, was in reality a son of Caracalla, induced them to proclaim him emperor. On the death of this infamous youth, four years later, Mæsa had the tact to secure the proclamation of her other grandson, Alexander Severus. She exercised the chief power under his reign, and d. about 225 A. D.

Maesto'so [It.], majestic, a directive term implying dignity, power, and majesty of movement in the performance of a piece of music.

Maes'tri (PIETRO), b. in Milan in 1816; was educated at Pavia; took a most active part in the affairs of Milan in 1848, both as a soldier and a surgeon, and finally as one of the heads of the provisional government. After a long exile in France he returned to Italy in 1859, and served as a Garibaldian volunteer. In 1861 he founded and assumed the direction of the *Statistica Generale*, etc., and in 1863 published at Milan a volume entitled *La Francia Contemporanea*. On the occasion of the Paris Exposition in 1867 he published *L'Italia Economica*, and after this became editor of a journal with the same title. D. at Florence in 1871. Though buried in Florence, Milan has honored him with a cenotaph.

Maes'tricht [Dutch, *Maastricht; anc. Trajectum ad Mosam*], city of the Netherlands, capital of the province of Limburg, on the Meuse, was founded in the fifth century. It is regularly and well built, and contains several fine buildings, among which is the church of St. Gervais with five towers. It is fortified, and is considered one of the strongest fortresses in Europe and the principal defence of Holland, as parts of the surrounding ground can easily be put under water. In the wars between the United

Provinces and Spain and France it often formed the centre of the contest, and suffered much. It has an extensive transit-trade and manufactures. Pop. 28,557.

Maestricht Beds, certain strata which at St. Pietersberg near Maestricht, in parts of France, and at Faxöe, Denmark, cap the Upper White Chalk, and thus terminate the Cretaceous series of rocks, and record the conclusion of the Mesozoic age. In the immense subterranean quarries abounding with fossils near Maestricht were found the celebrated remains of the huge reptile *Mosasaurus.*

Maffe'i (Andrea), b. at Riva di Trento in 1802; studied literature under Paolo Costa, and then went to Munich for the study of German. At the age of sixteen, encouraged by Monti, he began to publish his finished metrical translation of the *Idyls of Gessner* (Milan, 1818). This was followed by a translation of Schiller's *Bride of Messina,* and later by that of all the dramatic works of this great German, on whose manner Maffei formed his own poetic style. After this he made admirable translations of the poems of Moore, of Milton's *Paradise Lost,* of Byron's *Childe Harold,* of the *Faust* of Goethe, of his *Hermann and Dorothea,* and also of the *Odes* of Anacreon, and has also published three volumes of original poems.

Maffei (Francisco Scipione), Marquis, b. at Verona, Italy, June 1, 1675; educated at Parma; went in 1698 to Rome, devoting himself to literature and poetry; made several campaigns during the war of the Spanish Succession in the Bavarian service; founded in 1710 the *Giornale dei Letterati,* the first literary journal in Italy; exercised considerable influence on the development of the Italian stage by his *Tratato dei Teatri antichi e moderni,* and still more by his tragedy *Merope* and comedy *La Ceremonia,* which were received with great applause; published in 1731 his *Verona Illustrata;* travelled in France, England, Holland, and Germany, and d. at his native city Feb. 11, 1755. His collected works were published at Venice in 1790 in 21 vols.

Maffei (Giovanni Pietro), b. at Bergamo, Italy, about 1536; became professor of rhetoric at Genoa 1563; secretary of the republic 1564; entered the order of Jesuits 1565; taught rhetoric several years at Rome; visited Spain and Portugal in quest of materials for his Latin *History of the Indies* (1588), a work of great value upon which he bestowed twelve years' labor. He had previously published a *Commentary on the Achievements of the Society of Jesus in the East up to 1568* (1571), and a *Life of Ignatius Loyola* (1585). He edited a collection of missionary *Letters from the East* (1588), wrote the *Annals of Gregory XIII.,* and had commenced those of Clement VIII. at the time of his death, at Tivoli Oct. 20, 1603. His complete works in Latin were published at Bergamo (1747) with a *Life.*

Maf'fitt (John Newland), D. D., b. at Dublin, Ireland, Dec. 28, 1794; became a Wesleyan preacher in Ireland; was noted for his powers of oratory; came to the U. S. in 1819; was pastor of several churches in New England; published *Tears of Contrition* (1821), *Pulpit Sketches* (1828), and in 1831 began a remarkable career as "revivalist" in the Southern States; established the *Western Methodist* at Nashville, Tenn., in 1833; became professor of elocution and belles-lettres at Lagrange College, Ala., in 1837; published a volume of *Poems* (1839); was elected chaplain of the U. S. Congress in 1841; settled at Auburn, N. Y., where he edited (1845–46) the *Calvary Token,* a monthly paper; resided in Arkansas 1847–48, and d. at Mobile, Ala., May 28, 1850.

Ma'fra, small town of Portugal, a few miles N. W. of Lisbon, famous for the immense building which John V. erected here in 1717–31, and which comprises a royal palace with 866 rooms, a cathedral 186 feet long, 135 feet broad, and surmounted with a magnificent dome, and a monastery with 300 vaulted cells, the whole of white marble from Carrara, and surrounded with magnificent gardens.

Magadox'o, or **Makadi'shu,** an Arabic town of East Africa, on the Indian Ocean, in lat. 2° 2′ N. It was founded in the tenth century, and was formerly an important place, but is now decaying, though carrying on some trade in ivory, gums, and dates. It belongs to Muscat. P. 5000.

Magalha'ens, de (Domingos José Gonçalves), b. in Rio de Janeiro, Brazil, in 1810; was admitted to the bar about 1832; went to Europe as attaché of the Brazilian legation in Paris 1836; became on his return in 1838 professor of philosophy and member of the chamber of deputies, and took rank as a leader of Brazilian literature. His works include *Poesias* (1832), *Mysterios,* an imitation of romantic models, *Antonio José* (1838), and *Olgiato* (1839), historical tragedies on national subjects; *A Confederação dos Tamoyos* (1857), a lyrical epic of the foundation of Rio de Janeiro, and *Urania* (1862), a collection of songs, chiefly amatory. He has been minister at Naples, Turin, Vienna (1859–67), and Washington (1868–72).

Magalla'nes, or **Magellan** (Fernando), b. at Oporto, Portugal, in the latter part of the fifteenth century; entered the navy at a very early age, and distinguished himself in the East Indies, but left in 1517 the Portuguese service and went to Spain, proposing to Cardinal Ximenes to discover a western route to the Molucca or Spice Islands. With a fleet of five vessels and 234 men he sailed from Seville Aug. 10, 1519, reached the mouth of the river La Plata Jan. 12, 1520, and on Oct. 21, 1520, entered the strait between the island of Terra del Fuego and the American continent, which he called the Strait of the Eleven Thousand Virgins, but which afterwards came to bear his own name. On Nov. 28 he had cleared the strait and launched into the immense ocean, which he called the Pacific on account of the smoothness of its waters and the steadiness of its winds. After many hardships and much suffering the fleet, now reduced to three vessels, reached the Ladrones on Mar. 6, 1521, and Tamar, the first discovered of the Philippine Islands, on the 18th of the same month. Magellan took possession of these islands in the name of the Spanish king, and was at first very successful in subduing or conciliating the natives, but on Apr. 27, 1521, he was killed in an encounter with the natives of the island of Martan. Only one of the ships and fifteen men returned to Europe, reaching Spain in Sept., 1522, and thus the first circumnavigation of the earth was achieved.

Magallanes, or **Magellan, Strait of,** separates the continent of South America from the island of Tierra del Fuego. It is 300 miles long, from 5 to 30 miles broad, but difficult to navigate. It was discovered in 1520 by the Portuguese navigator Magallanes.

Magazine Guns, breech-loading small arms arranged to be loaded mechanically from either a *fixed* or a *detachable* magazine. The "fixed" is usually a tube let into the stock, either in the butt or under the barrel, in which cartridges are carried, to be successively brought in position by spring or lever, and loaded into the barrel by movement of the breech-block. The *detachable* magazine is a simple sheet-iron box containing a few cartridges compressing a folded leaf-spring. When attached to the gun, it may feed its cartridges to be loaded mechanically, or may retain them ready for an emergency, the gun being loaded in the mean time by hand, as a single-loader. In the early varieties of magazine guns used by the U. S. army (the Spencer, Henry, and Ward-Burton) all the cartridges were usually fed to the barrel from the magazine, but, as experience showed that the especial advantage of the magazine system in active service is to hold ready for rapid fire at a critical moment a few shots without handling cartridges or losing aim, the effort now is to secure this, while having the benefit of the lighter and simpler hand-loader for ordinary use.

A board of officers appointed Feb., 1881, for the purpose of selecting the best magazine gun, has, after carefully examining and testing forty different varieties, recommended "as the most suitable for military service, *first,* the Lee gun (fig. 1), with *detachable* magazine; and *second* (in the order named) the Chaffee-Reese (fig. 2) and Hotchkiss (fig. 3), with *fixed* magazines; representing the different systems—having passed all tests in a satisfactory manner,

Fig. 1.

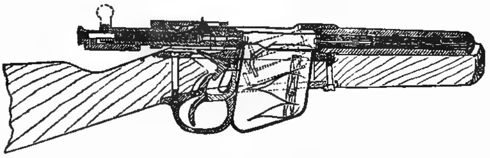


Fig. 2.

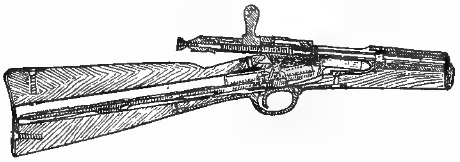
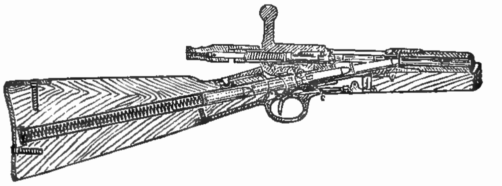


Fig. 3.



with remarkable efficiency as simple loaders, safety, ease of loading, rapidity of fire, endurance, moderate weight, and simplicity of construction." A number of each variety has been manufactured, and a competitive trial in service has been made (by the troops of each military department). One of the arms will be selected for adoption.

A feed-magazine is now applied also to the Gatling gun—discharging 100 rounds in 3½ seconds. P. V. Hagner.

Mag′dala [Arab. *Mejdel*], in Galilee, on the W. shore of the lake, at the S. E. corner of the plain of Gennesaret, about 3 miles N. of Tiberias. It contains some twenty miserable huts, and is the only inhabited spot in the plain. R. D. Hitchcock.

Magdala, a mountain-fortress of Abyssinia, situated on one of the three peaks of the spur which King Theodore defended against the English. The three peaks are called Fâla, Selassye, and Magdala. They rise about 9000 feet, and are separated from each other by saddle-like depressions. On Apr. 13, 1868, the English took the wretched fortress standing on the top of the steep peak, Theodore committed suicide, and Gen. Napier, commander-in-chief of the English expedition, was created baron of Magdala. August Niemann.

Magdale′na, a river of South America, rises in Ecuador, flows through Colombia, and enters the Caribbean Sea after a course of 900 miles. Its upper part is very rapid and full of cataracts, but below Honda, 540 miles from its mouth, it becomes navigable, and is the chief means of communication with Bogotá, the capital of that republic.

Mag′dalene, or **Mary Magdalene,** a woman who stood by Jesus at the cross; was present when Joseph of Arimathea laid him in the sepulchre: came early on the first day of the week to the tomb and found it open; went to Peter and John, and saw the two angels sitting in the sepulchre when she returned with the apostles. Jesus himself appeared to her shortly after, and announced his approaching ascension. The derivation of her surname is probably from "Magdala," the name of a town of Galilee. She is gratuitously identified with the "woman who was a sinner" (Luke vii. 37). She is the "Mary called Magdalene, out of whom went seven devils" (Luke viii. 2).

Mag′dalen Islands, a group of islands in the Gulf of St. Lawrence, belonging to Gaspé co., Quebec, comprising some 80,000 acres. They are the property of the descendants of Admiral Coffin of the British navy, and contain numerous harbors. Amherst, on Amherst Island, is a port of entry, and has a custom-house and jail. Fish, oil, and gypsum are exported. Pop. of the S. group, 1131; of Grindstone Island, 1053; of Allright Island, 838; of the N. group, 151: total, 3172.

Magdala Red. See Naphthalene Colors.

Magdeburg′, city of Prussia, capital of the province of Saxony, on the Elbe, founded in the tenth century by Otto the Great, and consists, besides its two suburbs, Neustadt and Sudenburg, of four parts—Altstadt and the Sternschantze on the left branch of the Elbe, the citadel on an island in the river, and Frederickstadt on the right bank. Each of these parts is strongly fortified, and together they form a fortress of the first rank, making Magdeburg one of the strongest places in Europe. Most of the streets are crooked and narrow, but the houses are generally neat and substantial, and there are several fine buildings, among which is a Gothic cathedral of the thirteenth century. There are many beautiful promenades, such as the Fürstenwald and the Friedrich-Wilhelm's Garten. The manufactures comprise woollens, cotton, ribbons, leather, soap, and glass; the breweries and distilleries are very extensive. On account of its position on the Elbe and at the junction of four principal railway lines, Magdeburg is one of the commercial centres of Northern Germany. It has many benevolent institutions, and several good military, scientific, industrial, and commercial schools. Its capture by Tilly in 1631 and the massacre which followed were the most frightful events in the Thirty Years' War, during which it had once before (in 1629) been besieged. Pop. 137,135.

Magdeburg Centuries. See Centuries of Magdeburg.

Magee′ (William), D. D., b. Mar. 18, 1766, in co. Fermanagh, Ireland; graduated at the University of Dublin 1785; was elected a fellow 1788; served as tutor while studying for the ministry; was ordained in the Church of England 1790; became some years later assistant professor of Oriental languages; senior fellow and professor of mathematics 1806; retired from the university 1812, taking the livings of Kappagh and Killyleagh; became dean of Cork 1814; won fame as a pulpit-orator; was promoted to the bishopric of Raphoe 1819; was appointed 1822 archbishop of Dublin, where he d. Aug. 18, 1831. Archbishop Magee was noted for his hostility to Romanism and Unitarianism. As a writer he was best known by his *Discourses on the Atonement and Sacrifice* (1811; 7th ed. 1841). His complete works were published in 1842.

Magee (William Connor), D. D., b. at Cork, Ireland, in 1821; studied at Trinity College, Dublin; became curate in a Dublin parish; went to Malaga, Spain, for his health, 1846, remaining there two years; obtained the curacy of St. Saviour's, Bath, 1848; became incumbent of the Octagon chapel, Bath, 1850; took a leading part in organizing the Church Defence Society in opposition to the Liberation Society; became minister of Quebec chapel, London, 1860, rector of Inniskillen 1861; dean of Cork 1864, and shortly afterwards dean of the chapel royal, Dublin; was Donellan lecturer at Dublin 1865–66, and appointed bishop of Peterborough 1868. He has acquired considerable reputation for eloquence, has preached on public occasions in various parts of Great Britain, and has taken an active part in the debates of the House of Lords, especially in opposition to the disestablishment of the Irish Church. Many of his sermons have been published.

Magellan. See Magallanes.

Magellanic Clouds. See Nebulæ.

Magendie′ (François), b. at Bordeaux, France, Oct. 15, 1783; received a medical education in Paris; was admitted to the Academy of Sciences 1821; became professor of anatomy in the Collége de France 1831; president of the consulting committee on public health 1848. D. at Paris Oct. 8, 1855. He practised vivisection extensively, and in far less humane methods than are now in use; but by this and other means of observation he made numerous and highly important discoveries in physiology, especially in that of the nervous system, and also in other departments of medical science. Among his works are *Formulaire* (1821) for new medicines, *Éléments de Physiologie* (1816–17), *Leçons sur les Phénomènes physiques de la Vie* (1836–42), *Leçons sur les Fonctions et les Maladies du Système nerveux* (1839), and *Leçons sur le Sang* (1839), which have been several times reprinted, and were translated into German.

Magen′ta, town of N. Italy, in the province of Milan, about 20 miles E. of the city of Milan, in a fertile district watered by the Naviglio Grande. Its topographic position has made it the theatre of many battles, the last and most memorable being that known as the battle of Magenta, fought on the 4th of June, 1859, in which the Austrians were defeated by the Italians and French, and thus forced to evacuate Lombardy. It gives the title of duke of Magenta to Marshal MacMahon, president of the French republic. Pop. 6135.

Ma′ger (Karl), b. June 1, 1810, at Gräfrath, near Solingen, in Rhenish Prussia; studied philology and philosophy at Bonn; resided for several years in Paris; held different positions at educational institutions in Geneva, Aran, and Eisenach, but retired in 1854 from practical activity on account of ill-health, and d. at Wiesbaden June 10, 1858. His *Die Deutsch Bürgerschule* (1840), *Pädagogische Revue*, *Die Modernen Humanitäts-studien* (1846), and a number of schoolbooks, exercised a considerable influence on the ideas of education in Germany.

Mag′eröe, an island of the Arctic Ocean, belonging to Norway, and terminating in the North Cape, a promontory 970 feet high, and lying in lat. 71° 10′ N. A few Norwegian and Lappish families live on the island.

Ma′gi, the priestly class among the ancient Medians. They are considered by some Orientalists to have originally formed a tribe or clan of the Median people, by others to have been the representatives of a more ancient Scythian or Turanian race which dwelt in the country conquered by and named from the Medes. The amalgamation between the Magian religion and the Zoroastrian, derived by the Persians from their Bactrian ancestors, seems not to have begun until the two nations were subjected to a common rule under Cyrus the Great, who was descended from both races. The Magi attempted to reassert their power during the reign of Cambyses by placing Gomates, one of their race or class, upon the throne; but upon his overthrow by Darius Hystaspes the Magi and their religion were proscribed and the faith of Zoroaster officially established. It was probably on account of this great revolution that in later generations the half-mythical Zoroaster was supposed to have lived during the reign of Darius Hystaspes, and to have personally established the predominance of his religion. This view prevailed until the revival of Oriental studies in the present century. The Magian religion was consequently confounded with the Zoroastrian, as it still continues to be by historical manuals in frequent use, the Magi being supposed to have been merely the priests of the Zoroastrian fire-worship. The knowledge of many occult arts (whence the term "magic") attributed to them caused *Magi* to be synonymous with "wise men," and they were gradually regarded as the inheritors of the astronomical and other lore of the Chaldæans. In this sense, probably, the word was current in the first century A. D. when applied to the visitors of the infant Christ. In the Middle Ages the Magians or "wise men" of the Nativity had become three kings, whose names were given as Melchior, Gaspar, and Balthasar, their residence was assigned to various localities in Persia, and their relics successively deposited in the church of St. Sophia at Constantinople, in the cathedral at Milan, and finally (A. D. 1162) in the grand minster of Cologne, where they still remain.

Mag′ic [Lat. *magus*; Gr. *μάγος*; Pehlvi, *mag* or *mog*, a "priest," probably from an Aryan original, indicated by the Sanskrit *mahat*, "great," from which the Latin *magus*]. Though popularly derived from the arts of the Magi, or Old Persian priesthood, the belief in magic, or the art of working wonders by supernatural power, is inherent in man, and history presents no instance of any race at any time in which pretenders to it have not existed. It is evident that before exact science was founded, yet while students were unwearied in searching into the mysteries of mind and of matter, and of the self-development of a First Cause, and while they were led astray at every step by the wonderful in nature, it was impossible not to believe that there existed some primal clue by which all knowledge, both of the sensible and the spiritual world, could be gained and all power attained. All that they knew indicated the existence of such a science of sciences and power of powers. As all that was positive and intelligible could be represented by numbers or expressed geometrically, it was natural enough to assume that the mysterious and spiritual was subject to the same laws. Hence, a belief in the occult power of numerals and proportions, derived from the East and taught by Pythagoras, Plato, and their followers. The heavenly bodies had certain influences, as of the moon on the tides, the sun in giving light, heat, and health. This was exaggerated as a matter of course, until it was believed that all the planets in their conjunctions had peculiar effects on individuals. The study of astronomy was closely allied to that of mathematics, and in this spirit they mutually became more and more magical. Such methods applied to natural philosophy naturally made chemical investigation reduce matter to a few elements and to a *prima materia*, which, once apprehended, could enable man to develop or make any later forms, such as gold or diamonds, an elixir of immortality, and a universal panacea, just as the first principle in astronomy, also divine, was believed to give the illimitable godlike knowledge of all that the stars governed. The next step was to bring chemical principles into harmony with astrology and the lore of God and spirits. So H. Cornelius Agrippa, whose work on occult philosophy (which he afterwards declared was nonsense) was the cornerstone of magic in the sixteenth century, declares, "There are four elements, without the perfect knowledge whereof we can effect nothing in magick. Now, each of them is threefold, that so the number of 4 may make up the number of 12; and by passing by the number of 7 into the number of 10, there may be a progress to the Supreme Unity, upon which all virtue and wonderful operations depends." As spirits were innumerable, they were classified, especially by Paracelsus, according to this chemico-astrologic theosophic philosophy. At the base of all was the fifth element, "the divine astral spirit," the *intelligentia abscondita* of Vaughan, the transcendental principle or power, "that spirit which God himself breathed into man, and by which man is united again to God." The powers of this spirit, according to Agrippa, "are full of wonders and mysteries, and are operative as in Magick Naturall, so Divine. For from these proceed the bindings, loosings, and transmutations of *all* things, the knowing and foretelling of things to come, the driving forth of evill and the gaining of good spirits." Objectively, this subtle spirit streamed through all nature, as the spirit or very being of stars, mountains, rivers, trees, fountains, flowers, leaves, gems, metals, herbs, establishing between them wonderful affinities or a grand *signatura rerum*, bestowing on them occult properties, either medical or magical, and impressing on them by divine art in their curves, lines, colors, or spots a secret alphabet and written language. The stars in the heavens considered as points, when connected, made Hebrew letters, "these having," says Agrippa, "the greatest similitude with celestials and the world." This poetic and picturesque principle of magic, which made forests, fountains, and gardens, with the stars above, a literal library, was curiously set forth by Jacques Gaffarel in the *Curiositez inouyes* (Rouen, 1632). *Subjectively*, this astral light becomes in man the *intellectus illustratus*, or magic perceptive power, which, united to a transcendent will proceeding from illumination or penance, enabled him to grasp all the mysteries and power hidden in the divine life of nature. As certain gems, metals, etc. were virtually the same with certain planets or certain divine numbers or times (time itself being a form of divinity), all of them consisting of matter (*i. e.* a lower form of God), impressed by the same astral element, it followed that these gems especially, when marked at fit times with signs of the proper planets, spirits, names of God, etc., became amulets or charms which protected the bearer from disease, evil spirits, or death. Hence the endless charms, talismans, and written spells founded on the theo-magic philosophy. From learning to know, and from conferring with the spirits of nature by means of prayer, will, and communion with God, there was but a step to commune with the dead and call up their spirits by the art of necromancy, which was professed from the earliest times in the East. Good or harmless spirits were drawn by pleasant charms and ceremonies; the dark and evil powers were won by horrors, by midnight incantations among graves, with such disgusting spells as we read of in *Macbeth*.

When the *Tarot*, or infinite Spirit of God, or God in nature, was supposed to be in all things, with a reciprocal appreciative spirit in man, it was soon believed that inspired books concealed deep mysteries. This was the secret of the Cabbala, or "the mystical explanation of the Bible, the art of finding sense by the decomposition of words, and that of working miracles by virtue of these words pronounced in a particular way." This kind of magic probably existed in Egypt and India, and it was known to Pythagoras. The rabbis by means of it deduced universal categories of the spirit-world, which they classified according to the elements, the art of governing them by spells, that of making talismans, and all manner of magic, great and small. The names of God properly pronounced were the highest spells; among these *Agla* was greatly revered. The Cabbala was much studied in the fifteenth and sixteenth centuries in Europe; among its greatest expounders were Akiba, Philo, Avicenna, Raymond Lullius, Mirandola, Paracelsus, Reuchlin, H. More, Robert Fludd, Postel, and Knorr von Rosenroth. The Rosicrucians, an imaginary sect of magicians, in whose name many books were written, were an offshoot of the Cabbala, allied to the peculiar views of the alchemists and Christian mystics.

As magic embraced a mutual harmony of all that exists, it included good and evil. Hence, white or holy magic, and also black magic or sorcery, which works by the aid of demons. This latter was closely connected with witchcraft. Celestial magic was founded on prayer and communion with God, or mysticism. Natural magic is the art of working wonders simply by science—*e. g.* by mechanics or chemistry. Ceremonial magic is chiefly cabbalistical, and treats of raising spirits, exorcising, finding treasures, and consecrating talismans by reciting sacred formulas when in circles drawn at certain hours with the aid of peculiar perfumes. Works on this subject are innumerable; as a specimen the reader may consult the *Heptameron, or Magical Elements* of Peter di Abano, or the *Magus* of Francis Barrett (London, 1824). Sorcery involved many horrible iniquities; according to Philo and Eliphas Levi, some of the old Hebrew works of magic are enough to cause their writers to be execrated by all the world. Magic was a passion—we might say the principal study—in Egypt and Assyria; several papyri and cylinders in the British Museum treat of it. In Alexandria, from the second to the fourth century, where the relics of old Egypt combined with Neoplatonic doctrines and many strange sects, magic revived, as it did subsequently at Cairo in the ninth century under the Arabs. The Knights Templar are believed to have brought Oriental magic to the West. The Renaissance, as well as the Reformation, had its school of devotees to occult philosophy; and since the doctrine is essentially religious, the movement of Luther, which made religious discussion common to all, also popularized the study of magic, and books hitherto kept in Latin for the learned were now translated, so that everybody could raise the devil in his native tongue. The last grand revival of such studies took place with that of Masonry, Illumination, and the extraordinary fancies of the eighteenth century. The lives of Cagliostro and Casanova, the works of Pierre le Brun, of Lascaris, the Count de St. Germain, and the Marquis d'Argens throw much light on the follies of this period. As astrology and the Cabbala lost ground in popular faith, and witches and devils grew dim, magic took refuge in mesmerism, and more recently in its nearly related Spiritualism. As of old, its professors did not disdain to aid their sacred lore with marvels which modern science claims were mere juggling, as many of the miracles of our modern magicians from their very humble and useless nature appear to be principally based on "hankey-pankey." Among the immense number of works on magic are—*Histoire et Traité des Sciences occultes*, by Count de Résie (Paris, 1857); *Histoire du Merveilleux dans les Temps modernes*, by Louis Figuier (Paris, 1860); *Réalité de la Magie*, by Collin de Plancy; *Von der alten und neuen Magie, Ursprung, Idee, Umfang und Geschichte*, by Horst (Mentz, 1820); *Curiosités des Sciences occultes*, by the Bibliophile Jacob (Paul Lacroix); *Dialogus in Magica Arte*, by Symphorien Champier (Lyons, 1506); *Entretiens du Comte de Gabalis, etc.*, by M. de Villars (Abbé de Montfaucon); *System of Magic*, by Defoe; the works of Delrio; *La Magie*, by L. F. Alfred Maury; *La Magie au XIX. Siècle*, by the Chevalier Gougenot; the *Clavis Solomonis*, by Rabbi Hawa (1714); *Trois Livres de Charmes*, by M. du Vair; *Bibliotheca Magica*, by Johann Geo. Th. Grässe (Leipsic, 1843); *Arcanes de la Vie future, Magie magnétique*, and other works, by M. Cahognet (Paris, 1848–56); *Sammlung der merkwürdigsten Visionen, etc.*, by Carl von Eckhartshausen (Munich, 1792); *Le Diable Rouge* (Paris, 1843); *Das Siebente Buch Mosis* (the common handbook of magic in Germany); *History of the Supernatural*, by William Howitt; J. Bodinus, *Demonomania* (Paris, 1501); Johannis Macarei *Abraxas;* a treatise on talismans, by Jean Chifflet (Antwerp, 1657); Johann Wierus, *De Præstigiis* (Frankfort-on-the-Main, 1566). C. G. LELAND.

Mag′ic Lan′tern, an optical instrument, invented by Anastasius Kircher (1602–80), which throws upon a screen magnified images of figures painted in transparent colors upon glass. This instrument, which, for a century or two after its invention, was nothing more than a philosophic toy, fulfilling no higher purpose than to amuse, has recently been made so important an auxiliary to public instruction in the lecture-room as to deserve, in its improved form, a particular description, for which see APPENDIX.

Magic Squares, arrangements of the terms of an arithmetical series in parallel and equal rows and columns, so that the sum of every continuous row, whether vertical, horizontal, or diagonal, may be the same. For convenience, the terms are commonly arranged in regularly celled geometrical squares. In some of these arrangements, the rows parallel to the diagonals give also the same sum as the diagonals themselves, if, after running out at top or bottom, they are resumed from the point immediately opposite, and continued to completion. Such rows may be called broken diagonals; and the squares which have this property possess the magical character in the highest degree, and may be distinguished as *perfect* magic squares, others being called *ordinary*. It is obvious that in any magic square the transfer of columns from side to side or of rows from top to bottom, and *vice versâ*, cannot affect the vertical or horizontal sums. By such transfers any broken diagonal may be made a true diagonal. In perfect squares these changes do not affect the magical character, but in ordinary squares they do so.

The subject of magic squares possesses a curious interest to the student of the properties of numbers, which has made it singularly fascinating to many minds. It has occupied the attention of numerous investigators, some of them men of high eminence. But the methods of construction invented by these writers, though manifesting in many instances great ingenuity, are none of them founded upon principles largely general, being apparently in most cases the results of tentative or empirical processes of inquiry. Special methods of construction may be multiplied almost to infinity; the aim of the present investigation is to discover the principles which such methods involve, and out of which their diversities naturally grow. The mode of treating the subject is original, and this circumstance may perhaps justify the devotion to it in this work of so large a space as is occupied by this article.

Magic squares seem to have been early known in the East, but their inventor and the date of their invention are alike unknown. The earliest writing on the subject in existence is a manuscript said now to belong to the National Library of France, the work of Emanuel Moschopulus, a Greek of the sixteenth century, which was translated into Latin by the celebrated De la Hire and read by him before the Academy of Sciences of France in 1691. The foregoing are examples of the squares of Moschopulus, in the first of which the common sum is 65, and in the second, 34.

FIG. 1.

11	24	7	20	3
4	12	25	8	16
17	5	13	21	9
10	18	1	14	22
23	6	19	2	15

FIG. 2.

1	15	14	4
12	6	7	9
8	10	11	5
13	3	2	16

In these squares the series employed is the natural series, and the order the natural order. It should be observed, however, that any series of numbers in arithmetical progression will serve for this purpose as well as the natural series, and also that, under certain limitations and conditions to be mentioned later, the terms of such series may be permuted in their order without vitiating the result. But the discovery of the laws which must govern the processes of construction is much facilitated by employing in the first instance the natural series without permutation; and in what follows such a series, so arranged, is always to be understood, unless the contrary is expressly stated. It will contribute to clearness to present, before proceeding further, a few preliminary explanations and definitions.

The series of natural numbers from 1 to n^2 (n representing any integral number whatever) is made up of n subordinate series, each composed of n terms, each term of each succeeding series being greater than the corresponding term of the series preceding by n units. In other words, the series 1 to n^2 consists of the series 1 to n repeated n times, every term at each repetition having an added *constant*, these successive constants increasing by the common difference n, from zero to n multiplied by $n-1$. This proposition is illustrated generally and specially in the following diagrams:

FIG. 3.

Square of n.

$$\begin{array}{l}
1+0,\ 2+0,\ 3+0\ \ldots n+0=n.\\
1+n,\ 2+n,\ 3+n\ \ldots n+n=2n.\\
1+2n, 2+2n, 3+2n\ \ldots n+2n=3n.\\
1+3n, 2+3n, 3+3n\ \ldots n+3n=4n.\\
\ldots\ldots\ldots\ldots\\
\ldots\ldots\ldots\ldots\\
1+(n-1)n, 2+(n-1)n, 3+(n-1)n\ldots n+(n-1)n=n^2.
\end{array}$$

FIG. 4.

Square of 5.

$$\begin{array}{l}
1+0, 2+0, 3+0, 4+0, 5+0,\\
1+5, 2+5, 3+5, 4+5, 5+5,\\
1+10, 2+10, 3+10, 4+10, 5+10,\\
1+15, 2+15, 3+15, 4+15, 5+15,\\
1+20, 2+20, 3+20, 4+20, 5+20.
\end{array}$$

For facility of reference the several subordinate series may be called *grades;* the constants, 0, n, $2n$, etc., *grade-bases;* the simple series 1 to n, the *elementary series;* and the series of constants, the *basic series*. It will be seen that when, as above, the grades are arranged horizontally, the elementary series increases horizontally, the basic series increasing at the same time vertically; in other words, that the directions of increase of the two are necessarily normal to each other. In what follows, it is assumed that the ordinary rules relating to arithmetical progressions are known.

Putting then Σ for the symbol of summation, E for the elementary series, B for the basic series, and S for the sum of any single row or column of the magic square, we shall have

$$\Sigma[1, 2, 3 \ldots n^2]=n.\Sigma[1, 2, 3 \ldots n]+n.\Sigma[0, n, 2n \ldots (n-1)n]= n.\mathrm{E}+n.\mathrm{B}. \qquad (1)$$

Hence $$\mathrm{S}=\frac{1}{n}\Sigma[1, 2, 3\ldots n^2]=\mathrm{E}+\mathrm{B}=\tfrac{1}{2}(n^2+n)+\tfrac{1}{2}(n^3-n^2)= \tfrac{1}{2}(n^3+n). \qquad (2)$$

And consequently any square will be magic which has every term of E and every term of B in every vertical, horizontal, and diagonal line. Furthermore, no square will be magic in which any term of E or any term of B is repeated in any line, unless there be repetition in the same line of some other term or terms of the same series, in such manner as to produce a compensatory effect.

Now, if in any square of n^2 vacant cells we enter successively in their order the terms 1 to n of the first grade, in such manner that no term entered shall be in the same line, vertical, horizontal, or diagonal, with any term previously entered, it is manifest that the first grade-base (0) will be found once in every such line, and will not be repeated in any. That this is always practicable with any *one* of these systems of lines (vertical, horizontal, or diagonal—the broken diagonals being taken along with the entire to form a system) is self-evident, since each such system contains as many lines as the number of terms in the grade and no more. It is equally evident that it is also simultaneously practicable with the system rectangularly co-ordinate to this; that is to say, it is practicable at once, whatever n may be, with the vertical and horizontal, or with the two diagonal systems, but not necessarily so in every case with both these co-ordinate systems at the same time. Trial will show, however, and it will be presently demonstrated, that the arrangement proposed can always be made with reference to all the systems, whenever n is a prime number greater than 3; and also when n is composite, provided it does not embrace either 2 or 3 among its component prime factors. The terms of the first grade having been entered, those of the second, third, etc. may be entered in like manner, beginning in each instance with any unoccupied cell, and preserving between the successive terms the same geometrical relations as in the first grade; and when all have been entered, every term of the basic series will be found in every line of every system, vertical, horizontal, or diagonal. Moreover, if, instead of beginning with each succeeding grade in a cell selected at random, we place the first or leading term of such grade in a cell which is not in line in any manner with the leading term of any grade previously entered, it is obvious that every term of the elementary series, as well as every term of the basic, will be found in every vertical, horizontal, and diagonal line. This too will be practicable whenever n is prime, or when it is composite without containing either of the prime factors 2 or 3. When either of these two factors is present, however, some terms of one or both series will be repeated in one or more systems of lines, and the square will only be magic in case such repetitions are compensatory. We find here a characteristic difference which suggests the first and most general classification of magic squares according to their structure as follows:

Class I. Squares in which every term of the elementary series and every term of the basic series occurs in every line of terms however taken.

Class II. Squares in which terms of the elementary series, or of the basic series, or of both, are repeated in some lines, in such manner that the repetitions are compensatory.

Squares of the first class are necessarily perfect; those of the second can only be so when compensation takes place in all the lines in which repetition occurs. Perfect squares can be constructed upon all numbers except those in which 2 is a factor, and a factor once only. If 2 is repeated as a factor in n, or if $n = 4m$, the square of n can be made perfectly magical.

From the foregoing explanation of the principle which must govern the construction of squares of the first class, it will be obvious that the arrangement of the terms of such squares admits of large variation. As an example, one of the possible varieties of form of a perfect square on the number 11 is given in Fig. 5. In order to make the governing terms conspicuous, those of the first grade, which in this relation we may call the *primitive* series, are printed in heavy *italic* type, and the leading terms of the following grades are enclosed within heavy lines.

Fig. 5.

1	17	49	62	101	113	32	97	37	88	74
106	112	25	98	42	81	77	***8***	**12**	50	60
43	86	70	***11***	19	**45**	61	104	117	24	91
22	52	**56**	105	115	29	90	36	87	75	***4***
116	27	95	35	80	76	***9***	15	55	63	**100**
79	69	***10***	20	48	66	107	**111**	28	93	40
53	59	110	118	**23**	94	38	84	68	***3***	21
30	**89**	39	82	73	***2***	14	54	64	103	121
71	***7***	13	47	65	108	114	33	96	**34**	83
58	109	119	26	99	41	**78**	72	***5***	18	46
92	44	85	**67**	***6***	16	51	57	102	120	31

To construct squares, however, with no guidance but this general principle, involves the necessity of study for the placing of each governing term, and is therefore tedious, besides being attended with some liability to error. It is on this account desirable to devise some practical method by which the construction may be reduced to a mechanical process capable of being rapidly executed. The variety of such possible methods is very great, but they are all deducible from certain general formulæ which will presently be given, and all rest on a well-known property of numbers, which may be thus stated:

If the consecutive multiples of any integral number, a, by the terms of the natural series, 1, 2, 3 . . . . n, viz. a, $2a$, $3a$ . . . na, be successively divided by n (itself also integral and prime to a) there will be obtained a series of integral remainders having every value less than n from $n-1$ to 0, without any repetition; and if the division be carried beyond na to the multiples $(n+1)a$, $(n+2)a$, etc., the same series of remainders will recur in the same order as before. These remainders, in fact, constitute an arithmetical progression, of which the first remainder is the common difference, subject to the condition that when any term exceeds n, it shall be reduced by the subtraction of n.

Let therefore the positions of the terms of the series 1 to n, as placed in the square of n^2 cells, be governed by a system of co-ordinates uniformly increasing—horizontally by the common difference a, and vertically by the common difference b—any terms which may stray beyond the limits of the square being brought back within those limits by deducting n units from either or both the co-ordinates. Take as the origin of such co-ordinates, or the zero cell, the cell exterior to the square diagonally contiguous to the upper left-hand corner. Let x and y represent the horizontal and vertical co-ordinates respectively, and let the first term of the series be placed in any cell at pleasure, of which the co-ordinates h and k are known. The co-ordinates of the successive terms to the nth, which is the end of the first grade, will then be,

$$x = h,\quad \tfrac{1}{n}(h+a)_r,\quad \tfrac{1}{n}(h+2a)_r,\quad \tfrac{1}{n}(h+3a)_r \ldots \tfrac{1}{n}(h+(n-1)\,a)_r. \qquad (3)$$

$$y = k,\quad \tfrac{1}{n}(k+b)_r,\quad \tfrac{1}{n}(k+2b)_r,\quad \tfrac{1}{n}(k+3b)_r \ldots \tfrac{1}{n}(k+(n-1)\,b)_r, \qquad (4)$$

in which the subscript r denotes the remainder left after dividing by n.

The $(n+1)$st term of the general series will be the leading term of the second grade, and its co-ordinates

$$\tfrac{1}{n}(h+na)_r,\qquad \tfrac{1}{n}(k+nb)_r, \qquad (5)\ (6)$$

will evidently be h and k, or those of the first term of the first grade. Without a new departure, therefore, the second grade would follow the track of the first, and its terms would fall into the same cells. We take such new departure by placing the leading term of the second grade in some unoccupied cell of which the co-ordinates may be made

$$\tfrac{1}{n}(h+a')_r,\qquad \tfrac{1}{n}(k+b')_r. \qquad (7)\ (8)$$

The leading term of the third grade will then properly be determined in position by the co-ordinates,

$$\tfrac{1}{n}(h+2a')_r,\qquad \tfrac{1}{n}(k+2b')_r, \qquad (9)\ (10)$$

and so on. These leading terms will thus form a series which may be called the *leading series*, of which the terms are placed by a system of co-ordinates resembling entirely in literal form, but not in the value of the increments, that of the primitive system. In referring to these two systems, the letters P and L will be employed to represent them respectively. It is obvious that, with definite values assigned to the increments a, b, a', b', the terms of a series may by their guidance be rapidly entered into the cells of a square. What limitations or conditions should control the selection of such values in order that the terms of P and L may not interfere, and in order that the resulting square may be perfectly or imperfectly magic, must be determined by further analysis.

First, in regard to interference. By this is meant the falling of different terms into the same cells. There are two kinds of interference possible; first, the terms of the series P, or of the series L, may interfere with each other; and secondly, the terms of P may interfere with those of L. All combinations of values of the increments a, b, a', and b', which lead to such interferences are unavailable in forming magic squares. It is self-evident that interference of the first description cannot occur in the series P when n is prime to a and b; nor in the series L, when n is prime to a' and b'. But if a, b, and n, or a', b', and n, have a common factor, then such interference will occur, as is manifest from the following:

Put μ to represent the common factor, and make $a = \alpha\mu$; $b = \beta\mu$; $n = \mu\nu$. Then the co-ordinates of the $(\nu+1)$st term of the series P will be,

$$x = h + \alpha\mu\nu = h + \alpha n = h. \ (11),\quad y = k + \beta\mu\nu = k + \beta n = k. \ (12)$$

In other words the $(\nu+1)$st term will fall into the same cell as the first, the $(\nu+2)$d into the same cell as the second, and so on. And so also of the series L, if a', b', and n are commensurable. It should be observed, however, that of the pairs a and b, a' and b', *one* of the members of either may have a common factor with n without interference, though both may not.

In order to investigate the possibilities of interference between the terms of the two series, assume T to represent the number, in regular sequence from the beginning, of the first interfering term of L, and t the number in like manner of the term of P with which T interferes. Then, as the first term of the general series is common to both, $T-1$ will be the interval from the beginning at which the first interference will take place. And,

$$(T-1)a' - (t-1)a = m_1 n\,; \qquad (13)$$

$$(T-1)b' - (t-1)b = m_2 n\,; \qquad (14)$$

whence,

$$T - 1 = \frac{(am_2 - bm_1)n}{ab' - a'b}\,;\ (15) \qquad t - 1 = \frac{(a'm_2 - b'm_1)n}{ab' - a'b}. \ (16)$$

By giving to the indeterminates m_1 and m_2 in (15) the values $m_1 = a'$ and $m_2 = b'$, the fractional coefficient of n becomes unity, and $T-1 = n$, or $T = n+1$; and in (16), by making $m_1 = -a$ and $m_2 = -b$, $t-1 = n$, or $t = n+1$; that is to say, there will in all cases be interference in the $(n+1)$st term, which is the first term of a succeeding grade and is of no consequence. Also in (15), if $m_1 = a$ and $m_2 = b$, $T - 1 = 0$, showing that there is interference or coincidence in the first term; which is true by hypothesis, and is equally of no consequence. If there is interference anywhere between these extremes, there must be an integral value of $T - 1$ greater than zero and less than n, which self-evidently can only be true in case the fractional coefficient of n is less than unity, and n itself is composite. If a and b are prime to each other, the numerator may be made to have any numerical value by properly substituting for the indeterminates. If they have a common factor, the numerator may be made any multiple of that common factor, and the denominator will be a multiple of the same factor. It has been seen above to be inadmissible that a, b, and n should all have a common factor. The case remains in which n has a common factor with the denominator differing from any which may be common to denominator and numerator. Suppose, then, that $n = \mu\nu$, and that μ is also a factor in the denominator; also that γ is the factor common to a and b; and κ a third factor prime to one or both of these. We may then have—

$$T - 1 = \frac{\kappa\gamma . \mu\nu}{\kappa\gamma\mu} = \frac{\kappa\gamma}{\kappa\gamma} . \nu = \nu, \qquad (17)$$

or interference will occur after an interval which is numerically the quotient of n divided by the factor common to it and the denominator. If $\mu = n$, $\nu = 1$; that is to say if the denominator is a multiple of the root of the square, interference will take place in every term. If $\gamma = 1$ and $\kappa = 1$, while $\mu = n$, the root of the square is itself the denominator. Combinations which lead to these results are therefore unsuited to form magic squares.

It may be added that we must not take simultaneously $a = b$ and $a' = b'$, since in such case expressions (13) and (14) give simultaneously $m_1 = 0$, $m_2 = 0$, and expressions (15) and (16) become

$$T - 1 = \tfrac{0}{0}; \quad t - 1 = \tfrac{0}{0}; \qquad (18) \ (19)$$

of which the mathematical significancy is that any value whatever will satisfy the equation, or that interference is continual. Nor may we take $a + b = n$ and $a' + b' = n$, at the same time; for in this case $b = n - a$ and $b' = n - a'$, whence (5), (6),

$$T - 1 = \frac{a(m_2 + m_1) - m_1 n}{(a - a')n} n; \qquad (20)$$

$$t - 1 = \frac{a'(m_2 + m_1) - m_1 n}{(a - a')n} n; \qquad (21)$$

in which the denominator is a multiple of n.

But if a and a' are both prime to n, and n is odd, there may be taken at once $a = b$ and $a' + b' = n$, or *vice versâ*; for (15) and (16) then become

$$T - 1 = \frac{a(m_2 - m_1)}{an - 2aa'} n; \qquad (22)$$

$$t - 1 = \frac{a'(m_2 + m_1) - m_1 n}{an - 2aa'} n; \qquad (23)$$

in which the denominator cannot be commensurable with the root of the square.

We have next to consider the character of the squares formed with given values of the increments. Assume p to express the place in numerical order of any term of the general series in its own grade, as first, second, etc.; q to denote the number of the grade; and give to x, y, h, and k the significancy already assigned them. Then, the co-ordinates of the term corresponding to p and q will be,

$$x = \frac{1}{n}\Big(h + (p-1)a + (q-1)a'\Big)_r; \qquad (24)$$

$$y = \frac{1}{n}\Big(k + (p-1)b + (q-1)b'\Big)_r; \qquad (25)$$

which, for convenience, may be written,

$$x = h + (p-1)a + (q-1)a' - m_1 n; \qquad (26)$$

$$y = k + (p-1)b + (q-1)b' - m_2 n; \qquad (27)$$

the indeterminates m_1 and m_2 being taken of such value that neither co-ordinate shall be less than 1, or greater than n. From the foregoing we deduce

$$p = \frac{b'(x-h) - a'(y-k) + (b'm_1 - a'm_2)n}{ab' - a'b} + 1; \qquad (28)$$

$$q = \frac{a(y-k) - b(x-h) + (am_2 - bm_1)n}{ab' - a'b} + 1. \qquad (29)$$

And if N be the numerical value of the term to which p and q belong, we shall have,

$$N = p + (q-1)n. \qquad (30)$$

These expressions for p and q must be integral for every possible value of x and y, in order that the square may be possible. The indeterminate co-efficients $b'm_1 - a'm_2$, and $am_2 - bm_1$ may be varied so as to make the expressions integral in every case except that in which n has a common factor with the denominator; and as this denominator $ab' - a'b$ is the same as in the expressions (15) and (16), this case has been already excluded and need not be considered. The case is also excluded in which n has a common factor with a and b, or with a' and b' [(11) and (12)]. But the joint value of the first and second terms in either of the numerators (28) or (29) may admissibly have a common factor with n; and in such case the same factor will remain in the integrated value of the fraction. The effect of this upon the structure of the square, as will be seen hereafter, is rather important. The truth of the proposition may be shown as follows: Let $n = \mu\nu$, and for simplicity let the joint value of the first and second terms of either numerator (28) or (29) be expressed by $\kappa\mu$, the common factor being μ. Put the denominator $= \lambda$, and the indeterminate co-efficient of $n = m$. Then,

$$p, \text{ or } q = \frac{\kappa\mu + m\mu\nu}{\lambda} = \frac{\kappa + m\nu}{\lambda}\mu. \qquad (31)$$

Here the fractional part is evidently integrable independently of μ, and its value must be multiplied by μ to give p or q.

Now if in (28) and (29) we make $x = h$ and $y = k$, the numerators of the literal fractions become zero, and we have $p = 1$, $q = 1$, and therefore $N = 1$; which accords with the original hypothesis that h and k are the co-ordinates of the first term of the series. If in (28) we put $y = k$, and $x = h + 1$, $h + 2$, etc. successively, the successive values of p (omitting for convenience the indeterminate term, which is always to be understood) will be,

$$p = \frac{b'}{ab' - a'b} + 1; \; p' = \frac{2b'}{ab' - a'b} + 1; \; p'' = \frac{3b'}{ab' - a'b} + 1,$$

and so on, (32)

showing that the values of p in the direction of x form an arithmetical series, of which the common difference is

$$\Delta p_x = \frac{b'}{ab' - a'b}. \qquad (33)$$

In like manner, in the direction of y, the values of p form a series, having the common difference

$$\Delta p_y = \frac{-a'}{ab' - a'b}; \text{ or to make it positive, } = \frac{n - a'}{ab' - a'b}. \quad (34)$$

The values of q form similar series with the common differences,

$$\Delta q_x = \frac{n - b}{ab' - a'b}; \; \Delta q_y = \frac{a}{ab' - a'b}. \quad (35) \ (36)$$

For the diagonal direction, between x and y from the origin (which we shall call the *direct* diagonal), we shall have

$$\Delta p_{xy} = \frac{b' - a'}{ab' - a'b}; \; \Delta q_{xy} = \frac{a - b}{ab' - a'b}. \quad (37) \ (38)$$

And for the *transverse* diagonal, joining the extremities of the ordinates $x = n$, $y = n$,

$$\Delta p_{-xy} = \frac{b' + a'}{ab' - a'b}; \; \Delta q_{-xy} = \frac{-a - b}{ab' - a'b}. \quad (39) \ (40)$$

The negative sign prefixed to the subscript index, xy, in these formulæ, denotes that, in the direction of this diagonal, one of the co-ordinates is diminishing and the other increasing. We suppose x to increase, and place the *diminishing* ordinate *last*. The distinction will have more importance in treating, further on, of magic cubes. In general, when the numerical values of the symbols are substituted in the formulæ, the expressions are not immediately integral. In order to make them so, the omitted indeterminate multiple of n must be restored. These differences give the law of progression both of the elementary and of the basic series in every direction in the square; and it is evident that, if they are all prime to n, every term of E and every term of B will be found in every line; and that the resulting square will be a square of the first class.

If in any case the denominator $ab' - a'b$ exceeds n, it will simplify the numerical operation of integration to replace it by the remainder left after subtracting n as often as possible. For in this case,

$$\Delta = \frac{\kappa + m_1 n}{\lambda + m_2 n}; \text{ or } \kappa + m_1 n = \Delta\lambda + \Delta m_2 n; \qquad (41)$$

whence $\kappa + (m_1 - \Delta m_2)n = \Delta\lambda$; or $\kappa + m_3 n = \Delta\lambda$,

and $$\Delta = \frac{\kappa + m_3 n}{\lambda} = \frac{\kappa + m_1 n}{\lambda + m_2 n}. \qquad (42)$$

It appears from (37) and (38) that the differences in the line of the direct diagonal of the series E will be either zero or n (which is practically the same thing) in case $a' = b'$; and those of the series B, in case $a = b$. And from (39) and (40) it appears that the same will be true in case $a' + b' = n$, or $a + b = n$. This indicates an arrangement of the terms such as that of Figs. 3 and 4, supposing the columns which are there vertical to have the diagonal direction. By inspection of those figures it will be seen that the differences are zero for the series E in one direction (the vertical in that arrangement) and for the series B in the transverse direction. The several rows sum up unequally in either direction, and if 2 is a factor in n, no one of the rows will give a sum equal to S. But when n is odd, the middle row in each direction gives such a sum; and if, when these rows are diagonally directed, as indicated in (37), (38), (39), and (40), they are brought into the position of the entire diagonals, the square will be an ordinary magic square of the second class. Such an arrangement may be effected by giving to h and k the values obtained from the following equations:

$$h = \tfrac{1}{2}(n+1) - \tfrac{1}{2}(n-1)\,(a+a') + m_1 n\,; \qquad (43)$$

$$k = \tfrac{1}{2}(n+1) - \tfrac{1}{2}(n-1)\,(b+b') + m_2 n\,; \qquad (44)$$

assigning to m_1 and m_2 such values as to make the expressions positive. The effect of this is to bring the middle term of the general series ($= \frac{1}{2}(n^2+1)$) to the central cell of the square.

If in any one of the formulæ (33) to (40) the numerator has a factor common to it with n, the case occurs which is shown in (31), and the integrated value of the fraction will contain the same factor. In this case there will be a rhythmic or periodical recurrence of certain terms of the series (E or B) to which the given difference belongs, and the resultant square, if magical, cannot belong to the first class. The recurring terms which are continually repeated in the same order form a cycle of which the component terms are distant from each other in the natural series by as many places as there are units in the common factor, and the number of terms is equal to the quotient of n divided by the same common factor. Thus if $\Delta = \kappa\mu$ and $n = \mu\nu$, the cycle will be composed of ν terms separated from each other in the natural series by μ places. These terms, if $\kappa = 1$, will follow each other in the regular order of increase; otherwise the order will be more or less permuted. The terms excluded from this cycle will form other cycles in lines parallel to it, so that there will be μ cycles having ν terms in each. The terms of these different cycles necessarily sum up unequally; but except when 2 is a factor in n, there will always be one series of cycles which sums up equal to $\Sigma(p)$ or $\Sigma(q)$; and it will presently be seen that, by permuting the order in which the terms of the series P, or of the series L, or of both, are entered in the square, all the cycles may be made of equivalent value. Cycles thus formed will be called in what follows *forced* or *artificial* cycles, in contradistinction to those formed in employing the natural order, which latter may be denominated *natural* cycles. If the terms are entered without permutation, no square can be perfectly magic in which any one of the increments a, b, a', b' is commensurable with n; but when permutation is employed this difficulty may be made to disappear. To this subject we shall presently return. But it should here be noticed that since, in the numerators of the expressions (33) to (40) there occur severally all the increments a, b, a', b', and also the sum and the difference of each pair, it will inevitably be the case that one or more of these numerators will be divisible by 2, and one or more also either divisible by 3 or zero. Hence no square of the first class can be formed on any number in which 2 or 3 is a factor.

Combinations of increments which lead to natural cycles will only produce magic squares in case the series of cycles whose sums equal $\Sigma(p)$ or $\Sigma(q)$ are brought into the position of the entire diagonals; and then the squares will be ordinary. This arrangement can be effected with the cycles of both classes, if both are present; since the directions of increase of E and B are normal to each other. To find the terms composing these particular cycles, put $n = \mu\nu$, and let Δ, the difference which has a factor common with n, be $= \kappa\mu$. There will be μ cycles with ν terms in each; and if ζ be the initial term of the cycle sought, we shall have

$$\nu\zeta + \tfrac{1}{2}\,(\kappa\mu\nu^2 - \kappa\mu\nu) = \frac{1}{2\mu}(\mu^2\nu^2 + \mu\nu) + m\mu\gamma. \qquad (45)$$

Whence $$\zeta = \tfrac{1}{2}\Big((\kappa + \nu - \kappa\nu + 2m)\mu + 1\Big). \qquad (46)$$

If the cycle is possible, ζ is integral, which requires that μ be odd, and κ or ν, or both, odd also; when the expression easily simplifies itself to $\zeta = \frac{1}{2}(\mu + 1)$. When ζ has been found, its cycle may be brought into the required position by means of equations (43) and (44); but if there are cycles only in one series (say the series E) and in one direction and not in the direction at right angles to this, any term of the cycle may be placed in any cell of the diagonal to which it belongs, and the ordinates h and k of the initial term may be found from equations (26) and (27), putting the co-ordinates of the cell in place of x and y, the numerical value of the term in place of p, and giving to q any value at pleasure. Such a case occurs in the square of 35 (5×7) with $a = 13$, $b = 1$, $a' = 1$, $b' = 4$, in which $\Delta p_{-xy} = 20$ and $\kappa = 4$, giving $\zeta = 28$; whence, in the transverse diagonal,

Cycle E = 28, 13, 33, 18, 3, 23, 8.

If the term 3, for instance, is put into the fourth cell of the transverse diagonal, we shall have $x = 32$, $y = 4$, $p = 3$, and $q =$ any value at pleasure—say 26. Then from (26) $h = 16$, and from (27) $k = 7$. And the term occupying the selected cell, found from (30), will be 878. If there are cycles in transverse directions, but an elementary only in one and a basic in the other, the process last described may be still employed, giving to p and q in the equations the numerical value of any terms in their several cycles; but the cell employed must be the central cell of the square. We may derive an example of this also from the square of 35, putting $a = 1$, $b = 4$, $a' = 16$, $b' = 6$, which will give $\Delta p_{xy} = 5$ and $\Delta q_{\ xy} = 20$. Here $\kappa = 1$ and $\kappa' = 4$; whence $\zeta = 3$ and $\zeta' = 28$, and the cycles are

Cycle E = 3, 8, 13, 18, 23, 28, 33; Cycle B = 28, 13, 33, 18, 3, 23, 8.

We may therefore put p and q equal to any of the numbers in cycles E and B respectively, but x and y must each be put $= \frac{1}{2}(n+1) = 18$. If there are cycles of the same kind (elementary or basic) in both directions, they cannot both be formed on the same difference; if one, for example, is formed on the difference μ, when $n = \mu\nu$, the other must be formed on the difference ν. These two cycles, since they intersect each other, must have a common term; and that term must be placed in the central cell of the square. The square of 35 may again be taken as an illustration, with $a = 1$, $b = 2$, $a' = 6$, $b' = 1$, giving two cycles in the series E, one on the difference 5 and the other on the difference 7. Here we have $\Delta p_{xy} = 10$, $\Delta p_{-xy} = 28$, $\kappa = 2$, and $\kappa' = 4$, which give $\zeta = 23$ and $\zeta' = 32$; and the cycles are

Direct cycle E = 23, 33, 8, 18, 28, 3, 13; Transverse cycle E = 32, 25, 18, 11, 4.

The common term is 18, which must be placed in the central cell of the square. If n has but two component factors, there can be four systems of cycles, an elementary and a basic on the difference μ, and an elementary and a basic on the difference ν. The *species* of cycles, however, are two only. But if the component factors of n are more numerous, there may be cycles of three or four different species. Thus suppose n to be composed of the factors 5, 7, 11, and 13; then if $a = 12$, $b = 1$, $a' = 6$, $b' = 1$, there will be cycles of the series E on the differences 6 + 1, and 6 − 1 (7 and 5); and cycles of B on the differences 12 + 1, and 12 − 1 (13 and 11). The side of such a square would be 5005. As no one would think of constructing it, the proposition has only a theoretic interest. (See APPENDIX.)

From what precedes, we are able to state the conditions under which squares of the first class may be formed by means of uniformly increasing co-ordinates as follows:

1. The increments of increase of the co-ordinates must in every case be prime to the root of the square; and the same must be true of the sum and of the difference of the increments of each pair.

2. The difference of the products formed by cross-multiplication of the two pairs of increments must not be equal to the root of the square, nor commensurable with it, nor zero.

It follows from the first specification above that neither pair of co-ordinate increments may have zero for their difference nor the root of the square for their sum.

These conditions may be fulfilled in a variety of ways with every number which does not embrace 2 or 3 among its component factors, the variety increasing with the magnitude of the number, if prime, or that of its component factors if composite. Disregard of the conditions may result either in failure to produce a magic square at all, or in the production of an imperfect or ordinary square. The second of the specifications is, as we have seen, indispensable for squares of either class. And, assuming the terms of the successive grades to be entered in the natural order, that portion of the first specification which requires that the increments of increase taken severally shall be prime to the root of the square, is equally indispensable; but the sum or the difference of one or both pairs may have a common factor with n, or the sum of a pair may be equal to n, or the difference of a pair may be zero, without making it impossible to render the square magical; only that, in these cases, it will be an imperfect or ordinary and not a perfect magic square. The case may occur in which only one sum or one difference may have a common factor with n, or in which one difference may be zero or one sum may equal n. In this case the sums of the diagonal lines (whole and broken) may be equal in one direction and unequal in the transverse direction, giving the square a character which may be called one-sidedly imperfect. Illustrations of the varieties above mentioned will be found in Figs. 6, 7, 8, and 9 which precede. The values of h and k for all the imperfect squares have been determined from the equations (43) and (44); for the perfect square they have been both taken $= 1$, but the initial term may be placed in any cell at pleasure.

Fig. 6.

$a = 2,\ b = 3,\ a' = 4,\ b' = 5,$

$\Delta p_x = 3,\ \Delta q_x = 7,\ \Delta p_y = 2,\ \Delta q_y = 10,$

$\Delta p_{xy} = 5,\ \Delta q_{xy} = 6,\ \Delta p_{-xy} = 1,\ \Delta q_{-xy} = 8.$

1	81	40	120	68	27	107	66	14	94	53
113	72	31	**100**	59	18	98	46	*5*	85	44
104	63	22	91	50	*9*	**78**	37	117	76	24
95	54	*2*	82	41	121	69	28	108	**56**	15
86	**34**	114	73	32	101	60	19	99	47	*6*
77	25	105	64	**12**	92	51	*10*	79	38	118
57	16	96	55	*3*	83	42	**111**	70	29	109
48	*7*	87	35	115	74	33	102	61	20	**89**
39	119	**67**	26	106	65	13	93	52	*11*	80
30	110	58	17	97	**45**	*4*	84	43	112	71
21	90	49	*8*	88	36	116	75	**23**	103	62

Perfect.

Fig. 7.

$a = 7,\ b = 4,\ a' = 5,\ b' = 5,\ h = 1,\ k = 5,$

$\Delta p_x = 4,\ \Delta q_x = 10,\ \Delta p_y = 7,\ \Delta q_y = 10,$

$\Delta p_{xy} = 0,\ \Delta q_{xy} = 9,\ \Delta p_{-xy} = 8,\ \Delta q_{-xy} = 11 = 0.$

50	43	25	18	*11*	114	107	**89**	82	75	57
35	28	21	3	117	110	92	85	**67**	60	53
31	13	*6*	120	102	95	88	70	63	**45**	38
16	*9*	112	105	98	80	73	66	48	41	**28**
1	115	108	90	83	76	58	51	44	26	19
118	**100**	93	86	68	61	54	36	29	22	4
103	96	**78**	71	64	46	39	32	14	*7*	121
99	81	74	**56**	49	42	24	17	*10*	113	106
84	77	59	52	**34**	27	20	*2*	116	109	91
69	62	55	37	30	**12**	*5*	119	101	94	87
65	47	40	33	15	8	**111**	104	97	79	72

Imperfect.

Fig. 8.

$a = 1,\ b = 3,\ a' = 6,\ b' = 5,\ h = 4,\ k = 10,$

$\Delta p_x = 3,\ \Delta q_x = 7,\ \Delta p_y = 3,\ \Delta q_y = 5,$

$\Delta p_{xy} = 6, \Delta q_{xy} = 1, \Delta p_{-xy} = 11 = 0, \Delta q_{-xy} = 2.$

9	**78**	37	117	76	24	104	63	22	91	50
56	15	95	54	*2*	82	41	121	69	28	108
114	73	32	101	60	19	99	47	*6*	86	**34**
51	*10*	79	38	118	77	25	105	64	**12**	92
109	57	16	96	55	*3*	83	42	**111**	70	29
35	115	74	33	102	61	20	**89**	48	*7*	87
93	52	*11*	80	39	119	**67**	26	106	65	13
30	110	58	17	97	**45**	*4*	84	43	112	71
88	36	116	75	**23**	103	62	21	90	49	*8*
14	94	53	***1***	81	40	120	68	27	107	66
72	31	**100**	59	18	98	46	*5*	85	44	113

One-sidedly imperfect.

Fig. 9.

$a = 4,\ b = 1,\ a' = 7,\ b' = 2,\ h = 6,\ k = 2,$

$\Delta p_x = 2,\ \Delta q_x = 14,\ \Delta p_y = 8,\ \Delta q_y = 4,$

$\Delta p_{xy} = 10,\ \Delta q_{xy} = 3,\ \Delta p_{-xy} = 9,\ \Delta q_{-xy} = 10.$

28	*15*	212	199	186	173	160	147	134	**106**	93	80	67	54	41
81	68	55	42	29	***1***	213	200	187	174	161	148	135	107	94
149	**121**	108	95	82	69	56	43	30	*2*	214	201	188	175	162
202	189	176	163	150	122	109	96	83	70	57	44	**16**	*3*	215
45	17	*4*	216	203	190	177	164	**136**	123	110	97	84	71	58
98	85	72	59	**31**	18	*5*	217	204	191	178	165	137	124	111
151	138	125	112	99	86	73	60	32	19	*6*	218	205	192	179
219	206	193	180	152	139	126	113	100	87	74	**46**	33	20	*7*
47	34	21	*8*	220	207	194	**166**	153	140	127	114	101	88	75
115	102	89	**61**	48	35	22	*9*	221	208	195	167	154	141	128
168	155	142	129	116	103	90	62	49	36	23	*10*	222	209	**181**
11	223	210	182	169	156	143	130	117	104	**76**	63	50	37	24
64	51	38	25	*12*	224	**196**	183	170	157	144	131	118	105	77
132	119	**91**	78	65	52	39	26	*13*	225	197	184	171	158	145
185	172	159	146	133	120	92	79	66	53	40	27	*14*	**211**	198

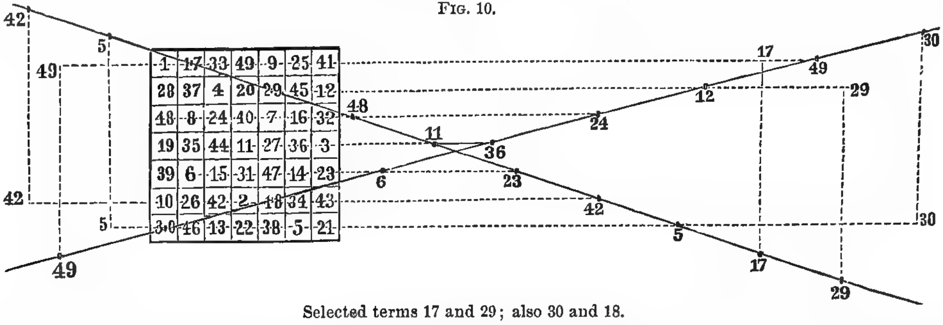
Fig. 9 is an example of a square imperfect in consequence of the occurrence of cycles in its diagonals. There are four cycles, two in the series E and two in the series B, as follows: Direct cycle E = 13, 8, 3; direct cycle B = 2, 5, 8, 11, 14; transverse cycle E = 5, 14, 8, 2, 11; transverse cycle B = 13, 8, 3.

It will now be perceived that the odd-numbered square of Moschopulus (Fig. 1), and others of its kind, of which the law was probably discovered empirically, or without any far-reaching method of research, belong to a class of squares imperfectly magical, in which $a = b = b' = 1$, $a' = n - 1$, and h and k, determined by equations (43) and (44), have the values $\frac{1}{2}(n + 1)$, and $1 + \frac{1}{2}(n + 1)$ respectively.

It is a curious property belonging to every perfect magic square, that if any two terms for which both p and q are different are selected, no matter how situated in such a square, and a straight line be drawn through the centres of the cells containing them, and if upon this line prolonged there be measured off from one of these centres successive distances equal to the distance between them, and to the points of intersection there be transferred from the square the terms whose co-ordinate distances from such points are zero, n, or multiples of n, then any n consecutive terms so transferred will give a sum equal to S. Or if the co-ordinates of one of the selected terms referred to the other as the origin be α and β, then the n terms whose successive co-ordinates referred to the same origin are $x = 0,\ \alpha,\ 2\alpha,\ 3\alpha\ \ldots\ldots\ (n-1)\alpha$; and $y = 0,\ \beta,\ 2\beta,\ 3\beta\ \ldots\ldots\ (n-1)\beta$, will give a sum equal to S. Fig. 10 on the following page illustrates this statement.

Permutation. The principle on which the construction of squares of the first class depends, makes it evident that the certainty of the result is independent of the order in which the terms of the several grades are arranged, provided that those of each succeeding grade follow the same order; and that it is equally independent of the order in which the grades are entered. An inspection of the examples given, especially Figs. 5 and 6, will show that the same results would have been obtained with other values of the increments of the ordinates, provided the series had been suitably permuted. Thus, in Fig. 6, if we had taken $a = 5$, $b = 2$, the terms of P would have fallen into the same cells which they actually occupy, supposing the series to have been arranged in the order 1, 9, 6, 3, 11, 8, 5, 2, 10, 7, 4; and with $a' = 1$, $b' = 4$, the same would have been true of the terms of L, in case the original order had been 1, 34, 67, 100, 12, 45, 78, 111, 23, 56, 89. Many variations of this kind may be made without altering the position of a single number in the square. In Fig. 5 we have an example which could not be produced with the natural series of numbers by any system of uniformly increasing co-ordinates; but it may be produced by permutation of terms with the increments $a = 3$, $b = 2$, $a' = 2$, $b' = 3$. Neither of these squares, however, could be produced by any one of the systems of co-ordinates which would produce the other. It thus appears that there are systems of co-ordinate increments which are essentially equivalent, and others which are essentially inequivalent. Any increment which exceeds $\frac{1}{2}(n-1)$ is essentially equivalent to a lesser increment taken negatively or in the opposite direction. Hence, there is a limit to the distance by which the terms of the series P or L can be separated. If this limit is exceeded in one direction the terms will approximate in the opposite. In general, the limit may be said to be the numerical root of the largest square contained in n. In 5 and 7 this root is 2, and accordingly in squares on these numbers no co-ordinate systems essentially different can be found, except those in which the consecutive terms follow each other without interval, and those in which they obey what is called the chess-knight movement. But as this movement may be made in several different directions, the apparent variety is considerable.

FIG. 10.



1	17	33	49	9	25	41
28	37	4	20	29	45	12
48	8	24	40	7	16	32
19	35	44	11	27	36	3
39	6	15	31	47	14	23
10	26	42	2	18	34	43
30	46	13	22	38	5	21

Selected terms 17 and 29; also 30 and 18.

An important advantage derived from the principle of permutation is the possibility it affords of equalizing the sums of the parallel cycles in squares like Fig. 9. The differences denoted by Δ are not differences of value, but differences of place in the series. Supposing the series so arranged that any set of terms taken from it differing in place by the distance Δ shall give the same sum; when cycles occur in the square in only one series (basic or elementary) and with only one value of Δ, the permuted order substituted for the natural will make the square perfect. The permutation need only be used in the series in which the cycle occurs. If there is a single cycle in each series derived from different factors of n, one species of permutation may be used in the series P and another in the series L. Neither of these cases can occur when either 2 or 3 is included among the prime factors of the root. But every number of which 3 is a factor must necessarily furnish cycles derived from that factor in both series; and there may be, though not necessarily, other cycles founded on a different factor. To meet such a case the series should be so permuted as to furnish equal cycles with either factor as a difference. In the following diagrams the series 15 is shown permuted for the factor 3, for the factor 5, and for both these factors at once. This last permutation is employed in diagram 14, which is consequently a perfect square. In this example, by making the increments commensurable with n, the cycles are thrown intentionally into the vertical and horizontal lines.

FIG. 11.

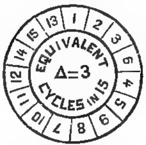


FIG. 12.

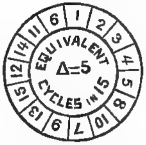
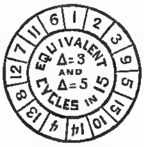


FIG. 13.



Equivalent cycles may be formed upon all composite numbers whatever, except those in which 2 is a factor once, all the other factors being odd. The reason of this exception will be apparent when it is considered that, with such numbers, cycles founded on this factor are inevitable, and that the sum of the series, being itself odd, cannot furnish two integral cycles exactly equal. These numbers require a special treatment and will be considered later. Upon all numbers divisible by 4, equivalent cycles are formed with great facility. It is only necessary to reverse the order of the terms in the last half of the grade, and not only all cycles dependent on 2, but all derived from the uneven factors which may be compounded in the root with 2, will be equalized.

But if $n=4m$, m being odd, cycles dependent on 4 cannot be equalized, because in this case the sum of the series, though divisible by 2, is not divisible by 4. Generally, if $n=2^{\mu}m$ (m being odd), all cycles dependent on the powers of 2 up to the $(\mu-1)$st admit of equalization by the reversal of terms above described, and likewise all those dependent on m, or its odd multiples, and also its even multiples up to $2^{\mu-1}m$.

FIG. 14.

$a=3,\ b=5,\ a'=5,\ b'=3.$

Order of series:
1, 2, 3, 9, 5, 15, 10, 14, 4, 13, 8, 12, 7, 11, 6.

1	217	118	10	219	106	7	223	115	9	211	112	13	220	114
105	33	201	102	34	210	93	36	207	94	45	198	96	42	199
188	89	65	182	86	68	194	80	62	191	83	74	185	77	71
136	172	28	145	174	16	142	178	25	144	166	22	148	175	24
135	48	156	132	49	165	123	51	162	124	60	153	126	57	154
8	224	110	2	221	113	14	215	107	11	218	119	5	212	116
91	37	208	100	39	196	97	43	205	99	81	202	103	40	204
195	78	66	192	79	75	183	81	72	184	90	63	186	87	64
143	179	20	137	176	23	149	170	17	146	173	29	140	167	26
121	52	163	130	54	151	127	58	160	129	46	157	133	55	159
15	213	111	12	214	120	3	216	117	4	225	108	6	222	109
98	44	200	92	41	203	104	35	197	101	38	209	95	32	206
181	82	73	190	84	61	187	88	70	189	76	67	193	85	69
150	168	21	147	169	30	138	171	27	139	180	18	141	177	19
128	59	155	122	56	158	134	50	152	131	53	164	125	47	161

In constructing squares on this class of numbers, care must be taken so to select values for the increments a, b, a', b', that the difference of the products formed by cross-multiplication shall not be even. Thus all four of the increments must not be even numbers nor all four odd. Three may be odd, but three may not be even. Two may be even, provided they are neither analogous (of the same pair), or homologous (of the same letter). The following square on the number 8 illustrates the foregoing remarks. It is of course perfectly magical.

FIG. 15.

$a=4,\ b=1,\ a'=1,\ b'=2.$

Order: 1, 2, 3, 4, 8, 7, 6, 5.

1	14	24	27	57	54	48	35
58	53	47	36	2	13	23	28
3	9	22	32	59	49	46	40
60	50	45	39	4	10	21	31
8	11	17	30	64	51	41	38
63	52	42	37	7	12	18	29
6	16	19	25	62	56	43	33
61	55	44	34	5	15	20	26

The square of 4 formed by this method possesses some very remarkable properties which adhere to it through all the varieties of arrangement of which it is capable. In some of its forms it seems to have been found empirically by Franklin, Frénicle, and others, and to have been made by the former the basis of his magic circle and of his magic square of squares. Two varieties of this are given below, of either of which the following propositions will be found to be true: 1. The sum of any quadrate group of adjacent terms is the same, and is equal to the sum of the terms in a row. 2. The sum of any two contiguous terms at side or bottom with the two directly opposite at the other side or at top is the same. 3. The sum of the four angular terms is the same. 4. The sum of the angular terms of any square of 3 which can be formed in this square is the same.

FIG. 16.
$a = 1, b = 2, a' = 2, b' = 1.$

Order 1, 2, 4, 3.

1	14	4	15
8	11	5	10
13	2	16	3
12	7	9	6

FIG. 17.
$a = 2, b = 3, a' = 1, b' = 2.$

Order 1, 2, 4, 3.

1	8	13	12
15	10	3	6
4	5	16	9
14	11	2	7

These squares are special examples of a very general method, which may be illustrated as follows:—Take α and β to represent any two numbers of which β is the greater. These, in what follows, will be distinguished as the independent governing terms. Increase each by the constant δ; the sums $\alpha + \delta, \beta + \delta$ will be called the dependent governing terms. The term β should exceed $\alpha + \delta$. Subtract each of the four terms thus obtained from a constant ρ, which to avoid repetitions must exceed twice $\beta + \delta$, and place the difference (complement) immediately after the term subtracted, in the upper cells of the four tesseræ below, thus:

FIG. 18.

Group I.

α	$\rho - \alpha$
$\varsigma - \delta - \alpha$	$\varsigma + \delta - \rho + \alpha$

Group II.

$\alpha + \delta$	$\rho - \alpha - \delta$
$\varsigma - \alpha$	$\varsigma - \rho + \alpha$

Group III.

β	$\rho - \beta$
$\varsigma - \delta - \beta$	$\varsigma + \delta - \rho + \beta$

Group IV.

$\beta + \delta$	$\rho - \beta - \delta$
$\varsigma - \beta$	$\varsigma - \rho + \beta$

Let ς be a constant greater than twice $\rho - \alpha$; subtract the independent governing terms from $\varsigma - \delta$, and the dependent from $\varsigma + \delta$; also the complements of the independent terms from $\varsigma + \delta$, and those of the dependent from $\varsigma - \delta$; placing in every case the difference (supplement) in the cell immediately below the number subtracted. For convenience we may call each number and its supplement a *couplet*, the number itself being called the antecedent and the supplement the consequent. Then invert the second and third groups; bring IV. under I. and II. under III. and form by their union a square of 16 cells. This square will possess all the properties of those shown in Figs. 16 or 17. The arrangement may be seen above.

FIG. 19.

α	$\rho - \alpha$	$\varsigma - \delta - \beta$	$\varsigma + \delta - \rho + \beta$
$\varsigma - \delta - \alpha$	$\varsigma + \delta - \rho + \alpha$	β	$\rho - \beta$
$\beta + \delta$	$\rho - \beta - \delta$	$\varsigma - \alpha$	$\varsigma - \rho + \alpha$
$\varsigma - \beta$	$\varsigma - \rho + \beta$	$\alpha + \delta$	$\rho - \alpha - \delta$

In the example Fig. 20 following, the numbers are assumed at random—viz. $\alpha = 3$, $\beta = 11$, $\delta = 2$, $\rho = 27$ and $\varsigma = 49$. The common sum of the columns is $2\varsigma = 98$.

FIG. 20.
General method.

3	24	36	35
44	27	11	16
13	14	46	25
38	33	5	22

Now suppose we wish to form a square on a multiple of 4 which shall possess the remarkable properties we have seen to belong to this. We shall have $n = 4m$, and $n^2 = 16m^2$; or the larger square will be made up of m^2 squares of 16 numbers each, like the foregoing; or m squares of 16 in the vertical and m in the horizontal direction. For ς we shall naturally put $n^2 + 1$; and for ρ we may have a value constant in each square or column of squares, but increasing from one to the next, or one which is constant throughout. A simple mode of construction, shown in Fig. 21, is to take 1 and 3 as the independent governing terms of the first sub-square, and 2 and 4 as the dependent; putting $\rho = 9$, and δ necessarily = unity. With the antecedents determined by these suppositions complete this square; and in the succeeding squares employ the same antecedents, increased by 8 for the second, by 16 for the third, by 24 for the fourth, and so on, passing from the bottom of each completed column to the top of the next until all are filled. But the construction which imparts to the square the most remarkable properties is the following. Make the leading independent, α, in the left-hand column of sub-squares, successively = 1, 3, 5, 7 . . . $\frac{1}{2}n - 1$. Put $\alpha + \beta = n$, and $\rho = 2n + 1$, δ being = 1. These will give the antecedents for this column. For the next, take the same antecedents increased by $2n$; for the third, the same increased by $4n$, and so on to the end. This method is illustrated in Fig. 22.

FIG. 21.

1	8	61	60	17	24	45	44
63	58	3	6	47	42	19	22
4	5	64	57	20	21	48	41
62	59	2	7	46	43	18	23
9	16	53	52	25	32	37	36
55	50	11	14	39	34	27	30
12	13	56	49	28	29	40	33
54	51	10	15	38	35	26	31

In the square thus formed, every quadrate group of four terms gives the same sum, which is always equal to 2ς. The four terms forming the angles of any rectangular figure which has even sides, gives this same sum also. Any two diagonally placed terms with a single term intervening, both within the same sub-square, added to any other similarly placed terms within the same or any other sub-square, whether parallel or normal to them in direction, will also give the sum 2ς. The square is perfect, and its diagonals, whole or broken, sum up equally; its half diagonals also sum up equally. Finally, its bent diagonals, that is to say, diagonal rows running from one side upward or downward to the central axis, vertical or horizontal, and continued from the axis to the opposite side with a movement inflected into the other diagonal direction, will sum up equally.

Tessellated Squares.—The remarkable square just described belongs to the class called tessellated squares; that is, squares made up of lesser squares which are also magic when taken separately. Tessellated squares may be formed in various ways upon any composite number. If $n = \mu\nu$, for example, $n^2 = \mu^2\nu^2$. The squares of μ may then be regarded as simple terms and arranged as such in a square of ν, or *vice versâ*. These sub-squares may be equivalent, as in the example above, in which case, if they are severally perfect, their order may be in any manner deranged, or some may be inverted and others rotated ninety degrees without destroying the magical character of the square compounded of them; or they may form an arithmetical series increasing, in which case their places in the compound square must not be changed. Equivalent tessellated squares cannot be formed on odd numbers.

Special Methods for Numbers Divisible by 4.—Besides the general methods for the construction of magic squares which are applicable to all numbers except those in which 2 is once a factor, there are others requiring notice which depend upon the properties of the powers of 2. These are founded upon the self-evident proposition that, in any arithmetical series, whether the number of terms is odd or

FIG. 22.
Magic square of squares.

1	32	241	240	**33**	64	209	208	**65**	96	177	176	**97**	128	145	144
255	226	**15**	18	223	194	**47**	50	191	162	**79**	82	159	130	**111**	114
16	17	256	225	**48**	49	224	193	**80**	81	192	161	**112**	113	160	129
242	239	**2**	31	210	207	**34**	63	178	175	**66**	95	146	143	**98**	127
3	30	243	238	**35**	62	211	206	**67**	94	179	174	**99**	126	147	142
253	228	**13**	20	221	196	**45**	52	189	164	**77**	84	157	132	**109**	116
14	19	254	227	**46**	51	222	195	**78**	83	190	163	**110**	115	158	131
244	237	**4**	29	212	205	**36**	61	180	173	**68**	93	148	141	**100**	125
5	28	245	236	**37**	60	213	204	**69**	92	181	172	**101**	124	149	140
251	230	**11**	22	219	198	**43**	54	187	166	**75**	86	155	134	**107**	118
12	21	252	229	**44**	53	220	197	**76**	85	188	165	**108**	117	156	133
246	235	**6**	27	214	203	**38**	59	182	171	**70**	91	150	139	**102**	123
7	26	247	234	**39**	58	215	202	**71**	90	183	170	**103**	122	151	138
249	232	**9**	24	217	200	**41**	56	185	168	**73**	88	153	136	**105**	120
10	23	250	231	**42**	55	218	199	**74**	87	186	167	**106**	119	154	135
248	233	**8**	25	216	201	**40**	57	184	169	**72**	89	152	137	**104**	121

even, the sum of any two terms situated symmetrically with reference to the middle point of the series is constant, and is equal to the sum of the extremes. Also the joint sum of any two grades situated symmetrically with reference to the middle of the series of grades is constant, and is equal to the joint sum of the two extreme grades. But this sum (1) is evidently

$$2\Sigma\,[1, 2, 3\,.\,.\,.\,.\,n] + n \times (n-1)n =$$
$$n^2 + n + n^3 - n^2 = n^3 + n = 2\mathrm{S}.$$

FIG. 23.
Odd-numbered tessellated square.

31	36	29	76	81	74	13	18	11
30	32	34	75	77	79	12	14	16
35	28	33	80	73	78	17	10	15
22	27	20	40	45	38	58	63	56
21	23	25	39	41	43	57	59	61
26	19	24	44	37	42	62	55	60
67	72	65	4	9	2	49	54	47
66	68	70	3	5	7	48	50	52
71	64	69	8	1	6	53	46	51

Now, if σ represent the sum of the extremes of the first grade, and σ' the sum of those of the last grade, G the total sum of the first and G′ the total sum of the last, we shall have

$$\mathrm{G} + \mathrm{G}' = \tfrac{1}{2}n\sigma + \tfrac{1}{2}n\sigma' = 2\mathrm{S}\,;\ \text{and}\ \mathrm{S} = \tfrac{1}{4}n\sigma + \tfrac{1}{4}n\sigma'. \quad (47)$$

It thus appears that one-half the first grade taken by pairs of terms symmetrically disposed, added to half the last grade similarly taken, is equal to the sum of a column in the square; a proposition true of any two other grades symmetrically situated, but practically inapplicable when n is odd, since in that case one-half the number of terms cannot be integrally expressed. Moreover, since σ and σ' are necessarily odd when n is even, the terms of the second member of (47) cannot be integral unless n is divisible by 4.

To deduce from this principle the practical modes of construction of magic squares of numbers of the form $n = 4m$, take any such number, and write the terms of the first grade in their order in a horizontal row. Under these in reversed order write those of the second grade. The couplets thus formed give severally equal sums, and the whole arrangement may be called an *equalized band.* Form similar bands with the third and fourth grades, the fifth and sixth, and so on, until half the grades have been written down; then reverse the order, commencing the $(\frac{1}{2}n + 1)$st grade at the right, and the $(\frac{1}{2}n + 2)$d at the left, according to which law the remaining bands are to be written. It is then self-evident that the sums of all the columns added vertically will be equal. Also, upon each diagonal, the sum of any two terms symmetrically chosen with reference to the middle point will be equal to the sum of the extremes, that is, to $n^2 + 1$. Accordingly, the total sums of the diagonal terms will be equal. Mark then, in the first grade, one-fourth of the terms anyhow selected on the left of the vertical axis of the square, and as many symmetrically situated to these on the right of the same axis. Mark also the terms of the last grade which are in the same vertical columns as the marked terms in the first. Finally, interchange the marked terms. Proceed in like manner with the other grades taken by pairs symmetrically situated to the horizontal axis of the square, and the arrangement finally resulting will be magic. The sums of the diagonals will not be in any manner affected by the interchanges. In fact, if t and t' are two symmetrically placed terms upon the two diagonals above the horizontal axis, and τ and τ' the corresponding terms on the diagonals below the axis with which the former are to be interchanged, then $t + \tau' = \tau + t' = n^2 + 1$, and the replacement of the former pair by the latter, and *v. v.* leaves the total sums unaltered. The following is an example of this method:

FIG. 24.

1	2	3	4	5	6	7	8
16	15	14	13	12	11	10	9
17	18	19	20	21	22	23	24
32	31	30	29	28	27	26	25
40	39	38	37	36	35	34	33
41	42	43	44	45	46	47	48
56	55	54	53	52	51	50	49
57	58	59	60	61	62	63	64

Bands equalized.

FIG. 25.

1	58	59	4	5	62	63	8
56	15	54	13	12	51	10	49
41	42	19	20	21	22	47	48
32	39	30	37	36	27	34	25
40	31	38	29	28	35	26	33
17	18	43	44	45	46	23	24
16	55	14	53	52	11	50	9
57	2	3	60	61	6	7	64

Bands balanced.

The variations of which this method admits are very numerous. In the first place the terms of each grade may be permuted at pleasure provided the two grades between which interchanges take place are similarly permuted. But each such associated pair of grades may have a system of permutation entirely different from any other. Moreover, in the selection of terms to be interchanged, there is room for large variety, which is greater as n is greater; and each pair of associated grades may have its independent system. Examples of such possible varieties may be illustrated by means of diagrams in small, without numbers, as seen in Figs. 26 and 27. Here the shaded cells are those supposed to be occupied by numbers selected for interchange; the others by the numbers remaining undisturbed. We may suppose the interchange to take place by the revolution of the entire system of shaded cells about the axis XX'.

FIG. 26.

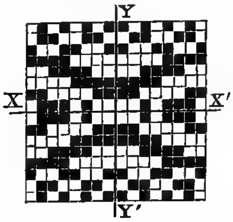
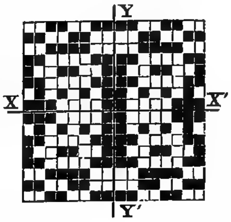


FIG. 27.



Another method of construction analogous to the foregoing is to form bands not only equalized but equivalent, by writing, or supposing to be written, all the terms of the general series from 1 to $\frac{1}{2}n^2$ in direct order from left to right, and the remaining terms in reversed order under these, forming as before couplets which sum up equally. The elongated band thus formed is then to be cut up into sections of n couplets each, the first half of which are to be written in direct order, and the second half in reversed order under each other in the square. These bands are *equivalent,* in distinction from those of the method previously described, which are *graded* bands. In what follows it may promote clearness to make the following distinctions also: Let the smaller terms of each couplet be called antecedents; the larger, consequents. Two couplets adjacent to each other constitute a group; if they are immediately consecutive in the series as above arranged, the group is a *close* group; if not, a *loose* group. A group formed of four consecutive terms of the natural series of numbers is a *current* group. The position of a couplet with the antecedent uppermost is *proper;* with the consequent uppermost, *inverted.* Increase toward the right is *direct;* toward the left, *reversed.*

Every current group, when its terms are added vertically, horizontally, and diagonally, gives three results—viz. equality, a greater inequality (which is 4), and a lesser inequality (which is 2). The typical current group is presented in the square of 2, which cannot be made magical. Every close group in an equalized band preserves the two relations of equality and of lesser inequality; but the greater inequality increases from the middle of the general series to the extremes. In the normal position of the terms, the lesser inequality is in the diagonals, but if the antecedents or the consequents be reversed, it is in the vertical sums, and the diagonals are equal. In the square constructed as last described, the vertical columns sum up of course equally, and the diagonals sum equally also; for though the direct diagonals of the groups are in deficiency in the upper half, they are equally in excess in the lower half; and *v. v.* for the transverse diagonals. If the consequents of all the groups are reversed, all the group diagonals become equal, and the inequalities thus transferred to the vertical lines balance as before. See Figs. 28, 29 following.

In order in either case to equalize the horizontal sums, one-half the couplets on the left of the vertical axis in each band must be inverted; and also an equal number symmetrically situated on the right of the axis. The band becomes then a *balanced* band. In making the inversions the couplets of each group on the true diagonals of the square must be treated alike—*i. e.,* both inverted or both preserved in proper position. Also, if diagonal groups above the axis XX' are inverted, as many must be inverted below that axis. If one-half the whole number of diagonal groups is inverted, the rest remaining undisturbed, the square becomes a tessellated square of four equivalent sub-squares. As every band may be independently balanced, and, when n

FIG. 28.

1	2	3	4	5	6	7	8
64	63	62	61	60	59	58	57
9	10	11	12	13	14	15	16
56	55	54	53	52	51	50	49
24	23	22	21	20	19	18	17
41	42	43	44	45	46	47	48
32	31	30	29	28	27	26	25
33	34	35	36	37	38	39	40

FIG. 29.

1	2	62	61	60	59	7	8
64	63	3	4	5	6	58	57
56	55	11	12	13	14	50	49
9	10	54	53	52	51	15	16
41	42	22	21	20	19	47	48
24	23	43	44	45	46	18	17
32	31	35	36	37	38	26	25
33	34	30	29	28	27	39	40

exceeds 8, balanced in a variety of ways, a corresponding diversity of arrangements is admissible, which increases with the increase of n. The bands may also be balanced in sections as well as in wholes, and such balanced sections may be interchanged with other balanced sections in any part of the square; so that for a very large value of n it would be difficult to compute the number of variations of which this method is capable. The following diagrams, without numbers, illustrate the method, the shaded cells being those in which couplets or groups are to be inverted.

FIG. 30.

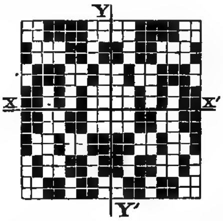
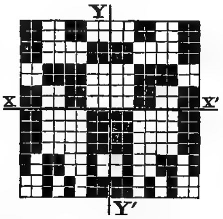


FIG. 31.



Particular examples under most of the general methods of construction thus far described may be found in works heretofore published on this subject. The two methods which follow, and which apply to cases in which n is a power of 2 exceeding the second, have not before appeared. From the form of equation (46) it is evident that ζ cannot be integral if n has no odd factor. The cycles which, when such is the case, are inevitably formed, will cause the lines in the direction of which they occur to sum up unequally, and to be invariably greater or less than the true value of S. Now every purely even square on the root n may be divided into four equal sub-squares with sides equal to $\frac{1}{2}n$. Let these be filled with grades also equal to $\frac{1}{2}n$ (which for convenience we may call sub-grades) with an alternation of movement such as is shown in Fig. 32 and in an order of succession indicated by the numbers in the following Fig. 33.

FIG. 32.

I. Movement Downward and Direct.	II. Movement Upward and Direct.
IV. Movement Upward and Reversed.	III. Movement Downward and Reversed.

FIG. 33.

Order of sub-grades in balanced squares.

Square of 16. Square of 8.

1	1	4	4	4	4	1	1	4	4	1	1	1	1	4	4
2	2	3	3	3	3	2	2	3	3	2	2	2	2	3	3
3	3	2	2	2	2	3	3	2	2	3	3	3	3	2	2
4	4	1	1	1	1	4	4	1	1	4	4	4	4	1	1

Square of 32.

In Fig. 33 the numbers 1, 2, 3, 4, in the first column indicate that the first four sub-grades are to be entered in the successive sub-squares I., II., III., IV., in the order of these numbers, which order is also to be observed with the second four; but the third and fourth series of sub-grades must be entered in reversed order, beginning at IV., and ending at I. This will suffice for the square of 8. For the square of 16, proceed in the same manner so far; and then continue to the close with the entire preceding system reversed. For the square of 32, proceed as for 16, and then as before, continue to the close with the entire preceding system reversed. This rule is general—*i. e.* for each higher power of 2 proceed as for the power next below, and then complete by reversing that proceeding from the beginning. In the selection of values for the increments a, b, a', b', two (extremes or means) should be even and the others odd. There will then be no cycles in the diagonals, but there will be one cycle in each of the remaining directions. One of the cycles will be basic and the other elementary. If the even factor determining or governing the cycle be μ ($n = \mu\nu$) and the value of Δ which is co-ordinate to the cycle (a value which will necessarily be odd) be *unity*, $\mu + 1$, $2\mu + 1$, $3\mu + 1$ . . . . . $m\mu + 1$, we may put $h = 1$, $k = 1$. But if this co-ordinate difference have any other value and μ exceeds 2, we must find proper values for h and k as follows: Write down the first μ terms of the series co-ordinate to the cycle. Subtract μ from each term so written as often as it can be done without reducing the term to zero. Look along the resulting series to find two contiguous terms whose sum is $\mu + 1$. Two such pairs may be found. One of these must be brought to the middle of the series, by transfer of terms from one end to the other. Then the term standing first in the series so transformed, or some term in its dependent cycle, should be made to occupy the cell of the square whose co-ordinates are $x = 1$, $y = 1$. The same process should be pursued if necessary with the other cycle. There will then be known values of p, q, x and y to be substituted in equations (26) and (27) from which h and k may be ascertained. As an illustration of this, suppose $n = 16$, $a = 4$, $b = 5$, $a' = 7$, $b' = 4$. These numbers give $\Delta p_x = 4$, $\Delta p_y = 5$, $\Delta q_x = 7$, $\Delta q_y = 4$. Since in this case $\mu = 4$, and $\Delta p_y = 5 = \mu + 1$, the series E demands no attention. But as $\Delta q_x = 7$, we must form a series of μ (four) terms with this difference, thus:

Original Series, 1, 8, 7, 6. Simplified Series, 1, 4, 3, 2.

Either $4 + 1$, or $3 + 2 = 5 = \mu + 1$. Hence we transfer 1 from one extreme of the series to the other, which gives us,

Transformed Series 4, 3, 2, 1.

There are but two terms in the cycle dependent on 4. They are 4 and 8, and either of these may be taken as the value of q in the cell for which $x = 1$, $y = 1$. As p may be taken $= 1$, we find $h = 8$, $k = 5$. The square is given below, q being taken $= 8$.

FIG. 34.

$a = 4$, $b = 5$, $a' = 7$, $b' = 4$, $h = 8$, $k = 5$.

225	197	**185**	157	**121**	93	**33**	***5***	116	88	44	***16***	236	208	180	152
126	90	38	***2***	230	194	190	154	239	203	183	147	119	83	47	***11***
227	199	187	159	123	95	35	***7***	114	86	42	***14***	234	206	178	150
128	92	40	***4***	232	196	192	156	237	**201**	181	**145**	117	**81**	45	***9***
229	**193**	189	**153**	125	**89**	37	***1***	120	84	48	***12***	240	204	184	148
122	94	34	***6***	226	198	186	158	235	207	179	151	115	87	43	***15***
231	195	191	155	127	91	39	***3***	118	82	46	***10***	238	202	182	146
124	96	36	***8***	228	200	188	160	**233**	205	**177**	149	**113**	85	**41**	***13***
136	164	224	252	***32***	60	72	100	***21***	**49**	77	**105**	141	**169**	213	**241**
27	63	67	103	131	167	219	255	138	174	210	246	***18***	54	74	110
134	162	222	250	***30***	58	70	98	***23***	51	79	107	143	171	215	243
25	61	**65**	101	**129**	165	**217**	253	140	176	212	248	***20***	56	76	112
132	168	220	256	***28***	64	68	104	***17***	53	**73**	109	**137**	173	**209**	245
31	59	71	99	135	163	223	251	142	170	214	242	***22***	50	78	106
130	166	218	254	***26***	62	66	102	***19***	55	75	111	139	175	211	247
29	**57**	69	**97**	133	**161**	221	**249**	144	172	216	244	***24***	52	80	108

To illustrate the principle of this method more fully, a larger value should be given to n. It is unnecessary to construct the square. Put $n = 128$, which gives $\frac{1}{2}n = 64$. Then if $a = 39$, $b = 40$, $a' = 48$, $b' = 51$, we obtain $\Delta p_x = 23$, $\Delta p_y = 48$, $\Delta q_x = 8$, $\Delta q_y = 59$. The cycle of E depends on the factor 16, and that of B on the factor 8. The original series of E is accordingly,

1, 24, 47, 6, 29, 52, 11, 34, 57, 16, 39, 62, 21, 44, 3, 26.

Which simplified is,

$$1, 8, 15, 6, \underbrace{13, 4}, 11, 2, 9, 16, 7, 14, \underbrace{5, 12}, 3, 10.$$

In which $13 + 4$ or $5 + 12 = 17 = \mu + 1$.

The transformed series may begin with either 4 or 12. The two cycles headed by these terms respectively will be 4, 52, 36, 20, and 12, 60, 44, 28, any one of which terms may be taken as the value of p in the cell of which the co-ordinates are $x = 1$, $y = 1$.

The original series of B is in like manner,

$$1, 60, 55, 50, 45, 40, 35, 30; \text{ or simplified, } 1, 4, \underbrace{7, 2}, 5, 8, \underbrace{3, 6}.$$

In which $7 + 2$ or $3 + 6 = 9 = \mu + 1$.

Any term of either of the two cycles of 8 terms each, headed 2 and 6, may be taken as the value of q in the cell above mentioned. The cycles are 2, 10, 18, 26, 34, 42, 50, 58, and 6, 14, 22, 30, 38, 46, 54, 62. If we assume, for instance, $p = 20$, and $q = 38$, we shall have from equations (26) and (27), $h = 44$, and $k = 42$.

The other method spoken of above, which forms an arrangement visibly and pleasingly symmetrical, is as follows. There is first to be formed a succession of equalized bands, each band being two grades in length, by writing the terms from 1 to $2n$ in direct order, and those from $2n + 1$ to $4n$ in reversed order beneath them, proceeding thus up to $\frac{1}{2}n^2$. Then reverse the entire process and continue to the end, or to n^2. Reverse the consequents in all the groups down to $\frac{1}{2}n^2$; also reverse the antecedents in all the remaining groups. This done, invert the right-hand couplets of all the groups down to $\frac{1}{2}n^2$, and the left-hand couplets in all the remaining groups. Then having divided the square into four principal sub-squares, as in Fig. 32, subdivide these into four others still smaller, and these again in like manner successively, until the whole is divided into compartments of four cells each; but the lines of each successive subdivision should be characteristically distinguishable. To fill the square so divided place the successive groups of the first of the equalized bands, prepared as above, in the compartments along the direct diagonals of the sub-squares of Fig. 32, following the movement there directed. The squares of 4 along these direct diagonals will be then half filled. Take the groups of the next band, and beginning in I. at top, as before, fill the transverse diagonals of these squares of 4. The squares of 8 on the direct diagonals will then be half filled. With the third band follow the direct diagonals of the unfilled squares of 4 in these squares of 8, and subsequently the transverse diagonals of the same, always beginning at top. Thus proceed till $\frac{1}{2}n^2$ terms are entered. The remaining terms will then be most conveniently introduced by beginning with the n^2 group at the angle diagonally opposite in the main square to the first, and reversing in every respect, in the order of groups and of movement, the course pursued with the first $\frac{1}{2}n^2$ terms. The following is an example:

FIG. 35.

1	64	65	128	152	169	216	233	232	217	168	153	113	80	49	16
63	2	127	66	170	151	234	215	218	231	154	167	79	114	15	50
67	126	3	62	214	235	150	171	166	155	230	219	51	14	115	78
125	68	61	4	236	213	172	149	156	165	220	229	13	52	77	116
148	173	212	237	5	60	69	124	117	76	53	12	228	221	164	157
174	147	238	211	59	6	123	70	75	118	11	54	222	227	158	163
210	239	146	175	71	122	7	58	55	10	119	74	162	159	226	223
240	209	176	145	121	72	57	8	9	56	73	120	160	161	224	225
32	33	96	97	137	184	201	248	249	200	185	136	112	81	48	17
34	31	98	95	183	138	247	202	199	250	135	186	82	111	18	47
94	99	30	35	203	246	139	182	187	134	251	198	46	19	110	83
100	93	36	29	245	204	181	140	133	188	197	252	20	45	84	109
141	180	205	244	28	37	92	101	108	85	44	21	253	196	189	132
179	142	243	206	38	27	102	91	86	107	22	43	195	254	131	190
207	242	143	178	90	103	26	39	42	23	106	87	191	130	255	194
241	208	177	144	104	89	40	25	24	41	88	105	129	192	193	256

Unevenly Even Numbers.—The case in which 2 is a factor once only in n, commonly called the case of unevenly even numbers, is yet to be considered. The algebraic expression for an unevenly even number is $n = 2(2m + 1)$. Its square is

$$n^2 = \Big(2(2m + 1)\Big)^2 = 16m^2 + 16m + 4. \qquad (48)$$

The portion of this represented by $16m^2$ is a square of $4m$; and if the remaining terms be omitted, either from the beginning or from the end of the series, or symmetrically any how in reference to the grades of $16m^2$, these may be employed to construct a regular magic square by means of any of the methods heretofore described. The $16m + 4$ terms in excess of this square are just sufficient in number to form a border round it, four occupying the angles, and the remainder the four sides. Suppose $8m + 2$ of these terms, that is one-half, be taken from the beginning, and the other $8m + 2$ from the end of the general series. The whole will then form $8m + 2$ normal couplets, each having a sum $= n^2 + 1$, which denote by s. If the antecedent and consequent of each of these couplets be arranged directly opposite to each other, vertically, horizontally, and diagonally around the square already formed, they will increase each such row by the same amount s; so that if the sum of a row in this lesser square is S', and the corresponding sum in the enlarged square S, we shall have $S' + s = S$. So much is easily accomplished. What remains to be done is so to dispose the marginal numbers that they also, when added up in line, shall give a sum $= S$.

FIG. 36.

Unevenly even square.

1	98	4	96	6	94	8	92	56	50
99	10	11	89	88	87	86	16	17	2
43	91	90	12	13	14	15	85	84	58
59	26	69	70	29	30	73	74	33	42
46	67	40	65	38	37	62	35	60	55
57	41	66	39	64	63	36	61	34	44
47	68	27	28	71	72	31	32	75	54
53	25	24	78	79	80	81	19	18	49
48	76	77	23	22	21	20	82	83	52
51	3	97	5	95	7	93	9	45	100

FIG. 37.

49	41	59	44	57	56	46	54	48	51
68	1	16	92	93	17	32	77	76	33
34	99	86	7	10	83	70	23	26	67
66	8	9	100	85	24	25	84	69	35
36	94	91	2	15	78	75	18	31	65
37	3	14	95	90	19	30	79	74	64
63	97	88	5	12	81	72	21	28	38
39	6	11	98	87	22	27	82	71	62
61	96	89	4	13	80	73	20	29	40
52	60	42	58	43	45	55	47	53	50

This cannot be completely accomplished by balancing the groups in the manner heretofore described, and illustrated in Figs. 24 to 31, since two groups or four couplets are necessary to a balance, and $2m + 1$, the number of groups to be balanced in this case, is odd. It will however be found practicable to make the marginal rows equal at the expense of equality in some other row or rows; and the irregularity thus introduced may usually be removed by transposing a few terms in the interior of the square. But the desired result may be effected without disturbing the interior terms, as follows:

Of the series of antecedents the first term is 1 and the last is $(8m + 2) = (2n - 2)$. These two terms are to be placed in the angles at top, the first on the left and the second on the right, and their supplements diagonally opposite to them. They are called the diagonal terms. The remaining antecedents are to be arranged as follows, their consequents being directly opposite to them:

At top, the even terms 4, 6, 8 . . . $n - 2$.

At bottom, the odd terms 3, 5, 7 . . . $n-1$, and the odd term $(\frac{3}{2}n-2)$.

On the right, the even term 2, and the series n, $(n+2)$, $(n+4)$ . . . $(2n-4)$ with the exception of the even term $(\frac{3}{2}n-1)$.

On the left, the odd terms $(n+1)$, $(n+3)$ . . . $(2n-3)$ with the exception of the odd term $(\frac{3}{2}n-2)$ and the addition of the even term $(\frac{3}{2}n-1)$. If the numbers selected as antecedents are not consecutive, these symbols must be understood to indicate *place in series* and not value.

Figs. 36 and 37 on preceding page are illustrations.

It is not necessary that these rows should occupy the border of the square. They may be interposed between those of the even square $16m^2$, provided only they be equally advanced from the exterior, and that the diagonal terms always occupy the intersections. Neither is it necessary that the antecedents $8m+2$ should be consecutive. They may be taken from the beginning or the end of the half series 1, 2 . . . . $\frac{1}{2}n^2$, or may be the first or the last $8m+2$ *odd* numbers, or the first or the last $8m+2$ even numbers. Or they may be the first $8m+2$ terms in arithmetical progression with any common difference, though thus they may overrun the limit $\frac{1}{2}n^2$, but must not pass beyond n^2. Finally, one-half the number, viz. $4m+1$, may be taken from the beginning, and the other from the end of the series 1, 2, 3 . . . $\frac{1}{2}n^2$, or these two halves may be anyhow placed symmetrically in the series, so that the remaining terms may form the even square. In Fig. 36 the antecedents are the first nine and the last nine of $50(=\frac{1}{2}n^2)$; other examples are given below:

Fig. 37 is an example in which the $8m+2$ antecedents, together with their consequents, are taken from the middle of the entire series. The marginal rows are made equal by balancing at the expense of an inequality in the fourth and fifth columns, which is compensated by transposing the terms 92 and 93, indicated by printing in heavy type. The interior square is tessellated, except as to these terms.

FIG. 38.

1	194	**193**	**6**	157	9	186	185	14	**40**	17	178	177	22
195	5	32	2	77	187	97	100	10	120	179	181	176	18
7	189	168	190	121	15	107	90	182	76	23	13	24	174
191	3	4	196	80	183	11	12	188	117	175	19	**20**	180
152	144	48	136	37	56	64	128	74	88	125	81	124	122
25	170	**169**	**30**	119	33	162	161	38	78	41	154	153	46
171	**106**	104	26	**82**	163	89	98	34	115	155	92	102	42
31	**91**	93	166	118	39	99	108	158	79	47	105	**95**	150
167	27	28	172	83	159	35	36	164	114	151	43	44	156
45	53	149	61	**109**	141	133	**69**	123	**160**	72	116	73	75
49	146	145	54	113	57	138	137	62	84	65	130	129	70
147	16	21	50	85	139	103	94	**58**	112	131	192	165	66
55	184	173	142	111	**63**	96	101	134	86	71	**8**	29	126
143	51	52	148	87	135	59	60	140	110	127	67	68	132

FIG. 39.

27	168	30	166	164	**36**	25	172	37	158	40	156	154	**46**
34	67	128	127	72	163	175	22	44	75	120	119	80	153
169	129	71	98	68	28	21	176	159	121	115	110	76	38
35	73	123	102	124	162	181	16	45	81	79	90	116	152
165	125	69	70	130	**32**	17	180	155	117	77	78	122	42
161	29	167	31	33	170	195	2	151	39	157	41	43	160
178	186	10	190	6	194	1	26	192	4	188	8	184	12
19	11	187	7	191	**3**	171	196	5	193	**9**	189	13	185
57	138	60	136	134	66	183	14	47	148	50	146	144	56
64	91	104	103	**96**	133	15	182	54	83	112	111	88	143
139	105	82	87	92	58	179	18	149	113	126	**99**	84	**48**
65	97	118	107	100	132	20	177	55	89	74	95	108	**142**
135	101	93	94	106	62	173	24	145	109	85	86	114	52
131	**59**	137	61	63	140	23	174	141	49	147	51	53	150

Bordered and Inlaid Squares.—As in the squares last described the magic character exists whether the border rows are present or absent, the question suggests itself whether this method may not be generalized. When $n = 4m$, the interior square may be made independent of the border, and *vice versâ*, by the simple expedient of balancing groups against each other; which can always be done, since $2m$, the number of groups to be balanced, is necessarily even. Rules, however, both for evenly even and for odd numbers may be given analogous to that given for unevenly even numbers above, as follows:

For *evenly even numbers:* place the diagonal terms as before; afterward,

At top, the even terms 4, 6, 8 . . . $n-2$.

At bottom, the odd terms 3, 5, 7 . . . $n-1$, and the even term $(\frac{3}{2}n-2)$.

On the right, the even term 2 and the series n, $(n+2)$, $(n+4)$ . . . $(2n-4)$ with the exception of the even term $(\frac{3}{2}n-2)$ and the addition of the odd term $(\frac{3}{2}n-1)$.

On the left; the odd terms $(n+1)$, $(n+3)$ . . . $(2n-3)$, with the exception of the odd term $(\frac{3}{2}n-1)$ and the addition of the even term $\frac{3}{2}n$.

For odd numbers: the diagonal terms are 2 and $2n-2$. These being placed in the upper angles, the remaining antecedents are arranged as follows:

At top, the odd terms $(n+2)$, $(n+4)$ . . . $(2n-3)$.

At bottom, the odd terms 1, 3, 5 . . . $(n-2)$.

On the right, the even terms, $(n+1)$, $(n+3)$ . . . $(2n-4)$ and the odd term n.

On the left, the series of even terms 4, 6, 8 . . . $(n-1)$.

In all cases the consequents are to be placed directly opposite to the antecedents. By means of the methods here described, a square may be constructed like a nest of boxes, admitting the removal successively of its exterior rows, and still remaining magic. An odd square may be built up in this way from the very central cell; but in an even square, the interior nucleus cannot be less than the square of 4. (See APPENDIX).

FIG. 40.
Even-numbered built-up square.

51	92	54	**90**	56	**88**	58	86	60	**84**	79	72
93	33	110	36	108	38	106	**40**	104	100	**50**	52
71	43	19	124	22	122	24	120	117	**32**	102	74
83	111	27	**9**	134	12	132	130	18	118	34	62
69	46	125	16	6	140	7	137	129	**20**	99	76
81	103	30	135	143	1	142	4	10	115	42	64
68	47	119	17	138	8	139	5	128	26	98	77
78	101	31	131	3	141	2	144	14	114	44	67
65	49	116	127	11	133	13	15	136	29	96	80
75	97	113	21	123	23	121	25	28	126	48	70
63	95	35	109	37	107	39	105	41	45	112	82
73	53	91	**55**	89	57	87	**59**	85	61	66	94

FIG. 41.
Odd-numbered built-up square.

2	113	19	117	15	121	13	119	17	115	**20**
106	**22**	95	35	101	31	99	33	97	36	16
4	**92**	38	85	47	**83**	45	81	48	30	118
110	24	78	50	73	71	55	56	44	98	12
6	**93**	40	52	**58**	**65**	60	70	82	29	116
111	26	79	69	63	61	59	53	43	96	11
8	90	42	68	62	57	**64**	54	80	32	114
108	28	76	**66**	49	51	67	72	46	94	14
10	88	74	37	75	39	77	41	84	**34**	112
104	86	27	87	21	91	23	89	25	100	18
102	9	**103**	5	107	1	109	3	105	7	120

Inlaid squares are those from which an interior rectangular row may be removed leaving the central square still magic, while the exterior portions, by dropping certain couplets, may be closed up on the central, preserving the magical character still. Fig. 42 is such a square. If along with the interior quadrilateral the middle marginal groups be dropped, the remaining portions of the square closed up will be magic.

FIG. 42.
Inlaid square.

1	2	98	97	25	76	96	95	7	8
99	100	3	4	75	26	5	6	93	94
17	83	33	36	66	64	62	42	82	20
84	18	67	43	50	55	54	34	19	81
29	71	63	57	52	45	48	38	70	32
72	30	40	46	47	58	51	61	31	69
21	79	41	56	53	44	49	60	78	24
80	22	59	65	35	37	39	68	23	77
86	85	14	13	74	27	12	11	92	91
16	15	87	88	28	73	89	90	10	9

Figures 38 and 39 have the properties of inlaid squares. In Fig. 38, for instance, if the four intersecting cross-bars be removed, and the nine squares of 4 remaining be brought together, the resulting square will be magic. If the five of these which form a cross be dropped, the four still remaining will be magic. If without dropping the cross, the borders of all the nine be removed, the central groups united will form a magic square; and if the five of these groups which form a cross be dropped, the four angular groups brought together will produce a magic square of 4 which will be perfect.

In Fig. 39, if the central cross be excluded, the four bordered squares of 6 united will retain the magic character. If the borders of these be dropped, the remaining squares of 4 will form still a magic square; and if the borders of these be also dropped, the central groups united will constitute again a perfect square of 4.

There is still another mode of constructing unevenly even squares which may be briefly noticed. Let the square to be filled be divided into compartments of four cells each, and arrange the general series in consecutive current groups. Treat these groups as single terms, and the four-celled compartments as single cells. Proceed to fill the compartments with these groups by any of the methods heretofore given, and equalize the sums of the columns by balancing the inequalities of the current groups against each other, the several groups being so arranged that their diagonal sums shall be equal. The greater inequalities may, for instance, be balanced in the vertical lines, and the lesser in the horizontal, the odd groups in the middle of each side being disposed of as in Fig. 42, with the lines of equal summation parallel to the sides 43, 44. A special arrangement is necessary for the five groups in and about the intersection of the central bands, such as is shown in Fig. 45. The isolated groups surrounding this figure are types for the arrangement of all other groups which may fall either into these bands continued or into the rectangular spaces into which they divide the square. The method may be applied, as in Fig. 44, to evenly even squares, in which case the four angular groups are the only guide needed.

FIG. 43.
Unevenly even-numbered square with current groups.

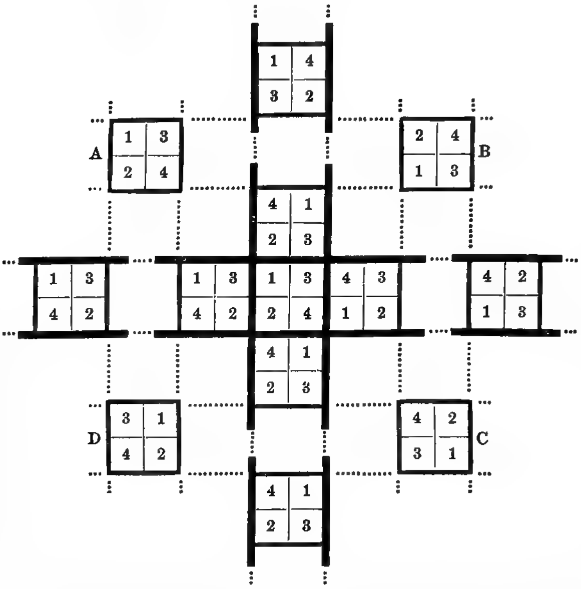
1	3	93	95	65	68	58	60	30	32
2	4	94	96	67	66	57	59	29	31
77	79	49	51	24	21	14	16	86	88
78	80	50	52	22	23	13	15	85	87
33	35	5	7	97	99	72	71	44	42
36	34	8	6	98	100	69	70	41	43
91	89	63	61	56	53	28	26	20	18
92	90	64	62	54	55	27	25	19	17
47	45	39	37	12	9	84	82	76	74
48	46	40	38	10	11	83	81	75	73

FIG. 44.
Even-numbered square with current groups.

1	3	29	31	50	52	46	48
2	4	30	32	49	51	45	47
57	59	37	39	10	12	22	24
58	60	38	40	9	11	21	23
15	13	19	17	64	62	36	34
16	14	20	18	63	61	35	33
55	53	43	41	8	6	28	26
56	54	44	42	7	5	27	25

This square is perfectly magic.

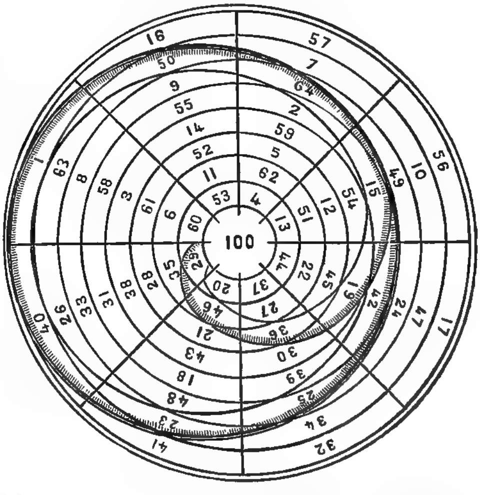
FIG. 45.
Construction of unevenly even squares by current groups.



If $n = 4m$, the intersecting bands are replaced by the central axes of the square, and the only guides needed are the four groups, A, B, C, D.

Magic Circles.—Dr. Franklin devised an arrangement of the terms of a series to which he applied the name of Magic Circle. This need not detain us long, since it is only a transformation of a well-known magic square. In fact, if the vertical columns in a square of 8 on the plan of Fig. 21 be written in their actual order on eight equidistant radii of a circle, the tops or the bottoms of the columns being directed toward the centre, and the number 100 in the centre, then the sum of any radial column added to this central number will give 360 = the number of degrees in a circumference. Also, the sum of any four contiguous terms forming a quadrate group, together with half the central number, or 50, will give 180 = the number of degrees in a semicircle. Dr. Franklin disguised to some extent the character of the contrivance by adding 11 to

FIG. 46.
Magic Circle and Cyclovolute.



every term in the radial columns and reducing the central number by eight times 11 (= 88), leaving it 12, which has a semblance of relation to the sexagesimal notation. By means also of an ingenious geometrical artifice he seemingly increased the marvellous character of the arrangement. The radius of the interior circumference being made equal to once and a half the distance between the successive circumferences, it happens that a ring having a breadth of once this distance, centred at any intersection of the interior circumference with one of the dividing lines between the radial columns, and touching the outer circumference, will fall on a series of numbers whose sum added to the central number will equal 360. But this is only an indirect way of stating the property of the bent diagonals in the square Fig. 21. Mr. Eugene Nulty, in the *Transactions of the Am. Philosophical Society*, vol. v., new series, 1837, has pointed out, further, that a spiral band (which he calls a cyclovolute) coinciding with the ring above described for half its course and afterwards winding downward to the inner circumference at the centre of the ring, will give a similar sum. This is also an indirect way of saying that the *unbent* diagonals of the square Fig. 21 sum up equally. Fig. 46 on preceding page represents Franklin's magic circle, with one of the rings and one of the volutes.

Magic Cubes.—The arrangement of the terms of an arithmetical series in the form of a cube so that each linear row of terms parallel to the edges or to the diagonals may sum up equally, is a problem which appears not to have been hitherto considered. It is one of a much higher degree of complication than that presented by the square. In a perfect magic square every term is a member of four different series all having the same sum. In a perfect magic cube the number of such equal series of which every term must be a member is thirteen. To construct such a cube by any merely tentative process must evidently be a matter of great difficulty. But by applying the principles already employed in the construction of squares, we may readily succeed in reaching a satisfactory result.

The cube being a magnitude of three dimensions, we assume three co-ordinates, x, y, and z, and three independent increments of different values, a, b, and c. There are also grades of two different orders; linear grades and superficial or quadrate grades; with corresponding basic series of two orders likewise, which may be distinguished as linear bases and quadrate bases, the latter being denoted by the letter Q. It follows that magic cubes admit of the same classification as magic squares, viz. 1, Cubes in which every term of every series, E, B, or Q, is found in every line; and 2, Cubes in which terms of one or more of these series are so repeated as to be compensatory. And as we have employed p to denote the place of the term in its linear grade, and q to indicate the number of such grade, so r may stand for the number of the quadrate grade. Also, as a', b', and c' are the increments corresponding to the leading terms of the linear grades, in like manner a'', b'', and c'' will be those corresponding to the same terms of the quadrate grades. From these assumptions we derive the equations following, from which, for the sake of simplicity, we omit, as before, the negative indeterminate multiples of n:

$$x = h + (p-1)a + (q-1)a' + (r-1)a''. \qquad (49)$$
$$y = k + (p-1)b + (q-1)b' + (r-1)b''. \qquad (50)$$
$$z = l + (p-1)c + (q-1)c' + (r-1)c''. \qquad (51)$$

Whence we deduce the values of p, q, and r:

$$p = \frac{(b'c'' - b''c')(x-h) + (a''c' - a'c'')(y-k) + (a'b'' - a''b')(z-l)}{a''(bc' - b'c) + b''(a'c - ac') + c''(ab' - a'b)} + 1. \qquad (52)$$

$$q = \frac{(bc'' - b''c)(x-h) + (a''c - ac'')(y-k) + (ab'' - a''b)(z-l)}{a''(bc' - b'c) + b''(a'c - ac') + c''(ab' - a'b)} + 1. \qquad (53)$$

$$r = \frac{(bc' - b'c)(x-h) + (a'c - ac')(y-k) + (ab' - a'b)(z-l)}{a''(bc' - b'c) + b''(a'c - ac') + c''(ab' - a'b)} + 1. \qquad (54)$$

These expressions admit of simplification. Since to the construction of a perfectly magic cube it is only necessary that no term shall be in line with another of its own grade, nor with another similarly placed in a different grade, and since this object may be more easily secured if one increment out of each triplet is made zero than if all have an actual value, provided the term made zero is different in each triplet, we may put $c = 0$, $a' = 0$, $b'' = 0$; when the foregoing expressions for p, q, and r will become

$$p = \frac{b'c''(x-h) + a''c'(y-k) - a''b'(z-l)}{ab'c'' + a''bc'} + 1. \qquad (55)$$

$$q = \frac{bc''(x-h) - ac''(y-k) - a''b(z-l)}{ab'c'' + a''bc'} + 1. \qquad (56)$$

$$r = \frac{bc'(x-h) - ac'(y-k) + ab'(z-l)}{ab'c'' + a''bc'} + 1. \qquad (57)$$

In order that there may be no interference of terms in the construction of the cube, it will be understood that no pair of increments (*i. e.* neither a and b, nor b' and c', nor a'' and c'') may have a common factor with n, and that n must not be commensurable with the common denominator of the values of p, q, and r, above. The same principles in regard to the occurrence of cycles will also govern here as in the case of squares. From these equations we deduce the values of the differences of the three series, viz. the elementary series, the linear-base series, and the quadrate-base series, precisely as from the equations of the squares (28) and (29). These differences are thirty-nine in all, thirteen for each series. For, assuming the initial term to be placed in the cubic cell of which the co-ordinates are $x = 1$, $y = 1$, $z = 1$, seven lines will diverge from this, viz. three parallel to the edges of the cube, three direct diagonals of the faces intersecting at the origin, and one direct diagonal of the solid. Besides these, there are the three transverse diagonals of the same faces, and three transverse diagonals of the solid likewise. These, for the series E, are denoted by the symbols, Δp_x, Δp_y, Δp_z, Δp_{xy}, Δp_{xz}, Δp_{yz}, Δp_{-xy}, Δp_{-xz}, Δp_{-yz}, Δp_{xyz}, Δp_{-xyz}, Δp_{-xzy}, Δp_{-yzx}; in which the negative sign prefixed to the subscript exponent denotes that the ordinate of which the symbol is placed last is diminishing, while the others are increasing. This indication fixes the position of the diagonal; the point of departure being taken on the axis of diminishing ordinates at the maximum distance from the origin, and the direction being toward the solid angle diametrically opposite. There will of course be an equal number of forms of Δq and Δr. But in order to ascertain whether a given combination of increments will make a cube magical or not, or will make it perfectly or imperfectly so, it is not necessary to calculate—that is, to find the integral value—of every one of these differences. Putting first, for simplicity, h, k, and l each = unity, we find the coefficients of x, y, and z in the foregoing equations, and then consider whether any one of these, or the sum or difference of any two of them, or any sum or difference which can be made with all three of them in each equation severally, is equal to or is a multiple of n, or is zero. In such a case there may be a magic cube, but not a cube perfectly magical. If any coefficient, or any sum or difference of coefficients, has a common factor with n, there will be cycles, with the same consequences as in squares; but the prejudicial effect of these may be removed in this case as in that, by so permuting the terms in the grades, and also the grades themselves, both linear and quadrate if necessary, as to make the cycles equal. If every coefficient, and every sum and difference of coefficients, is prime to n, the cube will be perfect, and the same will be true when they are not prime, provided the resulting cycles are equalized. The number of conditions to be fulfilled is so great that no prime number smaller than 11 will afford a cube perfectly magical. The smallest perfect even number cube is that of 8, and the smallest perfect odd number cube, that of 9. With this last root the latitude of choice in the selection of values for the increments is very limited; but a perfectly magical cube will be formed if we put $a = 7$, $b = 4$, $b' = 2$, $c' = 5$, $a'' = 5$, $c'' = 2$, provided the series be permuted as in Fig. 11.

To illustrate the method of determining the character which a cube constructed with given increments will possess, let us suppose $n = 11$, $a = 7$, $b = 3$, $b' = 5$, $c' = 7$, $a'' = 3$, $c'' = 4$. These when substituted in the above equations give the following values of p, q, and r:

$$p = \frac{20x + 21y - 15z - 26}{203\ (=5)} + 1. \qquad (58)$$

$$q = \frac{12x - 28y + 9z + 7}{5} + 1. \qquad (59)$$

$$r = \frac{21x - 49y + 35z - 7}{5} + 1. \qquad (60)$$

If the coefficients of x, y, and z, in these expressions for p, q, and r, be represented by A, B, C; A′, B′, C′; A″, B″, C″, respectively, we must examine first, for p, whether A or B, or C, or A + B, or A − B, or A + C, or A − C, or B + C, or B − C, or A + B + C, or A + B − C, or A + C − B, or

B + C − A, is either divisible by n (= 11) or is zero. If neither, the cube will be perfect so far as the series E is concerned. And if the same is found true for A′, B′, C′, and for A″, B″, C″, it will be perfect in the series B and in the series Q also. But when any one of these numbers or combinations of numbers is zero or is a multiple of n, the cube, though it may be magic, will be imperfectly so in the direction and in the series corresponding to the value of Δ in which this occurs. In the case foregoing we have

$$\begin{array}{lll}
A = 20 & A' = 12 & A'' = 21 \\
B = 21 & B' = 28 & B'' = 49 \\
C = 15 & C' = 9 & C'' = 35 \\
A + B = 41 & A' + B' = 40 & A'' + B'' = 70 \\
A - B = 1 & A' - B' = 16 & A'' - B'' = 28 \\
A + C = 35 & A' + C' = 21 & A'' + C'' = 56 \\
A - C = 5 & A' - C' = 3 & A'' - C'' = 14 \\
B + C = 36 & B' + C' = 37 & B'' + C'' = 84 \\
B - C = 6 & B' - C' = 19 & B'' - C'' = 14 \\
A + B + C = 56 & A' + B' + C' = 49 & A'' + B'' + C'' = 105 \\
A + B - C = 26 & A' + B' - C' = 31 & A'' + B'' - C'' = 35 \\
A + C - B = 14 & A' + C' - B' = 7 & A'' + C'' - B'' = 7 \\
B + C - A = 16 & B' + C' - A' = 25 & B'' + C'' - A'' = 63
\end{array}$$

No one of these results being zero or divisible by 11, it follows that the cube of 11 constructed with the given increments will be perfectly magical, and that all the rows parallel to its several edges or to the diagonals of its faces, or to those of the solid itself, whether these diagonal parallels are whole or broken, will sum up equally. It will be noticed that when, in these comparisons, there is obtained a negative result, the sign is omitted, as being of no importance to the test.

It is proper here to remark that, between the increments a, b, b', c', etc., there exist certain necessary relations which may serve as useful guides in the selection of values for these increments. The symbols A, B, C, etc., used above, represent nine products, or binary combinations, in the formation of which each increment is multiplied into every other which is neither analogous to it (of the same pair) nor homologous with it (of the same letter). If any one of these products is a multiple of n, the cube cannot be perfectly magical. In the application of this test, which is easy, a is tried with both terms of the second pair, and with the one unlike itself in the third; b, with both of the third and one of the second: b', with both of the third, and c' with one of the third. Secondly, among the combinations of A, B, C, etc., illustrated above, are some of which the expressions $(a \pm b)c'$, $(b' \pm c')a$, $(a'' \pm c'')b'$, and others similar, are the equivalents. From these we infer that if the sum of any pair of increments is n, or their difference zero, the cube cannot be perfect; and also that if (putting $n = \mu\nu$) the sum or the difference of any pair is a multiple of μ, and the other factor in the foregoing formulæ a multiple at the same time of ν, or $v.\ v.$, the cube cannot be perfect. Moreover, as the common denominator of all the equations is the sum of the products of the two triads, a, b', c'' and a'', b, c', if one or more of the factors in either of those triads has a common measure with n, and any one of those of the other triad has the same common measure, there will be interference, and the cube cannot be constructed at all.

These principles, however, are only applicable to the cases represented by the equations (55), (56), and (57). If all the increments have values greater than zero, it is permissible that any pair may have a difference equal to zero or a sum equal to n in one of the triplets, provided that no homologous pair in either of the other triplets has a similar difference or a similar sum, but if any two homologous pairs sum up severally equal to n, or if their differences are severally zero, the cube will be imperfect in some of the diagonals dependent on the combination of such pairs. The test of the fitness of a given selection of increments must in this case be made by means of equa-

Fig. 47.

Magic Cube of 8—perfectly magical.

$a = 1, b = 2, b' = 1, c' = 2, a'' = 2, c'' = 3, h = 1, k = 1.$ Order: 1, 2, 3, 4, 8, 7, 6, 5.

1

1	490	59	468	8	495	62	469
144	359	182	349	137	354	179	348
465	2	491	60	472	7	494	61
352	143	358	181	345	138	355	180
57	466	3	492	64	471	6	493
184	351	142	357	177	346	139	356
489	58	467	4	496	63	470	5
360	183	350	141	353	178	347	140

2

251	276	200	303	254	277	193	298
438	93	393	98	435	92	400	103
299	252	280	199	302	253	273	194
102	437	89	394	99	436	96	399
195	300	256	279	198	301	249	274
398	101	433	90	395	100	440	95
275	196	304	255	278	197	297	250
94	397	97	434	91	396	104	439

3

328	175	382	149	321	170	379	148
9	482	51	476	16	487	54	477
152	327	174	381	145	322	171	380
473	10	483	52	480	15	486	53
384	151	326	173	377	146	323	172
49	474	11	484	56	479	14	485
176	383	150	325	169	378	147	324
481	50	475	12	488	55	478	13

4

126	405	65	426	123	404	72	431
243	284	208	295	246	285	201	290
430	125	401	66	427	124	408	71
291	244	288	207	294	245	281	202
70	429	121	402	67	428	128	407
203	292	248	287	206	293	241	282
406	69	425	122	403	68	432	127
283	204	296	247	286	205	289	242

5

449	42	507	20	456	47	510	21
336	167	374	157	329	162	371	156
17	450	43	508	24	455	46	509
160	335	166	373	153	330	163	372
505	18	451	44	512	23	454	45
376	159	334	165	369	154	331	164
41	506	19	452	48	511	22	453
168	375	158	333	161	370	155	332

6

315	212	264	239	318	213	257	234
118	413	73	418	115	412	80	423
235	316	216	263	238	317	209	258
422	117	409	74	419	116	416	79
259	236	320	215	262	237	313	210
78	421	113	410	75	420	120	415
211	260	240	319	214	261	233	314
414	77	417	114	411	76	424	119

7

136	367	190	341	129	362	187	340
457	34	499	28	464	39	502	29
344	135	366	189	337	130	363	188
25	458	35	500	32	463	38	501
192	343	134	365	185	338	131	364
497	26	459	36	504	31	462	37
368	191	342	133	361	186	339	132
33	498	27	460	40	503	30	461

8

446	85	385	106	443	84	392	111
307	220	272	231	310	221	265	226
110	445	81	386	107	444	88	391
227	308	224	271	230	309	217	266
390	109	441	82	387	108	448	87
267	228	312	223	270	229	305	218
86	389	105	442	83	388	112	447
219	268	232	311	222	269	225	306

tions (52), (53), and (54), but the symbols A, B, C, etc. represent here not simple products but differences of products. As an example let there be taken $a=1$, $b=5$, $c=6$: $a'=2$, $b'=3$, $c'=3$; $a''=4$, $b''=5$, $c''=4$; and $n=11$ as before. These, substituted in the equations, give

$$p=\frac{4y-3x-2z+1}{5}+1. \qquad (61)$$

$$q=\frac{20y-10x-15z+5}{5}+1. \qquad (62)$$

$$r=\frac{9y-3x-7z+1}{5}+1. \qquad (63)$$

From which we derive the values,

$$\begin{array}{lll} A=3 & A'=10 & A''=3 \\ B=4 & B'=20 & B''=9 \\ C=2 & C'=15 & C''=7 \end{array}$$

As no one of these individual numbers, and no possible combination, made by means of the signs + and −, of the several members of either of the triplets, is divisible by 11, or is zero, it follows that the cube constructed according to this law will be perfectly magic. In this case, and in that of the cube of 11 mentioned above, the indications of theory have been verified by actual construction.

In Fig. 47 there is presented a cube perfectly magic on the number 8. In this example cycles are formed in each of the series, P, L, and Q, and in the direction of all the three co-ordinates, x, y, and z; but the effect of these is compensated by following, in every series, the order, 1, 2, 3, 4, 8, 7, 6, 5. The eight squares here exhibited are those parallel to the plane xy, which to form the cube should be placed one before the other in the order of their numbers. In order to verify the properties ascribed to the cube, we select for addition the terms which, in this arrangement, are brought in any direction into line. Observing that the value of S must in general be equal to the sum of an arithmetical series of which the first term is 1, the last term n^3, and the number of terms n, we have

$$S=\tfrac{1}{2}n(n^3+1)=\tfrac{1}{2}(n^4+n). \qquad (64)$$

And for the cube of 8,

$$S=\tfrac{1}{2}(8^4+8)=\tfrac{1}{2}(4096+8)=2052.$$

The row parallel to z on the right upper edge is then,

$$469+298+148+431+21+234+340+111=2052=S.$$

The direct diagonal of the solid is

$$1+93+174+207+512+420+339+306=2052=S.$$

The transverse diagonal $-yzx$ is

$$469+400+322+294+44+113+191+219=2052=S.$$

The broken diagonal parallel to $-xzy$, beginning at 141 and ending at 385, is,

$$141+278+479+128+372+235+34+385=2052=S.$$

And so of others.

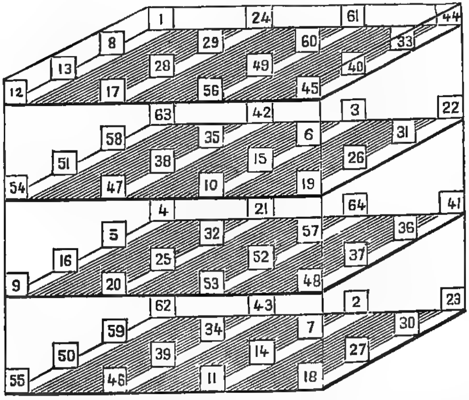
It is impossible otherwise than in this manner to exhibit magic cubes to the eye, except those of the smallest roots, which are necessarily more or less imperfect. The following diagram presents a cube of the number 4, which is magical except in the rows parallel to z, and in the diagonals of the faces xz, and two of those of the solid. In this figure every cubic tessera of eight terms, however taken, will be found to give the same sum; and cubes of the higher powers of 2 may be made to possess the same property, as is true of the cube of 8, Fig. 47.

FIG. 48.

Magic Cube of 4—imperfectly magical.

$a=2$, $b=3$, $b'=2$, $c'=1$, $a''=1$, $c''=3$, $h=1$, $k=1$.

Order, 1, 2, 4, 3.



Perfectly magic cubes may be formed on all numbers from 8 upward except the unevenly even. Odd-numbered cubes imperfect only in the diagonals may have all the diagonals passing through the central cell, whether of the solid or of the planes parallel to the faces, made equal, by giving to h, k, and l, the values determined by the equations,

$$h=\tfrac{1}{2}(n+1)-\tfrac{1}{2}(n-1)(a+a'+a''). \qquad (65)$$

$$k=\tfrac{1}{2}(n+1)-\tfrac{1}{2}(n-1)(b+b'+b''). \qquad (66)$$

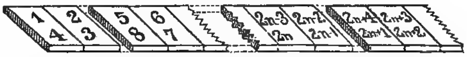
$$l=\tfrac{1}{2}(n+1)-\tfrac{1}{2}(n-1)(c+c'+c''). \qquad (67)$$

The effect of this is to bring the middle term of the general series, which is also the middle term of a series E, a series B, and a series Q, to the central cell of the cube. This takes place whether the cube is perfect or imperfect. For the perfect cube of 11 last considered, the values deduced from the foregoing equations are $h=4$, $k=7$, $l=7$.

Special Methods for Numbers Divisible by 8.—Magic cubes can be formed on numbers divisible by 8 by methods analogous to those described for squares of numbers divisible by 4. It will suffice to mention a single one of these; others may easily be devised by applying the principles heretofore explained. As in forming magic squares in accordance with these methods we begin by preparing equalized bands, so here we in the first place prepare what we may call equalized prisms. Let us suppose these prisms to be both equalized and equivalent. They will be composed of equivalent cubic tesseræ of 8 terms each, which are constructed as follows:

Arrange all the terms of the general series in a band of current groups horizontally, thus:

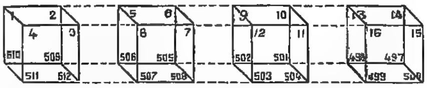
FIG. 49.



That is to say, the order in each current group is from left to right up to the term $2n$; then from right to left up to the term $4n$; then from left to right again to $6n$, and so on alternately as far as $\frac{1}{4}n^3$; every odd double grade having the first described movement and every even double grade the second. After this the odd grades take the second movement, and the even the first, up to $\frac{1}{2}n^3$; between which point and the end the entire preceding system is reversed. The last half of this band of groups is then to be brought beneath the first, not by folding under backward, but by swinging around upon an imaginary pivot at the middle point of the band. The elongated prism thus formed may be cut up subsequently into short ones, each in length equal to n, the first of which, for the cube of 8, is, for illustration, given in the figure below. The entire number of these prisms will be $\frac{1}{4}n^2$.

FIG. 50.

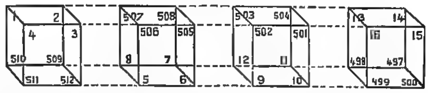
Equalized Prism.



Suppose these to be arranged in their order one beneath the other upon the plane of the co-ordinates xy. A number of them equal to $\frac{1}{2}n$ will cover the plane. In front of these is to be placed a second series in the same order, and so on until the cube is complete. Afterwards, for the purpose of balancing the linear rows, give to every even numbered tessera in the first half of the first prism, and to every odd numbered one in the second half, a motion of rotation round the axis of the prism of half a revolution. The result is shown in Fig. 51. Do the same in the prisms symmetrically opposite to this both on the plane xy and on the plane xz. In the prism next below and in its symmetrically opposed associate prisms in these planes rotate the odd tesseræ in the first half, and the even in the second. So proceed till the first series has been completed, and then continue in like manner with that next in front, reversing however the order of succession of rotations, but in the third resuming the original order, and continuing with similar alternation until all are balanced. All the linear rows parallel to the edges of the prism, all the diagonals of the solid, and all those of the several planes except those parallel to xz will then sum up equally.

FIG. 51.

Balanced Prism.



By applying the principles already explained under squares, there may be formed tesserated cubes on numbers having the form of $n=8m$; and there may also be formed cubes in shells, answering to bordered squares, in which the external strata of terms may be removed from all the sides, leaving the internal cube still magic; but the strata so removed must be two figures deep on every side.

In conclusion it may be observed, as to general methods, that the *law of construction* of a magic square or cube is known when the several increments of all its co-ordinates are given. The *system* of construction is known when, along with these values, those of the co-ordinates of the initial term are given. If, in any magic cube of which the system of construction is known, the numerical value of any term given by its co-ordinates, be represented by N, the following equation will be true, viz.:

$$N = p + (q-1)n + (r-1)n^2. \qquad (68)$$

And as, in such a cube, the values of p, q, and r are directly deducible from equations (52), (53), and (54), or from equations (55), (56), and (57), it is practicable to determine, without construction, or without inspection of the cube as constructed, what term must occupy any assignable place. Again, if N be given, but not its co-ordinates, p, q, and r are ascertainable by means of the formulæ,

$$r = \left(\frac{N}{n^2}\right)_q + 1. \quad q = \left(\frac{1}{n}\left(\frac{N}{n^2}\right)_r\right)_q + 1. \quad p = \left(\frac{1}{n}\left(\frac{N}{n^2}\right)_r\right)_r, \qquad (69)\ (70)\ (71)$$

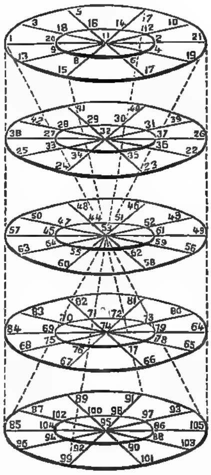
in which the subscript indices q and r signify simply *quotient* and *remainder*, and are not identical with the same symbols used to denote functions of N. The values thus ascertained being substituted in equations (49), (50), and (51), the co-ordinates of N become known, and therefore its place in the cube.

Magic Cylinders and Magic Spheres.—If one of the surfaces of any perfect magic cube be applied to a cylinder having a circumference equal to n (the edge of the cube), the vertical squares being at the same time thrown into positions radiating from the axis of the cylinder like the leaves of a book opened wide, the result will be a magic cylinder; and if the cube be formed on the principle of the square Fig. 21, the cylinder will possess the properties of Franklin's magic circle, only that it will be every cubic tessera of eight terms, instead of every plane group of four terms, which will give the constant sum. It is easy to see that magic parallelopipedons, which may be constructed as easily as cubes, may be substituted instead of cubes in constructing magic cylinders.

Magic cylinders formed in this manner will either have no numerical terms occupying the axis, or will have the same central term in every plane. But cylinders may be formed with an axial row of unequal terms, in which the vertical and diagonal rows shall all sum equally, and the diameters in each plane shall be equal among themselves, though the sums in different planes will be different. If the height of such a cylinder contain the same number of terms as the diameter, the entire series will be odd. Put n for the height and N for the number of terms in a plane, calling the first the minor grade, and the second the major grade. The whole series will consist of n major grades. The central terms may be most conveniently made the $\frac{1}{2}(N+1)$st terms of the successive major grades, or the n middle terms of the entire series. Make $n-1$ divisible by four, and let the number of diametric rows in each plane be taken at pleasure. If this number is n, the sum of every simple ring may be made double that of a diameter. These conditions determine the number of terms in the entire series. The terms in each major grade should thus be arranged in rings of balanced couplets around the centre, but some artifice will be required to make the vertical rows balance. Equality in the diagonals is secured as follows: If n' be the number of radii in a plane, it is demonstrable that there can be found $n'+1$ regular arithmetical series of n terms each, having as a common term the middle term of the general series, and for their first terms respectively, 1, $1+\frac{1}{2}(n-1)$, $1+2(\frac{1}{2}(n-1))$, $1+3(\frac{1}{2}(n-1))$, and so on. The middle term of this progression may occupy the centre of the upper plane, and the rest the extremities of the radii. The remaining diagonal terms are then easily found. A simple example of this construction is given in the figure. The diameters in each plane sum equally. Those of the central plane give the same sums as the diagonals and the verticals. A single pair of verticals remains unbalanced, which it is left to the reader to detect.

FIG. 52.

Magic Cylinder.

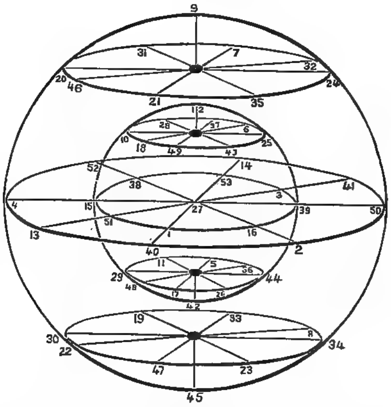


If the surface of a magic cube or parallelopipedon be applied to a sphere instead of a cylinder, and the several vertical columns assume the positions of radii, the result will be a magic sphere, possessing all the properties of the magic cylinder. In this mode of formation there will be no numerical term occupying the position of the pole of the sphere. Odd number spheres, however, can be constructed having a column of terms as the axis, and a term at the centre common to all the rectilinear rows (which necessarily follow the diameters). In these, all the diameters sum up equally, and the terms forming the equatorial circumference and its several parallels, whether of the exterior or of the interior shells, and those of every one of the meridional circumferences, interior or exterior, will sum equally, but with a sum different from that of the diameters.

To construct such a sphere, fix first upon the number of terms to be employed to form a circumference, which must of course be even, and if there is to be an equatorial ring, must be divisible by 4. Suppose this number 12. Then there should be six meridian circles passing through the common axis. Besides the two common polar terms, each circumference will have ten terms; or the entire number in the outer shell of the sphere will be sixty-two. If there are, say four shells, the total number of terms in these will be 248, and there will be a central term, making in all 249. This central term must be the middle term of the whole series, or 125. The remaining terms must be arranged in normal couplets, as 1, 249; 2, 248; 3, 247, and so on; and these are then to be balanced against each other on principles analogous to those employed in constructing balanced squares, Figs. 28, 29. It will facilitate the conception to suppose the spherical shells to be divided somewhere between the meridians occupied by the terms, and flattened out into plane strata. In such a development, particular attention must be paid to the polar numbers. The illustration of this branch of the subject by diagrams is difficult, but the following figure presents a simple case of a magic sphere of fifty-three terms.

FIG. 53.

Magic Sphere.



Magic Squares of Geometrical Series.—If the terms of a geometrical series be arranged in the cells of a square in accordance with any of the methods described in this article, the continued *products* of the terms in the several rows will be equal. For when numbers are in geometrical progression their logarithms are in arithmetical progression, and the sum of their logarithms is the logarithm of their product.

The literature of this subject is somewhat extensive. The largest work devoted to it is probably that of Violle, *Traité complet*, 2 vols. 8vo, with a folio vol. of plates, Paris, 1837. Other writers are Bachet de Meziriac, *Problèmes plaisans et délectables qui se font par les Nombres*, Lyons, 1613; Frénicle, *Divers Ouvrages de Math. et de Physique*, 1693; Poignard, *Sur les Quarres magiques sublimes*, 1703; De la Hire, in *Mem. Acad. Sci.*, Paris, 1705; Sauveur, in the same, 1710; Franklin, *Exp. and Obs.*, 1769; and in works collected by Sparks; Hutton, *Math. Recreations*, 1814; also in *Math. Dict.*, 1796; Montucla, *Histoire des Mathematiques*, vol. i., 1799; Möllweide, *De Quadratis magicis*, Leipsic, 1816; Nulty, *Trans. Am. Phil. Soc.*, vol. v. and vol. x., new series; Davies and Peck's *Math. Dict.*, New York, 1855; H. Carrington Bolton, *Acta Columbiana*, Nov., 1874, to June, 1875. In the conclusion of this series Dr. Bolton has given a nearly complete list of writers and writings on the subject, embracing about forty titles.

F. A. P. BARNARD.

Maginn′ (WILLIAM), LL.D., b. at Cork, Ireland, Nov. 11, 1793; exhibited such precocity in the classical languages as to be admitted to Trinity College at the age of ten years; was for many years a favorite contributor to *Blackwood's Magazine* under the *nom de plume* of "Morgan O'Doherty;" was Paris correspondent of the *Representative*, a daily paper started by Murray in 1824; editor of the *Standard* (1828), of *Fraser's Magazine* (1830), of the *Lancashire Herald* (1839), and of the *Magazine Miscellanies* (1840), a weekly issue of his own writings. He contributed numerous papers to the *Quarterly Review*, to *Bentley's Miscellany*, and to *Punch*, and wrote two novels, which had little success. All his writings are characterized by vast learning and exuberant wit, but his personal habits were such as to render his career a sad failure. He was dismissed from more than one literary post on account of drunkenness, was imprisoned for debt, was declared insolvent, and was reduced to great straits. D. at Walton-on-Thames, near London, Aug. 21, 1842. His critical and miscellaneous essays, *Homeric Ballads*, and *Shakspeare Papers* have been collected in the U. S. and edited by Dr. R. S. Mackenzie (5 vols., 1855–57).

Magio′ne, town of Central Italy, in the province of Perugia, near Lake Trasimeno. It contains some striking mediæval buildings, and the old Lombard tower on a hill near it was the scene of many a bloody fight between the people of Perugia and their lords. Pop. 6851.

Ma′glie, town of Southern Italy, in the province of Lecce, in a most fertile district, about 23 miles from Gallipoli. Pop. 5737.

Mag′na Char′ta [Lat., "the Great Charter"], a charter of liberties originally granted by King John (A. D. 1215) to the clergy, barons, and freemen of England, and repeatedly confirmed by subsequent monarchs, and justly regarded as forming the most important part of the British constitution. The tyrannical character and oppressive acts of King John, and his open violation of all law, aroused an opposition among the clergy and barons at an early period in his reign. This opposition, which at length became well organized and extensive, was headed and guided by Stephen de Langton, cardinal of the Roman Catholic Church and archbishop of Canterbury, to whose wisdom, firmness, and patriotism the successful issue of the great struggle between the people of the realm and the Crown was largely due. On Aug. 25, 1213, a council of the prelates and barons was held in London for the purpose of concerting measures by which the royal authority might be confined within legal bounds, and the rights and liberties of all estates in the kingdom might be secured and guarantied. The contest, which was thus openly commenced, lasted through the two succeeding years. On the one side were arrayed the freemen of England, the clergy, the barons, and the commons, united in one common cause and contending for rights which belonged to them all. On the other side was the king, standing almost alone, but using every artifice to divide and weaken his opponents. He applied for aid to Pope Innocent III., who, as a reward for his previous surrender of the English crown and reception of it again as a vassal of the Papal See, openly sided with him, censured the barons, and ordered the archbishop to excommunicate them. He also endeavored to detach the clergy from their union with the laity by granting (Jan. 15, 1215) a special charter to the English Church. All these manœuvres were unsuccessful: the clergy, as well as the nobility and the commons, remained firm in their demands for such fundamental guaranties as should secure their rights and liberties, and the king was forced to yield, after much delay and even violence in attempting to overthrow the organization which had been formed against him. The barons, with whom had collected a large force of armed knights and yeomen, proclaimed their array to be the "army of God and Holy Church." On May 24, 1215, they entered London, the king having fled from the Tower to Odiham in Hampshire. From this place he sent word that he would comply with the petitions, and asked that a time and place should be appointed for a conference. The barons named Runnymede as the place and the 9th of June as the day. The conference actually commenced on the 15th, and lasted until the 19th. An outline was first drawn up and assented to in the form of articles ("*articuli magnæ chartæ*"), upon the basis of which, although differing in some particulars, the more complete and formal instrument was prepared. The Great Charter itself was finally consummated and the royal seal affixed at Runnymede on Friday, the 19th, although it bears date the 15th of June, 1215, the day on which the negotiations were commenced. At the death of John the charter was at once renewed by the earl of Pembroke, who administered the government as protector on account of the minority of Henry III. In the next year it was again renewed, and again in the ninth year of Henry's reign, and on five subsequent occasions before the death of that monarch. The Great Charter, as it was promulgated in the ninth year of Henry III., was most solemnly re-established and confirmed by the king and Parliament A. D. 1300, being the twenty-fifth year of the reign of Edward I., and in the form as thus finally adopted, although differing in several particulars from the original, it appears in the English statute-book, and has been again confirmed by kings and Parliaments more than thirty times. We add a brief analysis of its text, and a general description of its most important provisions. The original charter of King John contained 61 chapters or articles. All of these after the 49th, except the 54th, were entirely temporary, relating to certain personal acts of the king, and establishing a means of enforcing its provisions by a commission of twenty-five, to be elected by the barons from among their own number, in case the king should refuse or neglect to carry it into effect. This portion was of course omitted in every subsequent renewal. Of the permanent articles a few only related to the clergy. The charter which had been granted to the Church earlier in the same year was deemed sufficient, and was expressly confirmed. By far the greater part of these chapters had reference to the laity, and they may be separated into two groups—namely, those which legislated for certain designated classes, and especially for the barons as tenants *in capite* of the Crown, defining, regulating, and limiting their feudal burdens and duties; and those which legislated for the whole nation, for the entire body of freemen. The former were based upon the then existing social condition, and, with the exceptions hereafter mentioned, they all ceased to be operative with the extinction of the feudal system. The latter remain in full force and effect as the very foundation and security of civil liberty in Great Britain, and the most important and comprehensive of the clauses has been incorporated into all the American constitutions, national and State. Among the articles defining the feudal relations of the barons to the Crown, the 12th enacts that "no scutage or aid shall be imposed in our kingdom unless by the general council of our kingdom," except for three specified purposes; while the 14th provides for the summoning and holding of the general council in order to assess such "aids." In these clauses are to be found the germs of the constitutional principle that no taxes shall be laid except by the consent of the persons to be taxed expressed through their representatives—a principle which involves the entire theory of representative government. These clauses were omitted in the charter of Henry III., but were re-enacted with even more explicitness in the confirmatory statute of 25 Edw. I. The most important articles by far of the Great Charter—since they contain a sure guaranty of every civil right and liberty belonging to freemen—are the 39th and 40th, the original text of which is: "39. *Nullus liber homo capiatur, vel imprisonetur, aut utlagetur, aut exuletur, aut aliquo modo destruatur; nec super eum ibimus, nec super eum mittemus, nisi per legale judicium parium suorum, vel per legem terræ.* 40. *Nulli vendemus, nulli negabimus, aut differemus rectum aut justitiam.*" The corresponding article of the charter of 9 Hen. III. and 25 Edw. I. is the 29th, the language of which is slightly varied and expanded: "*Nullus liber homo capiatur vel imprisonetur, aut disseisiatur de aliquo libero tenemento suo vel libertatibus vel liberis consuetudinibus suis, aut utlagetur aut exuletur aut aliquo alio modo destruatur; nec super eum,*" etc., the remainder of the clause being exactly the same as in the original form given above. The following is the authoritative translation of this capital provision as found in the English book of statutes: "No freeman shall be taken, or imprisoned, or be disseised of his freehold, or liberties, or free customs, or be outlawed or exiled, or any otherwise destroyed; nor will we pass upon him nor condemn him, but by lawful judgment of his peers, or by the law of the land. We will sell to no man, we will not deny or defer to any man, either right or justice." To this text I shall only add a sentence from the eloquent eulogium of Lord Chatham: "These three words, '*nullus liber homo*,' have a meaning which interests us all; they deserve to be remembered, they deserve to be inculcated in our minds, *they are worth all the classics*."

JOHN NORTON POMEROY.

Mag′na Græ′cia, the name by which the ancients denoted collectively the Greek cities and settlements in Southern Italy, sometimes, though improperly, including even those of Sicily. These colonies were planted in the eighth century B. C. by different Greek peoples—Croton in 710 by the Achæans, Tarentum in 708 by the Spartans, Locri in 708 by the Locrians, Sybaris and Rhegium by the Chalcidians—and they very soon attained a high degree of prosperity, partly through their commerce with the mother-country, partly through their communications, and even affiliations, with the natives, a Pelasgic and consequently kindred races. When conquered by the Romans in the third century B. C. they lost their splendor, and at the time of Cicero most of them lay in ruins. There seems to have been something in the Roman rule which brought death to the Greek spirit, for in Sicily also the Greek colonies degenerated and withered when they became Roman possessions.

Magne (PIERRE), b. Dec. 3, 1806, at Périgueux, France, of a poor family; saved of a small salary in a subordinate position in the prefecture of Dordogne money enough to go to Toulouse and study jurisprudence; then settled as a lawyer in his native city, and soon attracted the attention of the prefect of Dordogne by his ability; in 1835 was appointed a councillor of the prefecture, and having been elected some years afterward a deputy, became noted as a member of the committee on the budget; in 1847 was appointed a secretary in the ministry of war, but resigned this office during the revolution of February, and returned to Périgueux. Napoleon, however, called him back in 1849, and made him a secretary in the ministry of finance, and in 1851 minister of public works. On Oct. 6, 1851, the prince-president formed a new cabinet, in which Magne was replaced by Lacrosse, but on the evening before the *coup d'état* he once more changed his cabinet, and Magne resumed his place. With respect to the decree by which the estates of the family of Orleans were confiscated the cabinet disagreed; several ministers withdrew, and among them Magne. Soon after, however, he was elected a senator, and in July, 1852, he again became minister of public works; in June, 1853, he also became minister of agriculture and commerce, and in the beginning of 1855 changed this position for that of minister of finance. Questions relating to the internal policy caused Magne to change his office several times, but his great financial talent always brought him back to this department. In 1863 he retired on account of a controversy with Fould, but (Nov. 3, 1867) he was again appointed minister of finance in order to effect the new great loan. When Napoleon formed the cabinet of Ollivier (Dec. 27, 1869), Magne retired into private life. Once more, however, he took charge of the ministry of finance, from May 25, 1873, to May 16, 1874, in the cabinet of Broglie, but withdrew on account of a vote of the National Assembly which went against the ministry. D. Feb. 18, 1879. AUGUST NIEMANN.

Magnen'tius. See CONSTANS and CONSTANTIUS.

Magne'sia [origin of the word uncertain; conjecturally, from *Magnesia*, a locality in Asia Minor, but of this there is apparently no actual evidence]. Carbonate of magnesia, under the name of *magnesia alba*, is stated to have been introduced into Rome, and employed as a drug before its specific nature was known to chemists, and no longer ago than the beginning of the eighteenth century. Valentine first discovered the earth *magnesia* in the sulphate in 1707 (the latter having been known since 1675, as obtained from mineral springs); but it was for some time supposed to be a modification of lime. Magnesia is MgO, the oxide of the elemental metal Magnesium.

Native Magnesia.—It occurs as the beautiful crystallized mineral species *periclase* or *periclasite* in Dana's nomenclature, which is too rare even to be a gem. It has, however, been produced artificially by Ebelmen, by Deville, by Daubrée, and by Debray and Kuhlmann, all by different methods. Only one locality is known, in limestone on Monte Somma, discovered by Scacchi. Periclasite is in transparent crystals of the regular system, of density 3.65, about the same as diamond. Its hardness, however, is less than that of quartz.

Properties.—Artificial magnesia is a snow-white powder whose aspect is familiar to all. In the mass it is usually very light, because so finely divided, but its true density is high, at least 3.2, and on strong ignition it becomes, according to H. Rose, as heavy as periclasite = 3.61. Before Hare's blowpipe it melts to an enamel hard enough to scratch glass. It requires for solution 55,368 times its weight of water, or very nearly one U. S. gallon to dissolve one grain. Commercial magnesia may contain as an impurity small quantities of lime, which gives it an unpleasant taste. This may sometimes be detected by dissolving in an acid, and adding an excess of ammonia and a little oxalic acid, though, as oxalate of lime is somewhat soluble in magnesia salts, to detect minute traces of lime it is better to saturate some strong muriatic acid with the magnesia, filter clear, add a minute quantity of sulphuric acid and a considerable volume of alcohol. In some hours, if lime be present, minute crystals of gypsum will be found on the walls of the test-tube. Magnesia is an exceedingly bad conductor of heat, and may be used for confining heat in boilers, for refrigerators, and fireproof safes. Its refractory character has also led to its proposal as a material for crucibles made by hydraulic compression.

Occurrence in Nature.—Magnesia is of almost universal occurrence—in rocks, soils, mineral waters, the ocean, and as an essential constituent of almost all plants and animals. It occurs as *dolomite*, forming mountain-masses and containing 21.73 per cent.; as *serpentine*, a silicate of magnesia, containing some 43 per cent.; as *magnesite*, the carbonate, containing 47.6 per cent.; in the crystalline schists, from which most other rocks and all soils are mainly formed, it is in the forms of *magnesian amphiboles* and *pyroxenes*, containing often 20 or 25 per cent., magnesia-micas, or *phlogopite* and *biotite*, *hypersthene*, etc. etc. The trap-rocks of the Hudson River Palisades contain sometimes as much as 10 per cent. of magnesia. There are very few limestones which are not more or less magnesian. The great ocean contains nearly one-quarter of 1 per cent. of magnesia, and the *bitterish* taste of the ocean-brine is attributed chiefly thereto. Magnesia might be obtained economically and in unlimited quantities from the ocean by a simple method, by precipitating with the very cheap agent, milk of lime. Every cubic foot of sea-water contains 2⅓ ounces of magnesia; it is surprising that this source of magnesia has not been availed of. The chief source of commercial magnesia and its salts at present is probably the native chloride, *carnallite*, and other magnesian minerals of the celebrated Stassfurt deposits, the residua from the evaporation of some ancient sea. Many medicinal mineral waters owe their virtues wholly or in part to magnesia. The ashes of grains of wheat contain 11.75 per cent. of magnesia, and a soil deficient in this constituent, which is not at all uncommon, could not, of course, grow wheat, no matter how rich otherwise. The amount of magnesia in the grain is nearly four times the lime, while this proportion is about reversed in the straw; so that a good calcareous soil, if lacking magnesia, might produce straw without any wheat.

Preparation.—It is usually made by gently igniting the carbonate, as previously prepared by precipitating the sulphate or chloride, or both, as they occur in admixture in the bitterns of salt-works. The carbonate is also made by the action of carbonic acid and water on calcined dolomite under pressure. A solution is thus procured of the bicarbonate of magnesia, from which the carbonate precipitates on heating. It may be prepared in a pure state by igniting the *nitrate*.

Uses.—Under *Properties*, above, some of the uses have been referred to. Its medicinal uses are elsewhere treated of. A mixture of magnesia, water, and the chloride of magnesium forms a cement, known as Sorel's cement, which hardens to an oxychloride as hard as marble. There are no other important special uses for magnesia, as such.

Salts and Compounds.—Of these, the carbonate, sulphate, and chloride are the only ones of much practical note. The carbonate has been already somewhat referred to. The commercial carbonate is liable to contain silica, carbonate of lime, and oxide of iron as impurities. It is really not a simple carbonate of magnesia, but a compound of the carbonate and a hydrate, and its composition varies considerably with the mode of preparation. The simple carbonate occurs native, as already mentioned, as the mineral *magnesite*. The hydrate is also found native as two very beautiful dimorphs, *brucite* and *nemalite*. The sulphate of magnesia is known commercially as *Epsom salt* (Ger. *Bittersalz*). It was first discovered in the springs at Epsom in England by Dr. Grew in 1675. Much is contained in the mother-liquor left after crystallizing out the salt from sea-water. It occurs as a mineral, *epsomite*, particularly in dry caves. Epsom salt is $MgO,SO_3,7H_2O$, crystallizing in orthorhombic forms; of density, when perfectly pure, 1.7244, according to determination made by the present writer. Ice-water takes up in solution, for 100 parts, 25.76 parts, and .8597 part more for each degree F. above this. When warmed it melts in its own water of crystallization, of which it contains 51.22 per cent. The chloride of magnesium is important only as being the compound employed in the manufacture of the valuable metal MAGNESIUM (which see). HENRY WURTZ.

Magnesia, often called *Magnesia ad Sipylum*, to distinguish it from Magnesia ad Mæandrum, was a town in Lydia, the present *Manissa*, and celebrated for the battle which took place here in 190 B. C. between the two Scipios and Antiochus the Great of Syria, who after this defeat was driven out of Asia Minor by the Romans.

Magne'sium, the metal of which magnesia is the oxide, and of which magnesian minerals and magnesian rocks are the ores. Among the more common magnesian rocks, *serpentine* is the richest ore of magnesium. This contains by weight 25.8 per cent. of magnesium; but, considering that this metal when free is about half as light again as the serpentine, the magnesium contained in this ore is about 37 per cent. of its *bulk*. In Canada there occurs a rock, the *magnesitic ophiolite* of Prof. Sterry Hunt, which is richer still in magnesium, containing, as calculated from Hunt's analysis, 42.5 per cent. of its bulk of the metal. Serpentine, however, which constitutes large masses of rock in the U. S., will furnish a good deal of magnesium when it shall come to be required in large quantities; and in any case the ocean—as pointed out by the present writer in the article on MAGNESIA—is an inexhaustible reservoir of magnesium, belonging to nobody. Each cubic foot of the ocean contains 1.34 ounces of metallic magnesium, or over six-tenths of a cubic inch. A cube of 30 feet of sea-water contains one ton of 2240 pounds of the metal magnesium—more, probably, than could now be bought in the whole world.

Properties, Chemical and Physical.—Magnesium is silver-white and very brilliant, malleable, and ductile. It melts at a red heat, and is readily cast into ingots. At a higher heat it volatilizes and distills, like zinc, which will facilitate greatly its manufacture and purification on a large scale. The true density of magnesium has been in some doubt. Bunsen's earliest determination was 1.743; Kopp found 1.69 and 1.71; Deville and Caron found 1.75; but one of the latest determinations of Playfair and Joule gave the extraordinary figure 2.24. This has led the writer himself to repeat the determination of the density of this metal, with great precautions to ensure accuracy. The result was a complete confirmation of Bunsen's original figure, 1.743, at least so far as the second place of decimals. Its chemical equivalent is 24 ($O = 16$).

One of the most remarkable characters of magnesium is its combustibility in the form of filings, wire, or ribbon, with a light of dazzling brilliancy. In this also it is like zinc, which will burn in the same way if in sufficiently thin foil. A chemist named Woods has shown very recently that in this combustion more heat is developed per chemical equivalent of combustible—that is, for equal amounts of oxygen taken up—than in the case of any other metal, so far as known. Heretofore, potassium has had the reputation of possessing the greatest calorific energy among metals, but Woods rates it, as compared with magnesium, as 9 per cent. less than the latter, zinc being 50 per cent. less than potassium. When we consider how light a metal magnesium is, and that magnesia is quite a heavy oxide, nearly twice the density of the metal, we seem to see a reason for this immense evolution of heat. When shall we learn whether it is the metal or the oxygen that condenses so greatly in this combustion?

Magnesium does not rust rapidly in damp air, a thin white film of carbonate of magnesia forming, which, from its insolubility, protects the metal. It can undoubtedly be protected from corrosion as readily as steel, brass, or copper; and this will not stand in the way of its practical uses, especially as the rust, carbonate of magnesia, is devoid of toxic qualities, and not destructive to organic matter like that of iron and steel. Being by far the lightest substance of equal strength that is known (except possibly *calcium*, which is comparatively little known), and obtainable in unlimited quantities, it is unquestionably, next to *aluminium*, the most important of the metals of the future. Our almost absolute inaction in the way of bringing into common use this class of metals, which hereafter will be far more valuable than any other materials known to mankind, is difficult of comprehension. An impulse may be given to progress in this direction by the improvements now making in the conversion of mechanical force or force of combustion into chemical force, by means of modifications of the American invention of Saxton, the *magneto-electric engine*, which will undoubtedly give us currents of electricity strong enough and cheap enough to make magnesium and these other metals by direct electrolysis, without the use of sodium.

Manufacture of Magnesium.—As already intimated, the manufacture of magnesium is dependent at the present day entirely on that of sodium. The improved method of Sonstadt consists in heating in a closed crucible 6 parts of chloride of magnesium, 1 of dry common salt, 1 of powdered fluor-spar, and 1 of metallic sodium to a bright red heat. The granules of magnesium thus formed are separated from the mass, and purified by distillation in a current of dry hydrogen gas, at a white heat, in an apparatus composed of carbon. It is incorporated into a body for casting into ingots by fusing, under a flux composed of the same ingredients as above—mixed chlorides of magnesium and sodium and fluoride of calcium. The actual manufacturers who supply commerce no doubt know many important practical details which are not given to the public.

Alloys of Magnesium.—These are somewhat better known than those of calcium. They seem mostly more oxidable than magnesium itself, and no uses have been suggested for them. Mercury when hot amalgamates readily with magnesium, though without action in the cold. HENRY WURTZ.

Magne'sium, Medicinal Uses of. The compounds of magnesium used in medicine are magnesia and magnesium carbonate, citrate, and sulphate. Magnesia and the carbonate are valuable, in the first place, as alkalies to neutralize acidity in the alimentary canal, both from their high saturating power and from the absence of any corrosive or poisonous properties of their own. Hence, in poisoning by the mineral acids and in acid dyspepsia they are very useful; but from the low diffusion power of magnesian compounds they are but little absorbed, and hence cannot be employed like alkaline preparations of sodium and potassium to alkalize the blood. All soluble magnesian salts are purgative, producing, like other saline cathartics, watery discharges, while at the same time not irritating the intestinal mucous membrane. Magnesia and magnesium carbonate, formed into soluble salts by the acid of the gastric juice, thus combine the virtues of an alkali and a mild purge, and are accordingly useful in acid dyspepsia with constipation. Magnesium citrate is employed as an agreeable laxative and mild purge in the form of the officinal effervescing solution of the U. S. Pharmacopœia. This contains, besides the salt itself, free carbonic acid gas and a pleasant flavoring of syrup of citric acid and oil of lemons. Magnesium sulphate, or "Epsom salt," is a more powerful though safe neutral saline purge, and is used where a free watery evacuation is desired. From its less offensive taste it has superseded, for this purpose, the sodium sulphate, or "Glauber's salt." EDWARD CURTIS.

Mag'net; Magnetism; Terrestrial Magnetism. The word *magnet* is from the Greek μάγνης, the name given to the loadstone or native magnet, an ore of iron extensively distributed over the globe, and whose peculiar property of attracting metallic iron has been known from the remotest antiquity. The word *magnes* is said by some to be the name of Magnes, a Greek shepherd who observed on Mount Ida the attractive power of a large mass of loadstone on his iron crook. Others, with more probability, derive the name from Magnesia, in Lydia, where the loadstone was found; and this opinion receives weight from the fact that the ancients often called the magnet *lapis Heracleus*, from Heraclea, the capital of Magnesia.

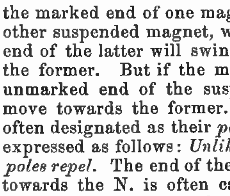
The loadstone has the remarkable power of giving all of its own properties to hard iron or steel when these bodies are rubbed, or even touched, by it. The endowing the iron or steel with its own properties does not cause a diminution in the attractive power of the loadstone.

A Suspended Magnet places its Length in a Northerly and Southerly Line.—If we take two bars of steel which have been magnetized as just described, and suspend them at some distance from each other, and so that they can swing in a horizontal plane, we shall observe that they will oscillate through arcs of gradually decreasing amplitude until they come to rest with their lengths in a northerly and southerly direction.

Like Poles Repel, unlike Poles Attract.—If we now mark those ends of the bars which point northerly, and bring the marked end of one magnet near the marked end of the other suspended magnet, we shall observe that the marked end of the latter will swing away from the marked end of the former. But if the marked end be brought near the unmarked end of the suspended magnet, the latter will move towards the former. The ends of the magnets are often designated as their *poles*, and the above laws are then expressed as follows: *Unlike magnetic poles attract, and like poles repel.* The end of the suspended magnet which points towards the N. is often called its N. pole, while the end which points towards the S. is called its S. pole. If we present either end of a bar of soft iron to either end of a suspended magnet, we shall observe attraction in all cases.

Method of Detecting a Magnet and a Magnetic Substance.—The knowledge of the above laws gives us the means of determining whether a body is a magnet, or, like soft iron, a *magnetic substance* which attracts either end of the magnet indifferently; and if the body be a magnet, of determining its N. and S. poles. Let N S be a magnet free to move in a horizontal plane, and let N′ S′ be the steel or iron bar whose magnetic condition we would determine. We bring N′ S′ near the magnet N S, so that it points towards the centre of N S, and at right angles to its length. If now N S remain at rest, we know that N′ S′ is not a magnet; but it may be a magnetic substance, for the bar N′ S′ acts like a bar of soft iron, attracting equally N and S, and hence the magnet remains at rest. But if N S should rotate around its

FIG. 1.

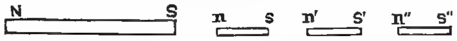


centre, then N′ S′ is a magnet; and if it should rotate in the same direction as the hands of a watch, then the end N′ nearest the magnet N S is a N. magnetic pole. If N S rotate in the opposite direction to the hands of a watch, then N′ is a S. pole.

Phenomena presented by a Broken Magnet.—One might infer from the above experiments that if a magnet were broken in two, one half of it would contain only N. magnetism and the other half S. magnetism; but this is not the fact; on the contrary, it will be found that no matter into how many parts the magnet is broken, each of these parts is a perfect magnet, containing N. and S. polarity, and placing itself, when freely suspended, in a northerly and southerly direction. From this experiment it has been inferred that each molecule of the magnet is itself a perfect magnet; and the fact that N. magnetism appears to exist alone at one end of the bar, and S. magnetism at the other, is owing to the interactions of these magnetized molecules; but of this and other hypotheses we shall speak further on.

Magnetic Induction.—The most remarkable phenomenon of magnetic action is that called *induction*, or the magnetizing action of a magnet on distant masses of magnetic substances. Thus, if N S be a magnet, and *n s*, *n′ s′*, *n″ s″* be bars of iron arranged as shown in the figure, it will be found that as long as N S is near the iron bars the latter will be magnets, with their poles *n s*, *n′ s′*, etc., all placed in the same direction as those of N S, as shown in the figure. The interposition of any substance, not magnetic, between S and *n*, or between S and *n′*, or *s′* and *n″*, has no effect in decreasing or augmenting the magnetic intensity of the bars. If N S be gradually removed from *n s*, then the magnetism of the iron bars will gradually diminish until it becomes imperceptible when N S has been removed to a considerable distance. If N S be brought in contact with *n s*, and the bars be pushed together, they will adhere as long as N S touches the bar *n s*. Another experiment will render clear this action of induction. Take two pieces of soft iron wire, and, holding them parallel to one another, bring them in contact with the end of a magnet. On taking away the hand they will adhere to the magnet, and diverge from the axis of the magnet, because of the repulsion exerted between the similar poles of the free ends of the wires. The action of induction explains the adherence of tufts of iron filings to the ends of a magnet when it is plunged into a mass of that substance and withdrawn. The particles of filings in contact with the magnet are rendered temporary magnets by induction, these act inductively on the particles touching them, and so all particles of the tuft are temporarily magnetized, with their poles arranged in lines pointing towards a point within the magnet. If instead of soft iron we had used steel in the above experiments, and had employed a powerful magnet, we should have found that the steel bars and filings had retained part of the induced magnetism after the magnet had been removed to a distance.

Fig. 2.

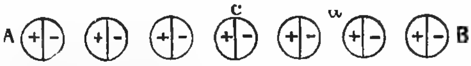


Explanations of Induction.—We have seen that there is reason to believe that the N. and S. magnetisms reside in or on the molecules of the magnet, and are there more or less separated, the N. magnetism being at one end of a molecule, and the S. magnetism at the other; and in these molecules like magnetic ends all face in the same direction. If, in soft iron and unmagnetized steel, we assume either that the magnetisms are, so to say, mixed on each molecule, and thus neutralize each other, or that they are already separated, but the molecules do not face with like magnetism in the same general direction, we can, with Poisson, explain the phenomena of induction as the separation of these magnetisms on the molecule, and their simultaneous arrangement, so that like magnetisms face the same general direction; or, with Weber, we may explain inductive action as the actual turning of the axes of the already polarized molecules of the iron or steel in the same direction. "If the axes of all the molecules were set parallel to each other, the iron would exhibit the greatest intensity of magnetization of which it is capable. Hence, Weber's theory implies the existence of a limiting intensity of magnetization, and the experimental evidence that such a limit exists is therefore necessary to the theory. Experiments showing such an approach to a limiting value of magnetization have been made by Joule and J. Müller. The experiments of Beetz (*Pogg.*, cxi. 1860) on electrotype iron deposited under the action of magnetic force furnish the most complete evidence of this limit. A silver wire was varnished, and a very narrow line on the metal was laid bare by making a fine longitudinal scratch on the varnish. The wire was then immersed in a solution of a salt of iron, and placed in a magnetic field with the scratch in the direction of a line of magnetic force. By making the wire the cathode of an electric current through the solution, iron was deposited on the narrow exposed surface of the wire, molecule by molecule. The filament of iron thus formed was then examined magnetically. Its magnetic moment was found to be very great for so small a mass of iron, and when a powerful magnetizing force was made to act in the same direction, the increase of temporary magnetization was found to be very small, and the permanent magnetism was not altered. A magnetizing force in the reverse direction at once reduced the filament to the condition of iron magnetized in the ordinary way. Weber's theory, which supposes that in this case the magnetizing force placed the axis of each molecule in the same direction during the instant of its deposition, agrees very well with what is observed."

Explanation of the Magnetization of Hard Steel.—Coercive Force.—That a bar of soft iron is only a magnet while under inductive action, while a steel bar retains more or less of its magnetism after the removal of the inducting magnet, is readily explained by Weber's hypothesis. In soft iron the molecules are readily placed with their magnetic axes in line, but the axes of the molecules of steel are with difficulty brought into one direction, but retain more or less of their alignment after the inducing magnet has been withdrawn. This resistance which a body offers to its magnetization is called its *coercive force*, which increases with the hardness of the steel. Also, the harder the steel the more permanent is any magnetic condition given by induction to the bar.

Explanation of the Apparent Concentration of Force at the Ends of a Magnet.—If a bar magnet be rolled in iron filings, this substance will only adhere near the ends of the magnet, the middle portion of the magnet appearing entirely devoid of magnetic properties. This fact is thus explained by the hypothesis of Poisson or of Weber: Let us consider a single row of magnetic elements A B (Fig. 3). If these elements do not mutually modify their magnetic condition, their effects on an exterior magnetic substance would be almost nothing, by reason of their entire neutralization throughout the whole row of elements except at the extremities, where the positive or N. magnetic fluid of A and the negative or S. magnetism of B would alone act. But the exterior action is different from this, and depends on the interaction of all of the magnetic elements. Thus, all the positive poles of the elements which are on the side B act more strongly on *a* than do their negative poles, which are at a greater distance. In like manner, the negative poles of all of the elements which are on the side A exert on *a* stronger actions than the positive poles. The two portions B*a*, *a*A of the row therefore so act as to augment the magnetic force of the element *a*. From these interactions it follows that in the half B of the row of elements the intensity of the negative magnetism of an element exceeds that of the positive magnetism of the element at its right; so that the action of the negative magnetism predominates in the half Bc; similarly, the actions of the positive magnetism predominate in the half Ac. Calculating the effects of the interactions of the magnetic elements on the basis of the law that the intensity of magnetic actions decreases inversely as the square of the distance from the centre of origin of such action, Poisson demonstrated that the sum of the actions which an element receives from all the others diminishes from the middle to the extremities of a magnet—at first slowly, then very rapidly. It follows that the difference between the magnetic forces of two neighboring elements augments as we go towards the extremities of the magnet. But it is this very difference which causes inductive actions exterior to the bar; the magnetic force therefore increases rapidly from the middle towards the ends. Near the middle the differences of magnetic force are barely sensible, and the exterior effect slight, although the elements are more highly magnetized than near the extremities of the bar.

Fig. 3.



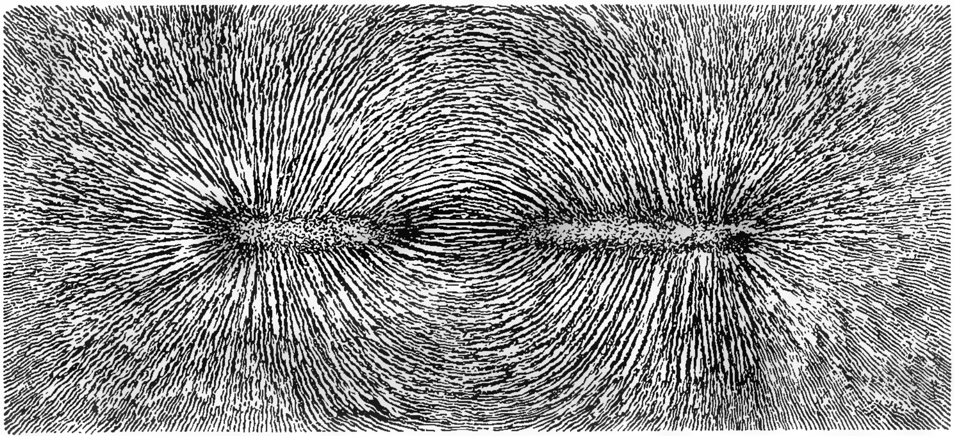
Determination of the Magnetic Intensity along a Straight Magnet.—Coulomb of France made a series of researches on the distribution of magnetic intensity along the length of a straight magnet formed of very hard steel wire. In his investigation he used two methods of measurement. In the first he used his *magnetic torsion-balance*, which consists of a horizontal magnet suspended by a fine wire of silver. The magnet was placed in a vertical position, and the intensities of the exterior actions along its length were measured by observing the repulsion or attraction it caused in the magnet of the torsion-balance. The second method used by him is known as that of *oscillation*, and is practised by placing a long magnet of hard steel in a vertical position, and then bringing various points on the surface of this magnet at the same distance from the end of a small magnet of hard steel, which vibrates in a horizontal plane, while the point of suspension of this small magnet and the axis of the vertical magnet are in the plane of the magnetic meridian. Designating by m and m' the magnetic intensities in two different points of the magnet, and by N the number of oscillations of the small suspended magnet under the influence of the earth alone, by n and n' the numbers of oscillations when the magnet is under the combined action of the earth and of the points $m\ m'$ of the magnet under measurement, we have $m : m' = n^2 - N^2 : n'^2 - N^2$. Coulomb represented the intensities of action at different points of the magnet by a curve formed by drawing ordinates at right angles to the length of the magnet, and Biot has given the following equation for this curve: $y = A(n^x - n^{2l-x})$, in which the abscissas are reckoned along the length of the magnet, starting from its extremity. A and n are constants, and $2l$ the length of the magnet. Where this length is very great, the value of n is a fraction in the neighborhood of $\frac{1}{2}$; hence, we can neglect n^{2l-x}, and the equation is reduced to $y = An^x$. The distance of the *poles* (see next paragraph) from the ends of the magnet is given by this formula: $x = -\left(2ln^l + \frac{(1 - n^{2l})}{\log n}\right) \frac{1}{(1 - nl)^2}$, in which the logarithms are hyperbolic. If the length is very great, n is a function, and in neglecting its powers it becomes $X = -\frac{1}{\log n}$. The results calculated by this formula agree in a very satisfactory manner with those reached by experiment.

Definition of the Pole of a Magnet.—Consider a point in which, let us say, positive magnetism is concentrated, and situate at so great a distance from a magnet that all straight lines drawn from this centre to different points of the magnet can be regarded as parallel. Each point of the negative half of the magnet is attracted, and so much the more strongly as it is nearer the extremity of the magnet. All of these parallel attractions have a resultant whose point of application is situate within the magnet at a certain distance from its extremity. This point of application is called *the pole* of the magnet. There exists a similar pole in the other half of the magnet, which is the point of application of the resultant of the repulsive forces exerted on the magnetic centre.

Law of the Variation of the Intensity of Magnetic Attractions and Repulsions with the Distance from a Magnetic Pole.—Tobias Mayer first formally stated that the intensities of the magnetic attractions and repulsions varied inversely as the squares of the distances from the pole of a magnet. This statement was subsequently confirmed by Coulomb, who made it the subject of a rigorous experimental research. He used in his measurements the same methods we have just described in his investigation on the distribution of magnetic intensities in bar magnets. (For an admirable account of Coulomb's researches the reader is referred to Biot's *Traité de Physique expérimentale et mathématique*, t. iii., Paris, 1816.)

Lines of Magnetic Force.—If fine filings of soft iron be uniformly sifted over a glass plate, and this plate be then placed gently on a magnet, we shall observe merely a slight bristling of the filings, caused by the action of the magnet; but if the plate be carefully vibrated, we shall observe a system of lines gradually develop (Fig. 4). The writer described in the *Amer. Journ. Science* (Apr., 1871) the following method of "fixing," photographing, and exhibiting these magnetic curves. A clean plate of thin glass is coated with a layer of hard varnish by flowing this substance over the plate in the same manner as a photographer coats a glass plate with collodion. After the varnish has dried to a hard film the plate is placed, varnished side up, over the magnet or magnets, with its ends resting on slips of wood, so that the under surface of the plate just touches the magnet. Fine iron filings of soft Norway iron are now sifted uniformly over the plate, and then the magnetic curves are developed by letting fall on the plate vertically at different points a piece of copper wire. The vibrations of the plate momentarily detach the filings from its surface, and at these moments the magnet arranges them in lines which are the resultants of its force. The plate is now carefully lifted from the magnet, and heated uniformly and slowly over a large hot metallic surface, or over a gas-lamp. The film of varnish is thus rendered soft, and the hot filings, sinking into it, are then fixed. Plates thus made have served (1) for accurate measures on the lines of magnetic force; (2) for photographic negatives from which numerous photographic prints have been obtained; (3) for lantern-slides to exhibit these curves to large audiences. The forms of these curves have been the subjects of mathematical investigation by Lambert, Leslie, and others. The contemplation of these curves, in connection with the action of magnets on magnetic and diamagnetic bodies (see DIAMAGNETISM), led Faraday to the adoption of the terms "magnetic field" and "lines of magnetic force." A magnetic field may be defined as any space at every point of which exists a finite magnetic force; while a line of magnetic force is a line drawn through a magnetic field in the direction of the force at each point through which it passes. Before the time of Faraday's writings physicists were satisfied with the mere formal statement of Coulomb's law of the diminution of the intensity of magnetic action in the inverse ratio of the squares of the distances from a magnetic pole; but Faraday, in the words of Maxwell, "in his mind's eye saw lines of force traversing all space when the mathematicians saw centres of force attracting at a distance; Faraday saw a medium where they saw nothing but distance; Faraday sought the seat of the phenomena in real actions going on in the medium; they were satisfied that they had found it in a power of action at a distance impressed on the electric fluids." Faraday gave very general laws of the behavior of bodies in the magnetic field. When the field is uniform—that is, when the lines of force are parallel—both magnetic and diamagnetic bodies place themselves in the direction of the lines of force; but in other cases magnetic bodies (like iron, nickel, cobalt, etc.) tend to go from weaker to stronger places of magnetic action, while diamagnetic bodies (like bismuth, borate of lead, etc.) tend to go from stronger to weaker places in the magnetic field. The conception of the lines of force and the magnetic field, and the enunciation of the laws just given, Sir W. Thomson says, "formed one of the most brilliant steps made in philosophical exposition of which any instance exists in the history of science. . . . Mathematicians were content to investigate the general expression of the resultant force experienced by a globe of soft iron in all such cases; but Faraday, without mathematics, divined the result of the mathematical investiga-

FIG. 4.

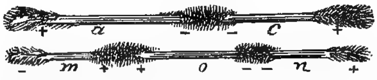


Magnetic Curves.

tion, and, what has proved of infinite value to the mathematicians themselves, he has given them an articulate language in which to express their results. Indeed, the whole language of the magnetic field and lines of force is Faraday's. It must be said for the mathematicians that they greedily accepted it, and have ever since been most zealous in using it to the best advantage." Indeed, much of the scientific labors of Thomson, and nearly all of Maxwell's *Treatise on Electricity and Magnetism* (1873), may be regarded as the translation of Faraday's ideas (as contained in his *Experimental Researches in Electricity*, Lond., 1845–55) into the language of mathematical analysis, and the further development of the consequences of their general quantitative expression.

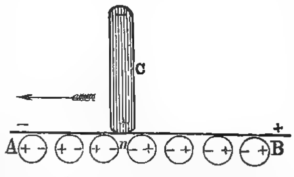
Methods of Making Artificial Magnets.—Consequent Points.—In hypothetical language *magnetization* may be described as a method of permanently separating the magnetisms of steel bars, and thus giving to the bars the properties of the loadstone or magnet which magnetized them. The various processes of magnetization are termed *touches*, and are divided into the methods of *simple touch, double touch*, and *separated touch*. The earliest known method of magnetization is to place the bar of steel against a loadstone, and in the direction of the line joining its two poles. After some time, depending on the strength of the loadstone, the size and hardness of the bar, the latter is found to be magnetized. Prof. Robison of Edinburgh first traced the gradual progress of the magnetization of the bar in the above experiment, and found that it proceeded more slowly as the bar was of harder steel. Thus, when the bar touches the N. pole of the magnet there is found near the point of contact a S. pole in the bar, and a little farther in the axis of the bar there exists a N. pole, and next to this a second very feeble S. pole. These poles proceed slowly towards the opposite extremity of the bar, and, if the bar be not too long, at the end of a certain time the first N. pole will reach its extremity, and the magnetized bar will be found with two poles only. If the bar is very long, this pole will never reach its extremity, and there will be produced *consequent points* in the bar; that is, there will exist more than two poles in the bar, and two of these *interior* contiguous poles form what is called a consequent point. These interior contiguous poles are of the same name. It follows that if there are an even number of consequent points, the ends of the bar are of opposite magnetisms; but these ends will be of the same magnetism when there is an uneven number of consequent points. These facts are shown in Fig. 5, where the consequent points have been detected by rolling the bar in iron filings.

FIG. 5.



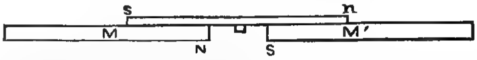
Simple Touch and Friction.—We can magnetize to saturation any little bar of steel by sliding over it the pole of a magnet several times, always being careful that the pole of the magnet glides in the same direction during each pass. In order to form a conception of what takes place, let us consider a row of magnetic elements, A B (Fig. 6), over which we slide the N. pole of the magnet C in the direction of the arrow. When the magnet has arrived in the position *n*, it will have caused in the different elements an arrangement indicated by the signs + and −. Those elements which are in *n* A will have the direction of their polarities inverted as the magnet progresses over them, so that when the magnet has reached A all the elements will have their magnetisms arranged as shown in *n* B of the figure. We see that the extremity last touched has a pole of the contrary name to the pole of the magnet which touched the bar. The above action is repeated several times, or until there is no more increase in the magnetic intensity of the bar.

FIG. 6.



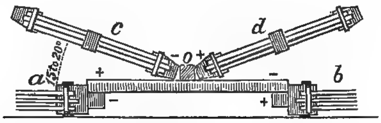
Method of Double Touch.—Up to the middle of the eighteenth century the only known methods of magnetization were those just described. About 1740, Réaumur and Buffon received from Oxford small magnetic bars, made by Dr. Knight of London, which had an extraordinary power for their size. The arrival of Dr. Knight's magnets caused Duhamel to experiment, and he found on magnetizing several pieces of sabre-blade, placed one over the other, that the lowest had a degree of magnetism comparable to those of Knight. The latter stated that he did not employ the loadstone, but he kept his process a secret. We are indebted to Knight for the discovery of the first effective method of making powerful permanent steel magnets. His method, which is as follows, is described in the *Phil. Trans.* for 1746 and 1747 (vol. xliv.): Two powerful magnetic bars, M M′ (Fig. 7), are placed in the same straight line with their opposite poles, N S, very near each other; the needle or bar *n s* to be magnetized is laid flat on the surface of the bars, with its centre over the space between the magnets. If the bar to be magnetized is a compass-needle having a cup for suspension, the cup can be placed between the magnets. The magnets M M′ are now separated by moving them in opposite directions, while the bar *n s* remains stationary, until the bar rests with its extremities in contact with the two magnets; it is then slid off sideways, removed to some distance, but still kept parallel to the magnets, which are to be restored to their former position, and the bar or needle replaced for a new operation. The poles N and S of the magnets conspire in their action on the bar *n s*; the pole N of the magnet M attracts all of the S. polarity and repels the N., whilst the pole S of the bar M′ attracts all of the N. polarity and repels the S.: hence, in the final and permanent magnetic condition of the bar, the position of the poles *s n* is the reverse of the poles N S of the bars. A small needle will become magnetized to saturation by one operation of this kind performed on each of its surfaces; for larger bars, two or three or more repetitions are necessary. A dozen bars or plates may be magnetized in this way in a very few minutes, and bars or plates of sixteen inches to two feet in length, and up to a quarter of an inch thick, may be magnetized within a minute. Dr. Knight thus made the bars of his two great compound magnets, at present in the possession of the Royal Society. Each magnet contains 240 bars of 15 inches in length, 1 inch wide, and half an inch thick. We have no authentic record of the power of this magnet during Knight's life. Faraday in 1830 found that when a soft iron cylinder 1 foot long and $\frac{3}{4}$ inch in diameter was placed across the dissimilar poles of these two magnets, a force of about 100 pounds was required to break down the attractive power.

FIG. 7.



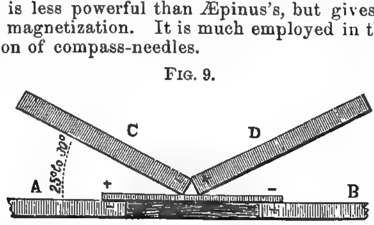
In Æpinus's method the ends of the bar to be magnetized rest upon the ends of the opposite poles of two powerful magnets, *a b*, as shown in Fig. 8. Two movable magnets, *c* and *d*, are placed on the middle of the bar, with the poles of each of the same name as that of the pole of the fixed magnet nearest it. These two magnets, separated by a block of wood, are placed at an inclination of 15° to 20° to the bar. In this position the two magnets are slid together from one extremity to the other of the bar, so that each half of the bar has had the same number of strokes. When the bar is thick the above operation has to be repeated on each side of the bar. This method gives a powerful magnetization, but has the drawback of sometimes producing consequent points and an irregular magnetization.

FIG. 8.



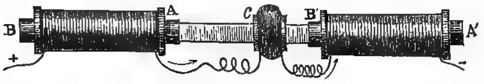
Method of Separated Double Touch.—Duhamel's method of separated double touch is similar to that of Æpinus, with the exception that the two movable magnets, C D (Fig. 9), placed on the centre of the bar, are not separated by the block of wood, and also they are not slid *together* backward and forward over the bar; but they are separated from each other by being drawn apart from the centre to the ends of the bar. After they have reached the ends, the magnets are raised from the bar, their poles placed together over the centre of the bar, and again drawn asunder. This method is less powerful than Æpinus's, but gives a more regular magnetization. It is much employed in the magnetization of compass-needles.

FIG. 9.



Magnetization by Means of a Current of Voltaic Electricity.—A powerful and equable magnetization is effected by enclosing the bar in a helix through which a current of voltaic electricity passes. If we assume that the current moves from the carbon to the zinc pole of the battery, then the end of the bar facing us, around which the current flows in the same direction as the hands of a watch, will be the S. pole of the magnet. The following modification of this method is the most powerful means known for the magnetization of large steel bars. The bar to be magnetized is placed between the opposite poles of two powerful electro-magnets (see Electro-Magnetism) A B, A′ B′ (Fig. 10).

Fig. 10.



The voltaic current which passes through these electro-magnets also passes through a helix C, which is moved backward and forward the same number of times over each half of the magnet, and is finally brought to rest in the centre of the bar. By this method the most powerful permanent compound magnets have been produced.

Qualities of Steel for Artificial Magnets.—From experiments of Scoresby it would appear that for large or massive single or compound magnets of the straight-bar form the best material is *hard cast steel;* for horseshoe magnets, if single, cast steel annealed from file hardness at a temperature of about 550°, or *shear steel* a little reduced; and for compound horseshoe magnets, cast steel annealed at 480° to 500°, or shear steel perfectly hard; for compass-needles, if single and heavy, such as are suited for stormy weather, *hard cast steel;* if light or of moderate weight, whether single or compound, the best cast steel annealed at 500° or 550°, or hard shear steel, or hard cast steel from Bradford iron; and for very light needles or other small magnets, the best cast steel annealed at the heat of boiling oil. Cast-iron bars, if hardened at the end, are capable of forming powerful and permanent magnets. Hearder constructed a compound magnet formed of twenty-four bars, each weighing 3 pounds, which lifted 60 pounds. The practice of hardening the ends only of bars destined for magnets is not to be recommended, as this mode of tempering possesses no advantage as to capacity, while it has much disadvantage as to tenaciousness, except in very thin bars. A moderate hardening throughout is the most efficacious. Scoresby found a constant relation between the *ductility* of iron and its magnetic capacity: the best iron possesses the highest magnetic quality. He examined magnetically all the varieties of steel, both hard and soft, and the results he obtained revealed such a relation between the magnetical properties of several bars and the denomination of the steel of which they were made as to show that it might not be impossible that magnetism may be rendered available for ascertaining not only the degree of carburation, but even for determining the quality of iron out of which the steel may have been manufactured.

Supersaturated Magnets.—Magnets made by the processes of double touch and of the voltaic current are often *supersaturated;* that is, they contain more separated magnetisms than the bar can maintain separated when it is left to itself; for after these magnets have been made their magnetic powers gradually diminish until they reach the condition of *saturation.* This condition is sometimes reached only after a long period, which may be shortened by the action on the bar of variable temperature and molecular vibrations. These vibrations, however, if they act on the bar during its magnetization, really aid the process, and are often employed to overcome the coercitive force of the bar. The coercitive force yields only slowly step by step at each stroke of the magnetizing bar. This phenomenon has been studied by Quetelet, who found that in order to obtain the condition of saturation the strokes of the magnets had to be made on all sides of the bar undergoing magnetization. Generally, twelve strokes gave him the maximum of magnetization. He found that after any number x of strokes, the magnetic intensity i, in function of the maximum intensity I, which the bar can receive, is given by the formula $i = I\,(1 - 0.36\sqrt{x})$. The magnetization in Quetelet's experiments was effected by the method of Duhamel. (The reader who desires further information in reference to the materials employed in the construction of steel magnets and the various processes of magnetization will find a large fund of experience in Scoresby's *Magnetical Investigations,* London, 1839–44.)

Terrestrial Magnetism.—Mariner's Compass.—The Magnetic Declination.—It is not known by whom and when a natural or artificial magnet was first suspended by a thread or floated on water, and the discovery made that it placed itself in a northerly and southerly line. All that we are certain of in the early history of this discovery is, that in the twelfth century the magnetic needle was known in France, for Guyot of Provins about 1180 wrote a poem called *La Bible Guyot*—the manuscript of which is now in the Paris library—in which he tells how a needle which has been rubbed by the *marinière* (as he calls the loadstone) will point to the pole-star, and in the dark nights, without moon or stars, will guide the mariner on his course. It is also to be remarked that Europeans have always marked the N. point of the mariner's compass by a *fleur-de-lis.* Some historians, with Humboldt, give the invention of the compass to the Chinese at a date over 1000 B. C., but others who have as carefully examined into the subject state that they are convinced that the Chinese learned the directive property of the magnet from the early European navigators. However this may be, it is certain that the mode of suspension of the needle in which the Chinese persist is similar to that which was used by the early Dutch navigators. The fact that the needle does not point to the N. at all places was early known. The discovery that it changed its direction of pointing with a change of place is generally attributed to Columbus, but this is incorrect, for the departure of the needle from the geographic meridian (called its *variation* or *declination*) is marked down for different points of the sea on the atlas of Andrea Bianco, which was made in the year 1436. What Columbus really discovered was a line of no variation 2½° E. of the Isle of Corvo in the Azores, on Sept. 13, 1492.

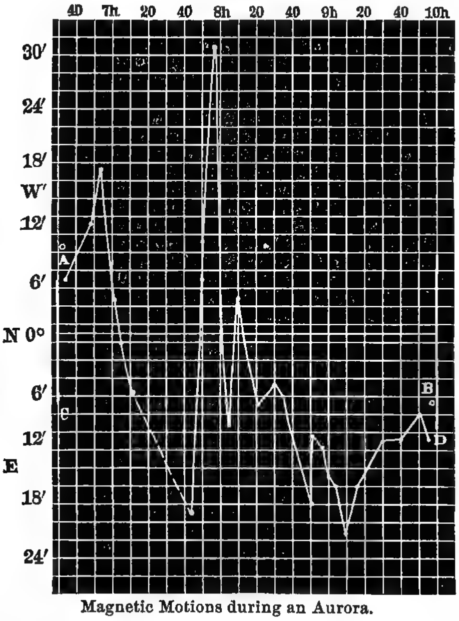
The Cycle of the Variation in Declination.—Some time after this, about 1620, it was found that the needle did not keep one line of direction even in the same place, but slowly changed its angle with the meridian year by year. This discovery is generally attributed to Gillebrand of England. He had compared the variation observed at London by Burroughs, Gunter, and himself, and found that the N. end of the needle was gradually drawing more to the westward, for Norman and Burroughs had observed it to point 11¼° to the E. of N. in 1580; Gunter had found its deviation only 6¼° in 1662; and he himself had observed only 4° in 1634. The examination of all of the observations made at London show that in 1580 the N. end of the needle pointed 11° 15′ to the E. of N. In 1662 the declination had fallen to 6° 15′, and in 1660 the needle pointed due N. and S. In 1730 it pointed 13° W.; in 1765, 20° W.; in 1818 it reached its maximum westerly position of 24° 41′; then it began a retrograde motion to the E., and in 1850 the declination was only 22° 30′ W.; in 1865, 21° 6′ W.; while in the present year the declination at London is about 20° W. The N. end of the needle has at London moved about 3½° to the eastward during the last thirty years. These figures show a remarkable motion in the needle, governed by some cause acting regularly through a long period of time. We see that it occupied 158 years for the needle to swing from the geographic meridian into its extreme westerly declination, and that after reaching this extreme position it at once began its approach to the meridian. Thus, in about 320 years it makes one oscillation; and what is remarkable is, that in this oscillation it follows the same kind of motion as the pendulum, moving faster as it swings towards the meridian, and gradually slackening its motion as it proceeds to the limits of its oscillation.

Daily Variations of the Magnetic Needle.—Perturbations.—If an elastic rod be clamped at one end and bent from its natural position, its free end will vibrate with a regular motion like a swinging pendulum; but this free end may at the same time have shorter and quicker swings, and carry these along in its main vibration. Observations have shown that in this manner the magnetic needle also vibrates, for it does not move steadily year after year, or even day after day, in its 320 years' swing, but, as Graham discovered in 1722, the needle makes during its main oscillation many minor vibrations. Some of these follow regular laws; others apparently follow no law, and are hence called *perturbations.* Among the former is the regular march of the daily variation discovered by Graham. This motion depends upon the apparent position of the sun, and therefore follows the time of the geographic meridian of the place where the needle is observed. In the northern hemisphere the northern end of the needle has its extreme easterly position four or five hours before midday; hence it begins to swing with an increasing velocity, which attains its maximum nearly at the moment when the sun crosses the magnetic meridian of the station. One or two hours afterward the needle comes to rest, and soon after begins its eastward swing, and comes, with a slight secondary vibration, to its first position about sunrise. The arc of the daily oscillation is small, only from 5′ to 25′; and its extent changes with the seasons, being nearly proportional to the diurnal arc described by the sun. Thus, from Dr. Bache's observations at Philadelphia the mean daily arc of vibration for the year is 7½′; for summer it is 10½′, and for winter it is 5½′. This daily variation also increases from the magnetic equator to its poles. On the equator it is only 3′, while Dr. Kane found over 60′ at Rensselaer Harbor, N. lat. 78° 37′.

The Cycle of the Range of Daily Motion in Declination the same as the Cycle of the Amount of Spotted Solar Surface and the Cycle of the Frequency of the Aurora Polaris.—Yet another cause, apparently removed from the earth, affects the magnitude of the needle's daily swing; which, strange to say, seems to depend upon the condition of the sun's surface. We owe this discovery to the labors of three men. First, Counsellor Schwabe of Dessau, Germany, began in 1826 daily observations on the number, size, and position of the spots which are nearly always visible on the solar disk. He kept up these observations for forty-nine years. In 1850, Schwabe announced that the amount of spotted surface which yearly appears on the sun follows a regular law, going through a cycle in about ten years. Thus, in 1860 a large number of spots was visible, but in 1865 very few were seen; after this they became more and more numerous, until in 1870 they had reached their maximum amount. About the same time that Schwabe gave this discovery to the world, Prof. Lamont of Munich discovered that the daily range of the needle's vibration went through a similar cycle. Very soon afterwards Gen. Sabine of England discovered independently the same fact, which he deduced from observations made at places so far removed from each other as Toronto in Canada and Hobarton in Van Diemen's Land, and was thus led to refer the cycle to some cause exterior to the earth, and pointed out the coincidence of the ten-year solar-spot cycle and that of the daily range of variation of the magnet. At Göttingen, for example, the daily variation is 4′ greater during the year of the greatest number of spots than during the year of the least.

Magnetic Perturbations and the Aurora Polaris.—The magnet is often subject to sudden and extensive motions in variation, coming at unexpected times, and affecting simultaneously magnets suspended at great distances from each other. These disturbances are often, though not always, accompanied by displays of the aurora polaris, and it has been observed that the flashes and lateral movements of the auroral columns are always accompanied by simultaneous movements of the magnet in declination. Also, an examination of extended series of observations on auroras has led to the remarkable discovery that they obey periods of maximum and minimum frequency, coinciding with the cycles of the solar spots and of the mean daily range in declination. The accompanying figure (11) exhibits the motions of the magnet observed by the writer during the exhibition of the brilliant aurora of the evening of Oct. 14, 1870. The vertical divisions of the figure, as shown on the left, equal 3′ of arc each. The P. M. times of observation are given on the upper horizontal line. The distances of the broken line above 0° show western, and those below eastern, positions of the N. end of the magnet, referred to the line 0°, which is the mean declination of Oct. 14, 1870. The line D represents the range (18′.43) of Oct. 14. A is the position the magnet had (+ 9′.33) at 1*h.* 17*m.* P. M. on Oct. 14, while B is the declination (— 7′.25) at 8*h.* A. M. (the time of greatest eastern declination) on the morning of Oct. 15. Observations made on the aurora simultaneously with those on the magnet showed that the motion of the magnet coincided in its maxima and minima with the greatest activity of the aurora. The rapid and steady easterly motion, from 7*h.* 57*m.*5 to 8*h.* 5*m.*5, of 42′.04 is remarkable. The flashing up of brilliant greenish auroral streamers or columns was observed at the time of the beginning of this easterly motion.

FIG. 11.



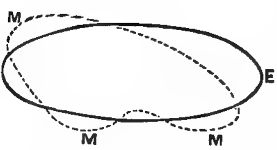
Magnetic Motions during an Aurora.

The direction of present research is to the discovery, if possible, of constant relations between the sudden deflections of the magnet and the sudden outburst observed in the chromosphere of the sun. (See SUN.) Several such coincidences have been observed by Prof. Young and others, but more extended and systematic observations are required to prove that a physical connection between the phenomena really exists, though that this is probably the case every one admits.

The Dip of the Magnetic Needle.—Magnetic Poles and Equator.—Robert Norman, whom Gilbert describes as "a good seaman and an ingenious artificer, who first discovered *the dip* of magnetic iron," observed in 1576 that if a bar of steel is supported on its centre of gravity, so that it will necessarily remain in any position in which it is placed, it will, after having been magnetized, swing into the magnetic meridian and place its length at an angle with the horizon. In the northern magnetic hemisphere the N. end of the needle points downward, making, for example at New York, an angle of about 73° with the horizon; in the southern magnetic hemisphere the S. pole of the magnet points downward. This phenomenon is called the *dip* of the needle. We shall proceed to examine the behavior of such a needle when it is carried over the surface of the earth. Proceeding N. and to the W. of New York, we shall observe the N. end of the needle dipping more and more, until, having reached a N. lat. of 70° 5′, and a W. lon. of 96° 46′, we have attained the position where Com. Ross in 1832 first observed the needle taking an exactly perpendicular position. This point is called the N. magnetic pole of the earth. It is inferred from observations on the dip in the southern hemisphere that a southern magnetic pole—where the needle will be vertical with its S. pole downward—exists about lat. S. 70° and lon. 125° E. of Greenwich. This would place this pole in the territory discovered by our countryman Wilkes. No explorer, however, has reached the S. magnetic pole.

Magnetic Equator.—Between these two poles, along an irregular line in the tropics, the needle does not dip, but holds a truly horizontal position. This line, passing round the globe near its equator, in every part of which the dip is nothing, is called the *magnetic equator*, which is a very irregular line, crossing the equator at *four* points, as shown in Fig. 12, where the full line E E is the geographic equator, and the dotted line M M M is the magnetic equator. The general inclination of the magnetic equator to the geographic equator is about 12°, its principal intersections or nodes being in 113¼° W. lon. and 66¾° E. lon. from Greenwich; and it is a tolerably regular line throughout one-half of its circumference in the Atlantic and Indian oceans. "The exact position of the nodes and the true form of the magnetic equator have been determined with great care by Morlet and Hansteen. There are some slight differences in their results, which have been pointed out by Arago in the following excellent summary of the results of their inquiry: "Both Morlet and Hansteen place the magnetic equator wholly to the S. of the terrestrial equator, between Africa and America, its greatest southern latitude being at 25°; one node is in Africa, in about 22° of E. lon., or in 18° according to Morlet. In setting out towards the E. from this node, which is nearly in the centre of that part of the African continent, the magnetic equator advances rapidly to the N. of the terrestrial equator, quits Africa a little to the S. of Cape Guardafui, and in the Arabian Sea it attains its most northerly latitude of about 12° in 62° of E. lon. Between this meridian and 174° E. the magnetic equator is constantly to the N. of the equinoctial line. It cuts the Indian peninsula a little to the N. of Cape Comorin, traverses the Gulf of Bengal, making a slight advance to the equinoctial, from which it is only 8° distant at the Gulf of Siam. It then reascends a little to the N., almost touches the N. point of Borneo, traverses the isle of Paragua, the strait of which separates the most southern of the Philippines from the isle of Mindanao, and under the meridian of Naigion it again reaches the N. lat. of 9°. From this point it

FIG. 12.



traverses the archipelago of the Caroline Islands, and descends rapidly to the equinoctial line, which it cuts, according to Morlet, in 174°, and according to Hansteen in 187° of E. lon. There is much less of uncertainty respecting the position of a second node, also situated in the Pacific Ocean. Its W. lon. ought to be about 120°; but while Morlet's inquiries lead him to conclude that the magnetic equator merely touches the equinoctial at that point, and then bends again to the S., Hansteen makes it cross the line into the northern hemisphere, and continue then through an extent of 15° of lon., and then return southward and cross the equinoctial again in about 108° of W. lon., or 23° from the W. coast of America. This discrepancy between the deductions of Morlet and Hansteen is, after all, very trivial, for in the case just mentioned the magnetic equator does not go more than 1½° to the N. of the equinoctial; and in general the magnetic equator of Morlet differs in no part so much as 2° in latitude from that of Hansteen. The magnetic equator thus traced over the globe has a motion from E. to W., in so far as can be determined by direct observations on the position of its nodes. The two nodes of Hansteen, corresponding to the tangent node of Morlet, are divided between 108° and 126° of W. lon. In 1819, Freycinet found, on board the Uranie, that this node was in 132° of W. lon.; and Sabine found that the node in Africa, which was far from the coast in 1780, had advanced from E. to W. even to the Atlantic Ocean. Morlet found that the dip of the needle diminished wherever the motion of the equator tended to diminish the magnetic latitude, and that it increased, on the contrary, wherever the magnetic latitude was increased—a result confirmed by observation."

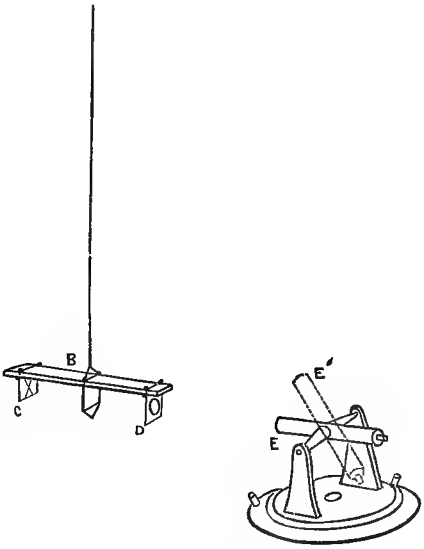
Intensity of Terrestrial Magnetism at Different Points of the Earth's Surface.—The magnetic intensity of any point of the globe can be determined by observations on the times of vibration of a dipping-needle. The dipping-needle holds to terrestrial magnetism the same relation that a pendulum does to gravitation. In a state of rest both show the direction of the resultants of these forces, and if set in vibration we can from the number of these vibrations in a given time determine the intensity of these forces if the known action of terrestrial magnetism or gravitation of any one point of the earth is taken as unity. Thus, if n and n' respectively represent the number of vibrations made in the same time by the same needle at the same temperature at two different stations on the earth, and F and F′ the intensities of magnetism at these two points, then $F : F' = n^2 : n'^2$. But this method is of no practical value, on account of the friction of the axis of revolution of the dipping-needle; and really to obtain the relative intensities of terrestrial magnetic forces we must deduce them from observations made on the vibrations of a horizontal needle suspended by a thread free of torsion. In this case the force F in the direction of the dipping-needle is supposed to be decomposed into two others—one vertical and destroyed by the suspending thread; the other, which we will call f, is horizontal, and in the magnetic meridian. Under the influence of the latter the needle makes its oscillations. If we call i the angle of the dip at the place of observation, we shall have $f = F \cos i$. The oscillations are isochronous if they do not exceed 3° or 4°. Hence, to obtain the relative magnetic intensities of two places of observation, we obtain n and n', the number of oscillations during the same time of the same magnet of hard steel at the two stations. Let i and i' be the dips, f and f' the intensities of the horizontal components, and F and F′ the magnetic intensities at the two stations; then $\frac{n^2}{n'^2} = \frac{f'}{f} = \frac{F \cos i}{F' \cos i'}$; whence $\frac{F}{F'} = \frac{n^2 \cos i'}{n'^2 \cos i}$. In 1798, Humboldt observed a point of minimum intensity on the magnetic equator in Southern Peru, and this value has been adopted as the unit of intensity by those who use the method of oscillation in determining these intensities. The following table gives the terrestrial magnetic intensities on the basis of Humboldt's observed unit:

Places of Observation.	Years.	Latitudes.	Mag. Intensity.
St. Antonio	1802	0° 0′	1.087
Carthagena	1801	10° 25′ N.	1.294
New York	1822	40° 43′	1.803
Naples	1805	40° 50′	1.274
Lyons	1805	45° 46′	1.333
Paris	1800	48° 52′	1.348
Brussels	1829	50° 52′	1.374
Berlin	1829	52° 51′	1.366
Christiania	1820	59° 55′	1.419
St. Petersburg	1828	59° 66′	1.410
Baffin's Bay	1818	62° 43′	1.590
Spitzbergen	1823	79° 40′	1.567

The magnetic intensity has been determined at many points on the earth, and the results reached are that there is an increase of magnetic intensity as we go from the magnetic equator to its poles, and that the intensity increases more rapidly in the southern hemisphere than in the northern as we recede from the equator. According to Sabine, it is equal to 1.624 at the N. magnetic pole, which is less than he found it at New York, where it is 1.803, whilst near the S. magnetic pole, at Mount Erebus, Ross found it equal to 2.052. The minimum of intensity, 0.706, was observed by Erman in S. lat. 19° 59′ and 10° 2′ of E. lon. Biot gives the following formula, which represents with tolerable accuracy the variation of magnetic intensity with the latitude: $i = \sqrt{1 + 3 \sin^2 l \ldots}$, in which i is the intensity and l the latitude of the place of observation.

Determination of the Declination.—We will now concisely describe those instrumental methods by which are determined the three magnetic elements just discussed—viz. the *declination*, the *dip*, and the *intensity*. The declination is most accurately determined with the instrument represented in Fig. 13, called a *declinometer*. E is a theodolite whose telescope, like a transit instrument, rotates on a horizontal axis. This telescope has also a motion around a vertical axis, and this motion in azimuth is measured by a horizontal divided circle. B is a magnet suspended by untwisted silk-fibres. Attached to the magnet is a small frame C carrying two crossed spider-threads. At the other end of the magnet is a frame D, in which is a lens whose principal focus is exactly in the plane of the cross-threads. The rays issuing from the illuminated threads will therefore emerge from the lens as parallel rays, and when the axis of the telescope is coincident with, or parallel to, the axis of the lens, we shall see distinctly the image of the cross-threads when the focus of the telescope is adjusted to parallel rays, or, what is the same, when the telescope gives the distinct image of a star. After the telescope has been adjusted so that the point of crossing of the threads at its focus coincides with the image of the point of crossing of the threads of the magnet, the reading is made on the horizontal divided circle. After this the theodolite is turned on its horizontal and vertical axes until the pole-star or some other circumpolar star is seen bisected by the cross-threads in the telescope. Knowing the time at which this bisection is made, the geographic meridian is readily computed, and the reading of the circle when the telescope points due N. is known. The difference between this angular reading and the one previously made when the cross-threads of the magnet were observed gives the *magnetic declination.* However, in the above description we have assumed that the optic axis of the lens and the magnetic axis of the magnet coincided, or were parallel to each other. This we can never assume; hence, to be sure of the correct determination we *reverse* the magnet in its support, so that the flat side which formerly was up is now down. Another reading is now made of the angle which the magnet makes with the meridian, and the mean of these two readings gives the true magnetic declination. Instead of attaching the magnet to a frame carrying the cross-threads and lens, the magnet may be *tubular*, with a plate of glass, cut with fine vertical lines, at one end and the lens at the other.

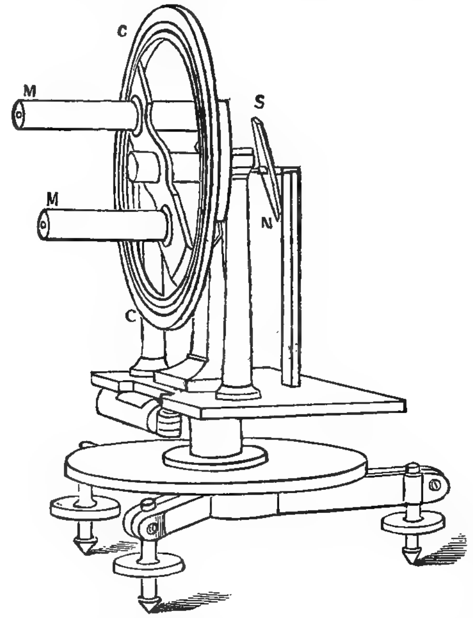
Fig. 13.



The Declinometer.

Determination of the Dip.—The dip of the magnet is the inclination to the horizon which a needle makes when it can freely rotate around a horizontal axis passing through its centre of gravity, the plane of motion of the needle being the plane of the magnetic meridian. Fig. 14 shows the essential parts of the best form of dipping-needle, known as the Kew pattern, from the fact of its having been first invented and used at the Kew Observatory. S N is a magnetic needle with a delicate steel axis resting on two parallel edges of agate. C C is a vertical divided circle. Attached to an arm with verniers are two microscopes with cross-threads at their foci. This arm glides around the vertical circle. To determine the dip, the vertical axis of the instrument is first adjusted to preserve a vertical position when the instrument is rotated around this axis. We then substitute for the magnetic needle a similar one made of brass, but loaded at one of its ends, so that this end always points downward. A sight is taken with one of the reading microscopes on a cross-thread stretched over an opening in this end of the needle. The axis of the needle is reversed and another sight taken, this time on the other side of the cross-threads. The mean of the readings of the vertical circle corresponding to the above two sights will give the reading of the circle for the vertical position of the axis of the needle. The magnetic needle is now placed on the agate edges, and the instrument is rotated around the vertical axis until the pointed end, or medial mark, of the needle points to the vertical reading of the circle. In this position the plane of motion of the needle is at right angles to the magnetic meridian, so that on rotating the instrument through 90° the plane of motion of the needle is brought into the magnetic meridian. The pointed ends of the needle are now bisected by the two reading-microscopes, and the corresponding readings on the vertical circle taken. If the needle were symmetric around its geometric axis, and this axis coincided with the magnetic axis of the needle while the latter turned truly on its centre of gravity, the above observations would give the true dip; but as we can never assume that the above conditions exist, we have to adopt the following method of observation: After having obtained the reading on the needle above described, the vertical axis of the instrument is rotated through 180°, and another reading of the dip obtained. The magnetism of the needle is then reversed by the method of double touch or by the voltaic current, and the two series of observations just described are repeated. The mean of the four series will give the true dip.

Fig. 14.

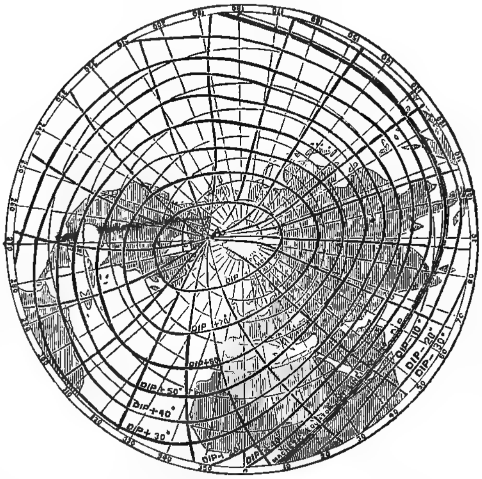


The Kew Dipping-needle.

Determination of the Magnetic Intensity.—It has already been described how the *relative* magnetic intensities of points on the earth's surface can be determined by observations on the times of oscillation of the same hard steel magnet. By the method of Gauss we can obtain *absolute* measures of the intensity of terrestrial magnetism. Our limited space will not allow us to enter into a description of his method, which requires a discussion in the higher mathematics, which would be out of place in a work of a popular character. (The reader is referred to Airy's *Treatise on Magnetism*, Lond., 1870, and to Clerk Maxwell's *Electricity and Magnetism*, vol. ii., Lond., 1873.)

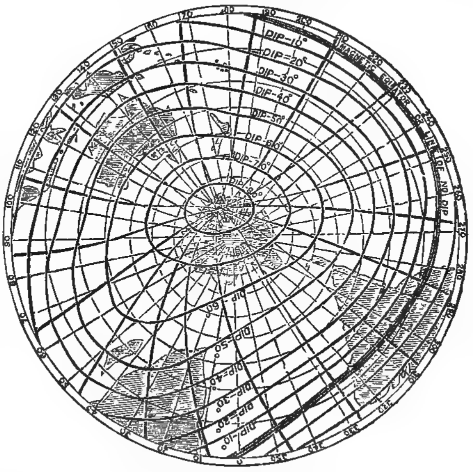
Magnetic Charts.—Observations on the magnetic declination, dip, and intensity have been made over a large portion of the earth, and maps have been constructed on which are drawn the magnetic equator and its poles, the lines of equal declination, the lines of no declination, the lines of equal dip with the magnetic meridians, and the lines of equal magnetic intensity. In Figs. 15 and 16, copied from Gauss, are laid down the position of the N. and S. magnetic poles, the magnetic equator, the lines of equal dip, and the magnetic meridians. The magnetic meridians are lines which would be described by transporting a declination magnet so that it constantly moved in the direction in which it pointed. These lines evidently cross the lines of equal dip, and converge to the two magnetic poles. Facing page 545 of Vol. II. of this *Cyclopædia* is an excellent map by Prof. Guyot, showing the lines of equal magnetic declination for the year 1858. To convey a vivid idea of the phenomena of the dip and the variations of total terrestrial magnetic intensity, Fig. 17, copied from Airy's *Magnetism*, is given. This figure exhibits at a glance the directions of dip and the magnitude of total force along a meridian of the earth. The magnitude of the force at different points is rudely shown by lengths of the dipping-needles on the magnetic meridian. The map is an orthographic projection. It will be remarked that there is little accuracy near the S. pole, arising from the circumstance that it is impossible to include N. and S. magnetic poles in the same geographic meridian.

Fig. 15.



A, North Magnetic Pole.

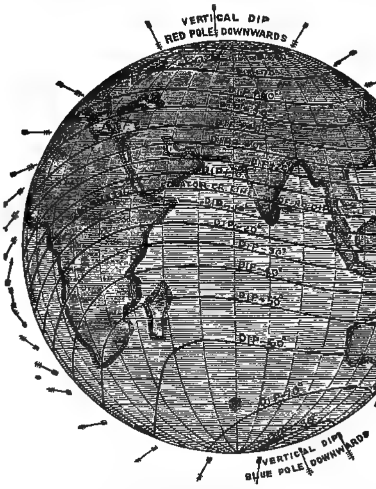
Fig. 16.



A, South Magnetic Pole.

The Earth a Great Magnet.—The phenomena of terrestrial magnetism are explained by regarding the earth as a great magnet of an irregular structure, so that its magnetism is very unequally distributed in and over its mass. Indeed, spheres have been formed of large masses of loadstone which so act on small dipping-needles carried over their surfaces as to give results which approach in character to the irregular lines which express the magnetic elements of

Fig. 17.



Magnetic Dip and Intensity.

the earth. The supposition that the earth is a magnet was first formally announced by William Gilbert, the physician to Queen Elizabeth, in a work entitled *De Magnete Magnetisque Corporibus, et de Magno Magnete Tellure* (Lond., 1600). Of this celebrated work of Gilbert, Prof. Robison of the University of Edinburgh thus wrote in the early part of this century: "It is not saying too much of this work of Dr. Gilbert's to affirm that it contains almost everything we know about magnetism. His unwearied diligence in searching every writing on the subject, and in getting information from navigators, and his incessant occupation in experiments, have left very few facts unknown to him. We meet with many things in the writings of posterior inquirers, some of them of high reputation and of the present day, which are published and received as notable discoveries, but are contained in the rich collection of Dr. Gilbert." That the earth is a great magnet is proved by its producing the same actions as does a loadstone or artificial magnet on bars of iron or steel and on suspended magnets when these bodies are placed in the same conditions in reference to the earth (considered as a magnet) and to the artificial magnet or loadstone. Thus, a bar of soft iron is temporarily magnetized when pointed towards the pole of a magnet or towards the magnetic pole of the earth. A bar of hard iron or steel is permanently magnetized when, while pointing towards the terrestrial magnetic pole or towards the pole of a magnet, it is struck a blow with a hammer in the direction of the length of the bar. A spherical magnet of steel or of loadstone produces in agitated iron filings in its vicinity lines of magnetic force similar to those traced out by the action of the earth on the beams of the aurora polaris. A small dipping-needle carried over a sphere formed out of loadstone acts like the same needle carried over the earth's surface. Finally, a current of electricity can be evolved from the earth in a closed conductor by moving this conductor so that it cuts the lines in which a dipping-needle, freely suspended, places its length; the same action is produced in like circumstances when an artificial magnet or loadstone replaces the earth in the above experiment.

Hypotheses as to the Distribution of the Magnetism of the Earth.—As far as the general fact is concerned of considering the earth as a great magnet, all physicists are agreed, but difficulties of complicated natures have occurred when into this general theory they have endeavored to bring the magnetic elements observed at different parts of the earth's surface. Hence, various hypotheses have been framed as to the positions, number, and intensities of the magnetic poles, as to the distribution of the magnetic forces within and on the earth, and as to the cause of the variations in the directions and magnitudes of the various resultants of terrestrial magnetic action.

Hypothesis of Mayer, Humboldt, and Biot.—About the middle of the last century it was suggested by the German astronomer Mayer—and the same idea was adopted independently by Humboldt and Biot—that the main phenomena of terrestrial magnetism could be explained by the supposition that near the centre of the earth exists a single magnet whose length is small in comparison with the earth's diameter, and whose axis passes through the centre of the earth in a direction perpendicular to the magnetic equator. This hypothesis may be concisely stated as follows: Let E Q represent the magnetic equator, and E m Q a great circle on the globe perpendicular to the plane of the equator. Let $n\,o\,s$ be the supposed interior magnet, whose centre o coincides with the centre of the earth, and whose axis $n\,s$ is perpendicular to E Q. Then, the length $n\,s$ being very small in comparison with the distance $o\,m$, the direction and magnitude of the force exerted by the magnet upon any point m of the earth's surface will be given by the formulæ

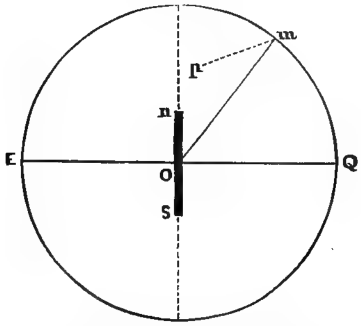
$$\tan omp = \tfrac{1}{2} \tan mon,\ \mathrm{R} = \frac{m\mu}{a^3}\sqrt{1 + 3\cos^2 mon};$$

in which m is the magnetic moment of the magnet $n\,s$, μ the quantity of free magnetism in the point acted on, and a the radius of the earth. But if λ denote the magnetic latitude $m\,o$ Q, and θ the magnetic inclination, or the angle made by the direction of the force with the horizon of the place, then is $mon = 9^\circ - \lambda$, $omp = 90^\circ - \theta$, whence

$$\tan \theta = 2 \tan \lambda,\ \mathrm{R} = \sqrt{1 + 3 \sin^2 \lambda},$$

the force at the magnetic equator being taken as unity.

Fig. 18.



Let us examine the consequences of these formulæ:

1. On the *magnetic equator* $\lambda = 0$, and consequently $\theta = 0$, $\mathrm{R} = 1$. Accordingly, the inclination will be nothing at all points of this line, and the direction of the needle horizontal. Again, the intensity of the force will be equal to unity, and less than at any other points on the earth's surface. The magnetic equator is therefore, on this hypothesis, also the line of *minimum intensity*.
2. The points in which the axis of the magnet meet the surface of the earth will be the *magnetic poles*. At these points $\lambda = 90^\circ$, and consequently $\theta = 90^\circ$, $\mathrm{R} = 2$. At the magnetic poles, therefore, the freely suspended needle takes the *vertical position*, and the force will be double that at the equator.
3. The great circles passing through the line $n\,s$ will be the magnetic meridians, and the declination at each point of them will be equal to the angle which they contain with the meridian of the place.
4. If planes be drawn perpendicular to $n\,o\,s$, or parallel to the magnetic equator, they will intersect the globe in circles which are analogous to the parallels of latitude, and may be called the *magnetic parallels*. For all the points of each such circle the magnetic latitude λ is the same. Hence, θ and R are also the same, and the parallels will be *isoclinal* and *isodynamic* lines.

We see from this account that the magnetic phenomena of the globe are represented, in a rude and general manner, by the hypothesis in question. In particular, it has been found that the formula $\tan \theta = 2 \tan \lambda$ is approximately true for points on the earth's surface whose magnetic latitude does not exceed 30°, and it is probable that the law of the intensity may be depended on within the same limits. But a closer comparison of the results with those of observation shows that the discrepancies are considerable. The line of least force does not coincide with the line of no inclination; the points of greatest force on the earth's surface are four instead of two; and none of these coincide with the points at which the inclination is 90°. Finally, the isoclinal and the isodynamic lines are not parallel circles, as they would be according to the hypothesis.

Hansteen's Hypothesis.—The next hypothesis of any importance was brought forth by Hansteen of Norway. He supposed the existence of *two* magnets in the interior of the earth. These magnets are placed eccentrically and inclined to the earth's equator, and one of these magnets is more powerful than the other. He then reached certain empirical formulæ which rather precisely gave the value of the magnetic elements on the earth. In this hypothesis by the magnetic poles of the earth is understood the poles of the two interior magnets, and not the points on the earth where the dipping-needle takes vertical positions. Hansteen assumes that these four poles have a regular motion of revolution about the terrestrial poles, the two poles of the N. going from W. to E. in an oblique direction, and the two S. poles from E. to W., also obliquely. He gives these motions the following durations of revolution: The stronger N. pole in 1890 years; the stronger S. pole in 4605 years; the feebler N. pole in 860 years; the feebler S. pole in 1303 years. Instead of two magnets we may imagine a greater number, and add one whenever the advance of scientific observations requires the addition in order to embrace the phenomena in the multipolar hypothesis. Thus, we may reach empirical expressions which are certainly valuable aids in directing original observations, but which cannot be said to form a *theory* of terrestrial magnetism.

Gauss's Theory.—In the year 1838, Gauss published in the *Resultate des Magnetischen Vereins,* his celebrated memoir on the earth's magnetism. It is impossible without a considerable space and the use of the calculus to give a thorough account of this theory. The reader will find Gauss's papers translated into English in *Taylor's Scientific Memoirs,* vol. ii. Gauss makes no hypothesis as to the number and position of the magnetic poles; he regards the earth as an infinite assemblage of magnets disposed in any manner; which amounts to saying that in the interior of the earth exist centres of action attracting and repelling in the inverse ratios of the squares of the distance. He determines certain relations among the components of the forces which are true generally; then he expresses these components by general formulæ, the constants of which can be obtained by observation. Gauss shows that only two poles can exist at the surface of the earth; the assumption of more than two leads to conclusions opposed to the facts of observation.

Gauss compared the results reached by his calculations with accurate observations made at ninety-one magnetic stations. In the majority of cases the difference between calculation and observation is about equal to the errors of observation; sometimes he found that these differences were not greater than those made by practised observers at the same station. He applied his formulæ to the determination of the position of the N. magnetic pole, and he found that for the year 1830 its position was 73° 35′ N. lat. and 264° 21′ E. lon. from Greenwich. Capt. Ross found for the position of this pole a lower latitude by 1°. This certainly was a very satisfactory agreement. For the same year he calculated that the S. magnetic pole was situate in 72° 35′ S. lat. and 152° 30′ lon. E. of Greenwich. As remarked before, this point has never been reached by explorers. Gauss found for the magnetic intensity of the N. pole, 1.701; for the S. pole, 2.253. Gauss succeeded in obtaining measures of the absolute magnetic forces of the earth, and thence computed the magnetic moment of the earth. He found that it was equal to 8500 trillions of magnetized steel bars each weighing 500 kilogrammes, and each having a length of one-half a mètre. He computed that if the earth's free magnetism was uniformly distributed throughout its mass, each cubic mètre would contain a quantity equal to eight of the above bars. As we know that the outer layers of the earth contain far less magnetism than this, it has been concluded that the terrestrial magnetism is concentrated towards the centre of the earth. Gauss also computed what distribution of the magnetic fluids would give effects equivalent to the magnetic actions of the globe. Poisson had previously shown that the action of any magnetic body could be assumed to be replaced by that of a surface charged with the hypothetic magnetic fluids. Gauss found that the southern hemisphere would be charged with a layer of southern fluid, and the northern hemisphere with a layer of northern fluid. The line of separation of the two fluids does not differ greatly from a great circle which cuts the equator on the coast of Guinea at 15° of W. lon. The density of these layers varies from one point to another, and has two maximum points of density in the northern hemisphere—one on the shores of Siberia, at 71° N. lat. and 116° E. lon.; the other situate S. of Hudson's Bay, at 55° N. lat. and 263° E. lon. There exists only one point of maximum density in the southern hemisphere, quite near the southern magnetic pole, in lat. 70° S. and 154° E. lon. From the observations which existed at the time when Gauss wrote his classic work he calculated the course of the magnetic curves on the earth's surface, and published maps of them which represent the magnetic condition of the earth at that period as far as observations allowed him to go.

Correction of the Compass in Iron Ships.—The importance of this subject demands a concise description of the process by which a compass is corrected for the magnetic action of the iron either composing the hull of a ship or existing in her interior. In 1803, Capt. Flinders first made the important observation that the disturbances in his compasses could be accounted for by assuming the existence of iron placed in the direction of the ship's head and charged with S. magnetism for the northern hemisphere, and with N. magnetism for the southern hemisphere. To correct these disturbances he suggested placing aft of the compass a vertical bar of soft iron whose upper end, having like magnetism as the imaginary mass in the ship's head, would, in acting on the opposite pole of the compass-needle, correct its disturbances. The discussion by Sabine of the deviations of the compasses in wooden ships during the voyage of Ross in 1839–43 showed that the peculiarities in the disturbances of the compass lasted a short time after the ship had left the regions in which the terrestrial forces were such as would tend to explain the disturbances.

The first real explanation of the peculiar disturbances observed in iron ships was given by Airy, the astronomer-royal, in 1839. He was the first clearly to distinguish between the effects of the magnetism *induced* in the ship by the earth's inductive action, and what he terms the *sub-permanent* magnetism of an iron ship. By the latter is designated such a character of magnetization as is given to a bar of iron when it is placed in the line of the dip and struck. "The magnetism of a struck bar resembles the magnetism of a permanent steel magnet in all respects but this—that, while perhaps no change can be remarked in its quantity of magnetism in hours or days, yet it infallibly diminishes in a long time. To express this partially permanent character the term *sub-permanent* magnetism has been adopted." In single iron bars the sub-permanent magnetism diminishes sensibly in a few hours, and is lost in a few days. In some large iron ships a portion of it has remained unaltered for many years. Hence, both induced and sub-permanent magnetism exists in iron ships. Airy "conceives the ship's magnetism to be resolved into two parts—one transversal to the ship, one longitudinal. When the ship's head is placed N. or S., the transversal force alone disturbs the compass, and the quadrantal (inductive) disturbance vanishes; and the transversal magnetic part can be corrected by an opposite transversal magnet broadside on to the compass, whose distance is determined without any calculation, simply by trying its effect at different distances till the needle points correctly. Then, in like manner, if the ship's head be placed E. or W., the longitudinal magnetism only disturbs the compass, as the quadrantal deviation vanishes there, and it is to be corrected by a longitudinal magnet broadside on to the compass, tentatively applied. The effects of permanent or sub-permanent magnetism are now entirely corrected. In order to correct for the induction effect which produces quadrantal deviation, the ship's head must be placed in azimuth 45° (nearly), or 135°, or 225°, or 315°; there will be no difficulty in ascertaining whether the quadrantal disturbance is such as corresponds to the effect of iron in the direction of the ship's head; and if so, it must be corrected by iron on one or both sides, shifted by trial till the correction is complete. These processes were introduced by the author (Airy) in 1838, and they are still retained in use without alteration."

If the sub-permanent magnetism of a ship were permanent in its direction and intensity, and if the earth's action on the ship in various latitudes remained the same, then the process just described would permanently correct the disturbance of the ship's compass. But changes in the above actions do take place, and it is only after a ship has made many voyages that its sub-permanent magnetism becomes permanent. Hence, a ship's compasses should be repeatedly corrected during successive years to ensure the safety of its navigation. (See SHIPS, IRON, MAGNETISM OF, by C. A. SCHOTT, M. N. A. S.) A. M. MAYER.

Magnetic Iron Ores. See IRON ORES.

Magnet′ic Pyri′tes, or **Pyrrhotine,** a natural sulphide of iron, differing from common iron pyrites in crystallizing in the hexagonal system and in chemical composition, containing a larger proportion of iron; sulphur 39.5, iron 60.5 (iron pyrites, sulphur 53.3; iron 46.7). Pyrrhotine is slightly attracted by the magnet.

Magnetism. See MAGNET.

Magneto-Electricity. See ELECTRICITY. See also APPENDIX.

Magnif′icat, the song of the Virgin Mary, as recorded in Luke i. 46–55. It is so named from the first word in the Latin version, *Magnificat anima mea, Dominum.* This song of praise by the Virgin Mother in thankfulness for the Incarnation, and uttered while yet she was the tabernacle of the Sun of Righteousness, must have formed a part of the worship of the Church from early times. It is first found prescribed about the year 506, when in France it was ordered to be sung at lauds. In the Eastern and Armenian churches it is still a lauds canticle. In the West it has during the last 800 years been sung only at vespers. A prominent place is given to this hymn in the vesper and other services of the Roman Catholic Church and the Church of England. It is omitted from the evening service of the Protestant Episcopal Church in the U. S.

Magnin′ (Charles), b. at Paris Nov. 4, 1793; was appointed assistant at the National Library in 1813, and one of the directors in 1832, and d. at Paris Oct. 7, 1862. As contributor to the *Globe*, together with Guizot, to the *National*, together with Armand Carrel, and afterwards to the *Revue des Deux Mondes*, he acquired great reputation as a spirited and acute critic, especially of dramatic poetry and art. A number of his articles he collected under the title *Causeries et Méditations historiques et littéraires* (2 vols., 1843). He also wrote *Les Origines du Théâtre moderne* (1838), *Le Théâtre de Hrosvitha* (1845), with translation and commentaries, and *Histoire des Marionnettes* (1852).

Mag′nitude [Lat. *magnitudo*], anything that can be measured. The term was originally applied to signify a portion of space possessing the three attributes, length, breadth, and thickness; by extension of meaning it has come to signify any quantity that can be expressed in terms of a quantity of the same kind taken as a unit. Lines, surfaces, and volumes are called geometrical magnitudes. An angle is also a species of geometrical magnitude. Time, weight, and numbers are arithmetical magnitudes. (See Quantity.) W. G. Peck.

Magno′lia [named by Linnæus in honor of Dr. Pierre Magnol (1638–1715)], a genus of exogenous trees and shrubs of the order Magnoliaceæ, mostly natives of the warm parts of North America and the temperate and warm parts of Asia. The U. S. have seven species, some evergreen, others deciduous, and all handsome trees and shrubs, mostly with conspicuous fragrant flowers. The wood is soft, but that of *M. grandiflora* is valued in joinery, and if kept wet is very durable. The larger Asiatic kinds are excellent timber trees, especially *Michelia champaca*, which is of a closely related genus. The Cucumber Tree and the Umbrella Tree (which see) are of this genus. The smallest and the hardiest of the American species is the white bay or beaver-wood (*M. glauca*), an evergreen found from Cape Ann in Massachusetts south-westward to Texas. The largest of our species is the *Magnolia grandiflora*, a superb evergreen of the Southern States, of noble size and large, beautiful, and very fragrant blossoms. There are as many Asiatic as American species. Some of these, from Northern China and Japan, are hardy and beautiful shrubs, becoming rather common in cultivation. The bark, leaves, and seeds of the various species abound in a bitter tonic principle, and have a limited use in medicine.

Magnolia, on R. R., cap. of Columbia co., Ark. (see map of Arkansas, ref. 6–B, for location of county), 40 miles S. W. of Camden. Principal business, farming. Pop. in 1870, 259; in 1880, 536.

Magnolia, on R. R., cap. of Pike co., Miss. (see map of Mississippi, ref. 9–F, for location of county). Pop. in 1880, 567.

Magnolia, Duplin co., N. C. (see map of North Carolina, ref. 4–I, for location of county), on the Wilmington and Weldon R. R., 45 miles from Wilmington, has a college, several distilleries, and quite a business in trucking and naval stores. The two "Natural Wells" about 1 mile from the town have never been known to dry up, and no bottom has been found to them. Pop. in 1880, 403.

Mag′nus (Heinrich Gustav), b. at Berlin May 2, 1802; studied natural science at the university of his native city, and chemistry under Berzelius in Stockholm, where he discovered the compound known as the green salt of Magnus; was appointed professor of physics and technology at the University of Berlin in 1834, and d. there Apr. 4, 1870. The results of his numerous original researches he communicated in Poggendorf's *Annalen* and in the transactions of the Berlin Academy of Science. The most remarkable were his experiments on the coefficient of the dilatation of gases, published in 1841, a few days after Regnault's publication of the same results; and his experiments on the transmission of heat through gases, which gave rise to a controversy with Tyndall.

Mag′nusen (Finn), b. at Skalholt, in Iceland, Aug. 27, 1781; studied at the University of Copenhagen; began to practise as a lawyer in Iceland in 1803, but returned in 1812 to Copenhagen; was appointed professor of Northern antiquities in 1815, and keeper of the archives in 1842. D. at Copenhagen Dec. 24, 1847. His principal works are a translation of the older *Edda*, with accompanying commentaries (4 vols., 1821–23), a critical exposition of the Scandinavian mythology (4 vols., 1824–26), and *Priscæ Veterum Borealium Mythologiæ Lexicon et Gentila Calendarium* (1828); but besides these works he wrote a great number of minor essays relating to Icelandic literature, Scandinavian mythology, and Northern antiquities, remarkable as well for learning as for critical acuteness.

Magnusson (Arne), b. in the western part of Iceland 1663, was educated at Hvamm by his uncle, Ketil the Priest, who was famous for his learning in Icelandic lore and as a copyist of old Icelandic manuscript. In 1683 he came to Copenhagen and received employment first as secretary to Bartholinus, afterward in the royal archives. In 1702 he accompanied the royal commission of survey to Iceland, and remained there till 1712. On his return to Copenhagen he was made professor of history and Northern antiquities at the university, and died there Jan. 6, 1730. During his ten years' stay in Iceland he made a complete and unique collection of Icelandic manuscripts, which he bequeathed to the university library (the Arne Magnæan collection) on the condition that it should undertake a gradual printing and publishing of the manuscripts. It afterward appeared that the collection had been made in the very last moment in which it could be made, as the literary interest of the Icelanders was fast dying out and the manuscripts were rapidly perishing from neglect.

Magoon′ (Elias L.), D. D., b. at Lebanon, N. H., Oct. 20, 1810; was a bricklayer in youth, but obtained by his own exertions an education at Waterville College; was ordained in 1840 to the ministry as pastor of the Second Baptist church at Richmond, Va.; made a tour in Europe 1846, and was successively pastor of churches in Cincinnati (1847), New York (1849), Albany (1857), and Philadelphia (1860). He has written *Orators of the American Revolution* (1848), *Living Orators in America* (1849), *Proverbs for the People* (1848), *Republican Christianity* (1849), and *Westward Empire* (1856), and is widely known as a connoisseur in art.

Mag′pie, a name applied to various birds, mostly of the genus *Pica*, belonging to the crow family. The common magpie of Europe (*Pica caudata*) is a bird well known for its cunning and mischievousness, and its disagreeable screaming voice. The *Pica Hudsonica* of North America, common north-westward, is by some regarded as of the same species. The *P. Nuttalli* is a common Californian species. There are other species, nearly all of them Old-World birds.

Magruder (Allan B.), b. in Kentucky about 1780; became a lawyer; published *Reflections on the Cession of Louisiana* (Lexington, 1803); removed to Louisiana; was U. S. Senator from that State 1812–13, and collected materials for a general history of the Indians. D. at Opelousas, La., in Apr., 1822.

Magruder (Gen. John Bankhead), b. in Virginia about 1810; graduated at West Point 1830; was distinguished in the Mexican war in command of the light battery of Gen. Pillow's division, earning the brevet of major for gallantry at Cerro Gordo, and lieutenant-colonel for Chapultepec, where he was wounded; resigned from the U. S. army Apr. 20, 1861; entered the Confederate army; commanded at Yorktown until its evacuation; took part in the campaign on the Chickahominy; was appointed brigadier and major-general, and sent Oct. 16, 1862, to assume command of the western department, including Texas, Arizona, and New Mexico. He recovered Galveston from the Federal forces, and took an active part in military affairs in Texas throughout the war. He then resided for a time in Mexico, but soon returned to Texas, and d. at Houston Feb. 19, 1871.

Maguire′ (John Francis), b. at Cork, Ireland, in 1815; was called to the bar in 1843; was a member of Parliament from 1852 until his death; was proprietor and editor of the Cork *Examiner*, a Catholic organ, and was a leading exponent of Irish Catholic interests in Parliament, in journalism, and in literature. He wrote *Rome and its Ruler* (1857), revised, enlarged, and republished in 1870, under the title *The Pontificate of Pius IX.*; *The Industrial Movement in Ireland* (1853), *The Irish in America* (1858), *Life of Father Mathew* (1863), and *The Next Generation* (1871), a political novel. Mr. Maguire was an advanced Liberal politician, an advocate of "home rule," and was four times elected mayor of Cork. He stimulated the growth of flax in the S. of Ireland by establishing linen-mills in Cork. D. at Cork Oct. 31, 1872.

Maguire (Robert), b. in Dublin, Ireland, in 1826; was educated at Trinity College, where he graduated with the highest honors in 1846; was curate of St. Nicholas, Cork, 1849–52, and became vicar of Clerkenwell 1857; was secretary of the Islington Protestant Institute, and published among other works, *The Seven Churches of Asia* (1857), *Expository Lectures on Bunyan's Pilgrim's Progress* (1859), *The Miracles of Christ* (1863), *St. Peter Non-Roman in his Mission, Ministry, and Martyrdom* (1871), and edited *Cassell's Illustrated Bunyan* (1864–65).

Mahâbhârata. The two great epics of ancient Indian literature are the *Mahâbhârata* and the *Râmâyana*. (See Râmâyana.) The word *Mahâbhârata* is from the Sanskrit *mahat*, "great," and *Bharata*, the name of an ancient king of the Lunar race. Judging from the nature of the poem of the *Mahâbhârata*, the word may be translated "*The Great* (epic relating to the history of the descendants of) *Bharata*." Bharata is said to have been the first *samrâj*, or universal monarch, and to have brought all kingdoms "under one umbrella." It is from him that the whole of India is known to Hindus as *Bhârata-Kânda*—*i. e.* Bharata's continent. Bharata's descendants were called Bharatas, and the *Mahâbhârata* was the great war which raged between the Bhârata heroes—that is, between the Kauravas and the Pândavas, all of whom were alike descended from Bharata. The two great dynasties of ancient India are respectively known as the Solar and the Lunar. To the latter belongs the *Mahâbhârata* narrative. It is a heroic epic, chiefly, though by no means wholly, in praise of the valorous exploits of the chiefs of the dynasty in question. The kings of the Lunar race originally reigned in the Doab, between the Jumna and the Ganges. Near the site of the present city of Allahabad stood the first capital of the dynasty—namely, Pratishthâna—at the *prayâga* or confluence of the Jumna and Ganges. The second capital adopted by the race was Hastinâpura, on the Ganges, N. of where Delhi now stands. The Pândava branch of the family subsequently built Indraprastha, on the Jumna, partly on the site of the present Delhi. The kings of Magadha also belonged to the Lunar race, and were well known to the ancient Greeks. Of all early Indian dynasties, that of the kings of Magadha was the most powerful and lasting. Though the wars carried on between the Kaurava and Pândava families form the principal subject treated of in the *Mahâbhârata*, yet a great variety of other topics are dilated on during the course of the poem. In many parts of the stupendous work the wars are only introduced as a kind of link between narrative and narrative, disquisition and disquisition—a link to bind the whole together. The *Mahâbhârata* contains old poetical versions of pretty nearly all the legends current amongst ancient Hindus; it cannot be doubted to be in parts an accurate reflex of their early history; it treats of their customs, sciences, and laws; it gives minute particulars of their religious observances; it affords us a clear insight into the domestic circumstances of Hindu kings of old; in a word, it contains almost all that which was known by ancient Hindus, with the exception of that which was contained in the Vedas. The main story of the book—namely, that about the primarily unfortunate but subsequently victorious Pândavas—is constantly interrupted. Instead of proceeding straight forward, the narrative winds about like the pathway of a traveller through an Indian forest. It now leads through tangled brushwood and matted bamboos, now ascends, now descends, now curves sharply round some obstacle, and now seems to be altogether lost in the leafy maze. Thus, though the *Mahâbhârata* has won for itself the name of a great "*kavya*" or epic, some prefer to designate it simply as an *itihâsa* or ancient narrative. But an epic it is, of vast scale, grand poetic conception, and wonderful merit. If the whole of the poem were compared to a dark and stormy sky, lurid with wild gleams of lightning, and constantly changing its threatening aspect, the episodes it contains—some of them of rare and touching beauty—might fitly be likened to patches of soft blue sky calmly islanded in the midst of the driving scud. The *Mahâbhârata* professes to have been composed by the Rishi, *Krishna-Dwaipâyana-Vyâsa*, commonly called *Veda-Vyâsa*, and still more commonly simply *Vyâsa*. It also professes to have been first recited in public by *Vaisampâyana*, who learned it from *Vyâsa*, and to have been recited for the second time by the poet *Ugra-Srava*. It is also stated in the poem that when it was first published it only contained 24,000 verses, but that many thousand verses were added to it on its second recitation. Exclusive of the "*Hari-Vamsa*," a supplement to the poem, the *Mahâbhârata* contains 91,015 slokas. In all, there are more than 100,000 verses in the whole epic. The poem contains between three and four millions of syllables! There is reason to believe that at one time the *Mahâbhârata* was even larger than it is now, and thus some have rashly imagined that, being so weighty a poem, the name *Mahâbhârata* must be derived from *mahâ*, "great," and *bhâra*, "weight." In any case, this great Indian epic is certainly one of the most enormous poems ever penned. It, like many great works of antiquity, is evidently the production of many minds and many epochs. As a poem it is very unequal; the surface-matter continually varies, but beneath all there lies, without doubt, a solid and thoroughly precious substratum of historical fact.

The manner in which the *Mahâbhârata* was composed may be stated, with nearly absolute certainty, to be as follows: The ancient legends which were current respecting the Bhârata heroes were versified by *sûtas*, or royal bards. These versified accounts were repeatedly sung at the courts of Hindu kings. New songs and poems were from time to time added to the old. Finally, some learned Hindu pandit collected all these various compositions from the *sûtas*, arranged them with some degree of order, and at last published them as one entire production, giving as the name of the whole composition the apt and high-sounding one of the *Mahâbhârata*. The Bhârata legends were of course current in India centuries before they were reduced to writing, just as the Vedic hymns were doubtless sung ages before the Vedas were written. Then, as to the dates of the *Mahâbhârata* legends, it would be rash to premise anything concerning them. The events to which any given narrative in the *Mahâbhârata* relates probably occurred long before that narrative was versified; and, as we have seen, it was at a still later period that the versified story, after being sung at the royal courts all over India, was finally embodied, in a polished and perhaps greatly altered state, in the *Mahâbhârata*. It may be truly said that, as almost all rivers flow into the sea, almost all of the compositions of the most ancient Aryan poets of Hindostan flowed into and found their final rest in the deathless pages of the *Mahâbhârata*. It is as absurd to suppose that Vyâsa composed the whole of the *Mahâbhârata* as to suppose that one man wrote the Bible from Genesis to the Apocalypse. Throughout the poem the diction in the several parts is as different as the style of the Song of Solomon from that of the Epistle to the Hebrews. In the *Mahâbhârata* we have dry metaphysics side by side with voluptuous love-scenes; on one page customs are defined and laws promulgated, whilst on the next we find ourselves hurled amidst scenes of battle, murder, and sudden death.

The contents of the *Mahâbhârata* are not only various, they are extremely contradictory in parts. Thus, it is not at all an easy matter to give a clear and succinct account of the whole work, or even of any one of the principal tales embodied in it. Every story is related in one portion of the book in one way, and in another portion of the book in another way. It does not appear that Vyâsa, or whoever it was who compiled the *Mahâbhârata*, took the trouble to compare the various versions of the stories contained therein. Certainly, he has not endeavored to reconcile them, even where they are most glaringly diverse. He appears to have transcribed primarily the first version of any given tale which he met with, and then when some other courtly minstrel related to him some other version of the same narrative he seems to have transcribed that also with calm indifference. One consequence of this may be noted. When a scholar says that such and such a narration of events is to be found in the *Mahâbhârata*, another scholar may point to some other counter-narration, and thus endless controversy will be engendered. "When any one," writes an eminent Orientalist, "affirms that the representation which the *Mahâbhârata* gives of any one subject is of such and such a nature, it is always possible for some other person to deny the statement, and to assert that the *dictum* of the *Mahâbhârata* is a totally different one on the point. On examination, however, it will probably be discovered that both statements are correct, both being contained somewhere in that extensive work. For this reason it has been customary for the authors of Purânas and the adherents of various sects to overlook so much of the *Mahâbhârata* as does not suit their purpose, to select and utilize only those portions which do suit them, and to attribute the name and authority of the *Mahâbhârata* to those portions alone."

In conclusion, an exceedingly brief epitome of the contents of the *Mahâbhârata* may be given: Bharata had a lineal descendant named Kuru. He had two sons, Dhritarâshtra and Pându. The former was blind, but was possessed of considerable political sagacity. He had a hundred sons, whilst Pându had but five—viz. Yudishthira, Bhîma, Arjuna, Nakula, and Sahadeva. The latter were called the Pândavas. The hundred sons of Dhritarâshtra were called the Kauravas. Pându resigned his throne to his elder brother, who, though blind, occupied it, and then subsequently divided his kingdom fairly, and even generously, between his own sons the Kauravas and the five Pândavas. The Kauravas, however, soon grew envious of the equable arrangement, and determined to wrest by force or guile their portion of the kingdom from the Pândavas. A game of dice was played. The Pândavas lost their all. However, the Kauravas agreed to restore their cousins to their kingdom if they passed twelve years in a forest, and a thirteenth year in undiscoverable disguises. This the Pândavas did, but when they claimed the fulfilment of the Kauravas' promise, it was basely evaded. At this the great war arose, and the Pândava princes were ultimately triumphant. The several characters of the five Pandava princes are finely drawn; many of the battle-scenes are striking for their animation; and the whole poem is re-plete with frequent references to Hindu legends, mythology, and ceremonial rites. A thorough knowledge of the *Mahâbhârata* is essential to any one who would aspire to be a Sanskrit scholar. Even if in many particulars it fails when considered merely as a poem, yet as a repertory of ancient Aryan tradition the *Mahâbhârata* is invaluable.

R. C. Caldwell.

Mahan′ (Asa), D. D., b. in Vernon, N. Y., Nov. 9, 1800; graduated at Hamilton College in 1824, at Andover Theological Seminary in 1827; became pastor of a Presbyterian church in Pittsford, N. Y., in 1829, of the Sixth street church in Cincinnati 1831, and in 1835 president and professor of philosophy at Oberlin College, O.; was president of Cleveland University 1850–56; pastor of a Congregational church in Jackson, Mich., 1856–58, of another at Adrian 1858–61, and president of Adrian College 1861–71. In 1880 he was residing in England. He has been a prominent advocate of the views generally called "Perfectionist," which he set forth in a work entitled *Scripture Doctrine of Christian Perfection*, and acquired considerable distinction by his metaphysical treatises: *The Science of Intellectual Philosophy* (1845), *The Doctrine of the Will* (1846), *The Science of Moral Philosophy* (1856), and *The Science of Logic* (1857). He also published *Modern Mysteries Explained and Refuted* (1855), a treatise directed against Spiritualism.

Mahan (Dennis Hart), LL.D., b. in New York Apr. 2, 1802, but taken to Norfolk, Va., in infancy; intended for the profession of medicine, he relinquished his medical studies in 1820 to enter the U. S. Military Academy, from which he was graduated at the head of his class in 1824, and appointed a second lieutenant of engineers, but retained at the Academy as assistant professor of mathematics and of engineering until 1826, when he was sent to Europe on professional duty, where he passed four years in visiting and studying the fortifications and institutions connected with his profession, being for fifteen months a pupil at the engineering school at Metz. Returning to the U. S. in 1830, he was in 1832 appointed professor of the department of civil and military engineering, of which he had been in charge since 1830, and at the head of which he continued until 1871. He was of nervous temperament and subject to fits of depression, and in a moment of temporary alienation threw himself into the Hudson River from the steamer Mary Powell while on his way to New York to consult his physician, and was drowned near Stony Point, N. Y., Sept. 16, 1871. In his professional capacity he acquired a worldwide reputation, as well as by his many valuable works on engineering and the art of war, which have met with extensive sales and are largely used as textbooks in the U. S. In 1836 he published a *Treatise on Field Fortifications*, to which was added in 1865 *Military Mining and Siege Operations*, the whole now comprising Part I. of *An Elementary Course of Military Engineering*, of which *Permanent Fortifications* constitutes Part II. His *Course of Civil Engineering*, first published in 1837, was largely improved and extended up to 1868, when it was almost entirely rewritten; at the time of his death a new revised edition was in preparation and partly printed; *Advanced Guard, Outpost, and Detachment Service of Troops* (1847; enlarged in 1862); *Fortification-Drawing and Stereotomy* (1865); *Industrial Drawing* (1853). Mahan's American edition of *Moseley's Mechanical Principles of Engineering and Architecture* appeared in 1856, reaching a second edition in 1869. Degree of LL.D. conferred by William and Mary and Dartmouth colleges and Brown University, and member of various scientific assocations.

Mahan (Milo), D. D., brother of D. H. Mahan, b. at Suffolk, Nansemond co., Va., May 24, 1819; was educated at St. Paul's College, Flushing, L. I.; entered the Protestant Episcopal ministry in 1845; became in 1851 professor of ecclesiastical history in the Episcopal General Theological Seminary in New York, and in 1864 rector of St. Paul's church, Baltimore, where he d. Sept. 3, 1870. He published *The Exercise of Faith* (1851), *History of the Church* (1860; new ed. 1872), *Reply to Colenso* (1863), *Palmoni, a Free Inquiry* (1863), and *The Comedy of Canonization* (1868). His collected works were published in 3 vols., 1872–75, with a memoir by Rev. J. H. Hopkins, Jr.

Mahanoy City, R. R. centre, Schuylkill co., Pa. (see map of Pennsylvania, ref. 5-H, for location of county), 80 miles N. W. of Philadelphia, in the Mahanoy valley and coal-field, has a public library and a foundry. The inhabitants are directly or indirectly connected with the neighboring mines of anthracite coal. Mahanoy was first settled in 1859. Pop. in 1870, 5533; in 1880, 7181.

Mahanud′dy, or **Mahanadi** [Sansk. "great river"], a river of Hindostan, rises in lat. 20° 20′ N. and lon. 82° E., flows with an eastward course for a distance of 520 miles through Berar and Orissa, and falls into the Bay of Bengal, where it forms a large delta. Navigable for 300 miles during the rainy season, it becomes almost dry during the remaining half of the year. The river-bed is celebrated for the fine quality of diamonds found in it.

Mahdi, El, the latest prophet of Islam, was b. at Dongola, a fortified town on the Nile, between the third and the fourth cataract and close to the Nubian desert. His true name was Mohammed Achmet, and he is said to have had pure Arab blood in his veins. He studied Mohammedan theology in a free school kept by a fakir at Khartoum, and afterward in a similar school at Berber, and in 1870 he was ordained as a sheik. He took up his abode in the island of Abba, in the White Nile, and immediately began preparations for the *rôle* he was going to play. His fame for learning and holiness rapidly increased; and when, in 1881, he openly announced himself to be the mahdi foretold by Mohammed, and sent messages to the sheiks and fakirs round about declaring that he had a divine mission to reform Islam, he was immediately accepted and followed by many. The first rumors of the new prophet were received with incredulity and derision in Cairo, Constantinople, and Mecca, but it soon became evident that the whole Soudan was in uproar, and that the separation of the Soudan from Egypt was most likely to be the first result of the movement. The grand sheriff of Mecca, the highest of the high priests of Islam, then issued a proclamation declaring the self-styled mahdi an impostor and warning the Faithful against joining his standard. The proclamation, however, had no effect at all. The khedive of Egypt next sent out an expedition against El Mahdi, under Hicks Pasha, an Englishman. It came to an encounter at El Obeid, W. of the White Nile, and Hicks Pasha and his army were massacred. England then interfered. Jan. 27, 1885, El Mahdi took Khartoom, and Gen. Gordon was assassinated. El Mahdi died June 22, 1885.

Mahim′, town of British India, on the island of Bombay, 7 miles N. E. of the city of Bombay, is ill built, but has very valuable oyster fisheries. Pop. about 9000, who are mostly Christians of Portuguese descent.

Mahmood′ (or **Mahmûd**) **I.,** sultan of Turkey from 1730 to 1754, b. at Constantinople Aug. 6, 1696, a son of Mustapha II.; succeeded his uncle, Ahmed III., but his long reign was comparatively insignificant.—Mahmood II., sultan of Turkey from 1808 to 1839, b. at Constantinople July 20, 1785, the second son of Sultan Abdul Hamed. According to Turkish custom, he was educated in the seclusion of the seraglio, and occupied himself mostly with literary and scientific studies, but he very early showed signs of a bright intellect and a strong will. In 1807 his cousin-german, Sultan Selim III., was deposed by an insurrection of the janizaries, who feared his zeal for reforms, and Abdul Hamed's oldest son, Mustapha IV., was raised to the Ottoman throne. From Selim, whose imprisonment he shared, Mahmood imbibed that implacable hatred to the janizaries which afterwards became so conspicuous in his life, and the deep conviction of the necessity of introducing into Turkey those reforms which modern European civilization had adopted. Submitting to the demands of the janizaries, Mustapha IV. abolished all Selim's reforms, but did not thereby establish peace. On the contrary, Bairaktar, pasha of Rustchuk, and one of Selim's adherents, rose in open rebellion, took Constantinople by storm, deposed Mustapha, and proclaimed Mahmood II. sultan July 28, 1808, Selim having been strangled in the mean time. Mahmood II., with Bairaktar for his grand vizier, immediately took up the work of reform, but on Nov. 14, 1808, a new insurrection of the janizaries broke forth. The house of the grand vizier was rased to the ground, the city was pillaged and set on fire at different points, and even the seraglio was stormed. In this emergency Mahmood II. ordered Mustapha and his infant son to be strangled, and his four pregnant sultanas to be thrown into the Bosporus; he thereby became himself the only surviving descendant of Osman, and, in consequence of a prevailing Turkish superstition which makes the destiny of the Turkish race dependent on the continuation of the dynasty of Osman, his person became inviolable. Peace was immediately restored, but the situation was still very dangerous. During the long series of court revolutions the authority of the sultan had decreased; the pashas ruled the provinces almost independently. The recent attempts at reform had roused the religious and national fanaticism of the Turks to the highest pitch, and in this situation entered a young prince with his head full of reforms, but without experience—shrewd, with a talent for dissimulation, but at the bottom of his heart haughty, unscrupulous, cruel, and revengeful. In some respects, however, Mahmood II. succeeded. In 1826 he dissolved the corps of the janizaries after a horrible struggle in the streets of Constantinople; 6000 were executed, 15,000 exiled, and the reorganization of the Turkish army after European models followed rapidly. Roads were made, an effective police and public safety established, postal communications introduced, and regular diplomatic connections with other European courts maintained. Of immense importance was the beginning emancipation of the Turkish women; they appeared now for the first time in public outside the harem. But in other respects Mahmood II. failed signally. Greece became independent, and Egypt was almost independent. (See the articles on Greece, Mehemet Ali, and Ibrahim Pasha.) It was only the interference of Russia which prevented the Ottoman empire from falling entirely to pieces; and when Mahmood II. died (July 1, 1839) Turkey had actually entered on her course of a long and slow, but sure and inevitable dissolution.

Mahmood (or **Mahmûd**) **of Ghizni** (Abul-Kasim-Yemin-ed-Daulah), sultan of Persia, first Mohammedan emperor of India and founder of the Ghiznevide dynasty, b. at Ghizni (Ghazna or Ghuzny) in Candahar Dec. 12, 967. His father, Subuktigin, a descendant of the Sassanian kings of Persia, was governor of the province after the death of his father-in-law, Alptigin, and owned a nominal allegiance to Persia, but was really independent, and extended his frontiers on every side. Mahmood distinguished himself in youth, under his father's command, in campaigns against the Tartars, who had invaded Khorassan, and received from Noh, the Samanide sovereign of Persia, the title of Seif-ed-Daulah ("sword of the state"), together with the government of the province of Segestan. On the death of Subuktigin in 997, Mahmood overthrew his younger brother, Ismael, who had succeeded to the government by his father's appointment; took Ghizni 998, and having some grievance against Mansur, the new Persian monarch, formed an alliance against him with the rulers of Toorkistan and Kashgaria, and overthrew the Persian kingdom, which was divided among the confederates. Having laid the foundation of an extensive empire in Central Asia, Mahmood turned his arms against India, and in a series of twelve expeditions, begun in 1001 and extending through nearly thirty years, he plundered and devastated the country, carried off enormous treasures, and massacred vast numbers of the Hindoos. Mahmood was the first ruler who assumed the title of sultan. D. at Ghizni Apr. 3, 1030. Many of his descendants bore the same name. (See India: its History, by R. C. Caldwell.)

Mahog'any [a word of aboriginal American origin], the *Swietenia Mahogoni*, a noble forest tree of the West Indies and Central and South America, growing also to some extent in Florida. It is of the order Cedrelaceæ. Its wood is of very beautiful reddish color, extremely hard, strong, and heavy, and so costly that for a long time it has been used almost entirely as a veneering. It has for nearly 300 years been a staple article of commerce, and is brought from Honduras, Cuba, Hayti, Jamaica, and South America. The Honduras mahogany is now the most abundant and the largest, but also the coarsest and least handsome variety. The better sorts are called Spanish mahogany. Considerable quantities of the timber of *Khaya Senegalensis* from Africa and *Soymida febrifuga* from Calcutta (both cedrelaceous trees) are imported into England as mahogany, but the wood is generally inferior to true mahogany. Madeira mahogany is the wood of *Persea Indica*, and is coarse and inferior. Australia and other countries also furnish spurious though often valuable mahoganies. The bark of the true mahogany abounds in an active febrifugal principle. The "mountain mahogany" of Utah is the *Cercocarpus ledifolius*, of the order Rosaceæ.

Mahomet. See Mohammed.

Mahon, Lord. See Stanhope, Earl of.

Mahone (Gen. William), b. in Southampton, Va., about 1827; graduated at the Virginia Military Institute 1847; devoted himself to civil engineering; was the constructor of the Norfolk and Petersburg R. R.; took part in the capture of the Norfolk navy-yard Apr. 21, 1861; raised and commanded the 6th Virginia regiment; was engaged in most of the battles of the Peninsular campaign, those on the Rappahannock, and those around Petersburg; was appointed brigadier-general Mar., 1864, and major-general Aug. 12, 1864; commanded a division in Hill's corps, and at Lee's surrender was in command at Bermuda Hundred. Since the war he has devoted himself to the development of Va. railroads. Became U. S. Senator 1881.

Maho'ny (Francis), b. in Cork, Ireland, about 1805, studied at Jesuit colleges in Paris and Rome, and took orders in the Catholic Church, and relinquished that profession to connect himself with *Fraser's Magazine* about 1831, in which he published an amusing series of articles, collected in 1836 as *Reliques of Father Prout.* He was also a contributor to *Bentley's Miscellany* (1837), travelling correspondent, and afterwards Roman correspondent, of the *Daily News*, and for many years Paris correspondent of the *Globe.* He advocated the unity of Italy in the powerful letters published as *Facts and Figures from Italy,* by Don Jeremy Savonarola, Benedictine monk (1849). His closing years were passed in a monastery at Paris, where he d. May 19, 1866. Some of his later essays were edited by Blanchard Jerrold as *Final Reliques of Father Prout* (1874).

Mahopac', Lake, in Carmel tp., Putnam co., N. Y., is a pleasant summer resort, 14 miles from Peekskill. It has many pleasant residences and several good hotels. The lake is about 3 miles across, has three beautiful wooded islands, and is about 800 feet above the sea-level.

Mahrattas, a people of Central and Western India, who in the last century overran the greater part of the peninsula, placed the Mohammedan empire of Delhi under tribute, and were for half a century the most formidable obstacle to British supremacy in India. Their origin, geographical and ethnological, and their early history, are alike unknown, but the evidence of physical characteristics, customs, religion, and language, combined with the feeble indications of tradition, would point to one (or several) of the numerous irruptions of Turanian races from Central Asia prior to the rise of Mohammedanism (seventh century A. D.). This supposed race must have found its chief seat in the N. W. of the Deccan, along the Indian Ocean southward from the Nerbudda River to the neighborhood of Goa, and by intermarriage with Sudras and other low-caste Hindoo women acquired at once a language and a religion, the latter, however, being distinctive in ignoring caste and in permitting the use of meats. There can be no doubt that intermarriages with Arabs and Abyssinians impressed further characteristics upon the race during its period of formation. (See Grant Duff's *History of the Mahrattas*, and, for a comprehensive though brief résumé of Mahratta history, Meadows Taylor's *Student's Manual of the History of India.* See also India: its History.)

Mai (Angelo), Cardinal, b. at Schilpario, near Bergamo, Italy, Mar. 7, 1782; educated by the Jesuits; was appointed assistant at the Ambrosian Library of Milan in 1813; chief-keeper of the Vatican Library in Rome in 1819; secretary to the Propaganda in 1833; cardinal in 1838, and d. at Albano Sept. 8, 1854. Even when in Milan he acquired great reputation from his publications of fragments of ancient works discovered on palimpsests; the most remarkable of these were the fragments of Cicero's *Orationes*, M. C. Fronto's letters, Eusebius, Dionysius of Halicarnassus, and Julius Valerius's *Res Gestæ Alexandri.* In Rome he discovered an imperfect manuscript of Cicero's *De Republica*, which he published in 1822, and in 1825 he began the publication of those series of ancient works, Greek and Latin, which have made his name so celebrated among scholars—namely, *Scriptorum Veterum Nova Collectio e Vaticanis Codicibus edita* (10 vols., 1825–38), *Auctores Classici e Vaticanis Codicibus editi* (10 vols., 1828–38), *Spicilegium Romanum* (10 vols., 1839–44), and *Nova Patrum Bibliotheca* (6 vols., 1845–53).

Maidenhead, town of England, in the county of Berks, on the southern bank of the Thames, here crossed by a fine stone bridge erected in 1772, is picturesquely situated and has a brisk trade in malt, meal, and timber. Pop. 8219.

Maiden Rock, Pierce co., Wis., on the Mississippi River (Lake Pepin), is a place of summer resort. Here is the precipice, 409 feet high, from which the Dakota maiden Wenona leaped, rather than marry a warrior of the Wabashaw tribe, preferring a young brave of her own nation.

Maid'stone, town of England, in the county of Kent, on the Medway, here crossed by a fine stone bridge of three arches, erected in 1879, is a handsome old place, with a fine church, many good educational institutions, extensive oil and paper mills, breweries, and manufactures of hats and blankets. The church of All Saints is one of the largest parish churches in the kingdom, and contains several interesting monuments and other antiquities. The surrounding country is famous for the wheat, and especially for the hops, it produces. Pop. in 1881, 29,632.

Mai'gre, French name of the *Sciæna aquila*, a fish of the family Sciænidæ, inhabiting the Mediterranean Sea and the E. Atlantic Ocean. It sometimes attains the length of six feet, is much sought as a food-fish, is very strong, and the stroke of its tail is dreaded by fishermen. It emits a groaning sound, which often guides the fishermen to its shoals. The maigre is taken with the net. Its ear-bones are worn by some as charms against colic.

Maimaitchin', a commercial station of Mongolia, the entrepôt of the Chinese trade with Russia, is situated immediately opposite Kiakhta, well built and fortified. It is inhabited by 1500 men; no women are allowed to live there. Since the treaty of Peking (1860), which opened the whole Russian-Chinese frontier to commerce, it has lost much of its importance.

Maimburg (Louis), b. at Nancy in 1610, entered the Society of Jesus in 1626, and was for some years professor of rhetoric at Rome. He enjoyed a great reputation as a church historian, and his *Histoire de l'Arianisme, Histoire des Iconoclastes, Histoire du Calvinisme*, etc., were much read in their time. But he wrote with one eye fixed upon his friends and the other upon his foes, totally blind to truth, and having incautiously entered into the contest between Louis XIV. and the pope, and taken the side of the king in his *Traité historique sur les prerogatives de l'Eglise de Rome*, 1682, he was expelled from his order on the demand of the pope. He retired, protected by the king, who gave him a pension, to the abbey of St. Victor in Paris, where he d. Aug. 13, 1686.

Maimon'ides, or, more properly, **Rabbi Moses ben Maimon,** generally abridged into the initials **Ra M Ba M,** b. Mar. 30, 1135, of a rich and influential Jewish family in Cordova, at that time the principal seat of Arabic learning: received an excellent education, his father being himself a distinguished Hebrew and Arabic scholar. For many years he was compelled by the religious intolerance of the kings of the dynasty of the Almohades to renounce the public profession of Judaism, and (at least outwardly) embrace Mohammedanism; but in 1165 he determined to emigrate from Spain with his whole family. He settled in Egypt, at Fostat or Old Cairo, and was for some time engaged in the jewelry trade, but his great learning and eminent genius soon gained for him a most prominent place among his coreligionists, who rank him next to Moses, and at the Egyptian court, where he became physician to the sultan Saladin, while his numerous writings, theological, philosophical, and scientific, spread his fame all over the world. His position in the Jewish civilization is that of a systematizer. Well versed in Greek and Arabic speculation, and aided by a comprehensive knowledge of mathematics, astronomy, and medicine, he succeeded in bringing into a consistent system the whole mass of Jewish tradition, which lay scattered in Midrash, Mishnah, and Talmud, and demonstrated the principles on which Judaism is based. Even during his lifetime his views met with some opposition, and in the next century they occasioned the fiercest controversy. Nevertheless, when he died, at Cairo, Dec. 13, 1204, his body was brought to Tiberias in Palestine, and his tomb became a place of pilgrimage, and at the close of the thirteenth century his ideas had become authoritative, not only among the Jews, but, on many points and for a long time, also among Christian and Mohammedan philosophers. He wrote generally in Arabic; his principal work, however, is written in Hebrew, *Mishneh Torah* ("The Second Law") or *Yad Chazakah* ("The Strong Hand"), which gives in 982 chapters a systematic representation of all Jewish laws scattered in the Bible, Talmud, and elsewhere, even those which were no longer in practical use, such as the precepts regarding the soil of Judæa. The most remarkable of his Arabic works is the *Delalath Al-Hairin*; Hebrew, *Moreh Nebuchim*; Latin, *Doctor Perplexorum* ("The Guide of the Erring"), a philosophical representation of Judaism or the philosophy of the Jewish religion. This last book, as well as his compends of logic, astronomy, and medicine, was much studied in the Christian universities during the Middle Ages. *Doctor Perplexorum* has been translated into German by Scheyer and Fürstenthal (1838), and into French by S. Munk (1856).

Main, a river of Germany, rises in the Fichtelgebirge, flows westward with a tortuous course for a distance of 300 miles, and joins the Rhine opposite Mentz. It is navigable for a distance of nearly 200 miles, and is connected with the Danube by the Ludwig's canal. The principal cities on its banks are Würzburg, Offenbach, and Frankfort.

Maine, an ancient province of France, lying S. of Normandy, and comprising the present departments of Mayenne and Sarthe, and parts of Eure and Orne.

Maine, the largest of the Eastern or New England States, and the extreme N. E. portion of the U. S., between 43° 04′ and 47° 31′ N. lat., and between 66° 45′ and 71° 06′ W. lon. It is bounded on the N. W. by Quebec, Dominion of Canada, on the N. by Quebec and New Brunswick, on the E. by New Brunswick, on the S. E. and S. by the Atlantic Ocean, and on the W. by New Hampshire; area, 33,040 square miles, or 21,145,600 acres; greatest length, 320 miles; greatest width, from the ocean to the Canada line, 160 miles. Part of the Isles of Shoals, near New Hampshire, belong to Maine.

Maine, by census of 1880, ranked 27 among the States in population, 29 in value of agricultural products, and 15 in value of manufactures.

Seal of Maine.

Face of the Country.—The sea-coast for 10 or 20 miles inland is flat, low, and at some points marshy; exceptions are Mount Agamenticus, in the S. W., 670 feet high, the Camden Hills, on the Penobscot, 1500 feet, and the thirteen peaks of Mount Desert Island and its vicinity, ranging from 1000 to 2800 feet. The Appalachian chain has its origin in the province of New Brunswick, enters Maine at Mars Hill, and crosses it in a S. W. direction, joining the White Mountain range at the New Hampshire line. It consists of isolated peaks, all trending S. W., though often separated by broad river-valleys and large streams. Mars Hill is about 2000 feet above the sea; Mount Katahdin, in the centre of the State, is 5385 feet in height. Mount Abraham, in Franklin co., 3400 feet, Mount Blue, in the same county, 2800, Sugar Loaf, Chase's Mountain, Mount Mattatuck or Speckled Mountain, Mount Puzzle, and Mounts Saddleback and Bigelow also belong to this chain. Two principal spurs or outliers from this range deserve notice—viz. the Ebene and Spencer Mountains, trending S. in Piscataquis co., and the range of highlands along the Canada boundary, which rise to the height of 2000 feet at the Monument, and attain a higher altitude in Bald Mountain. Between these isolated summits the Penobscot and its principal tributary the Piscataquis, the Kennebec, and the Androscoggin flow toward the ocean, and the valleys thus formed also contain large and deep lakes. The N. portion of the State slopes gradually down to the valley of the St. John, which is less than 300 feet above the sea at the N. extremity of the State.

Coast, Bays, Rivers, Lakes, etc.—Following the line of the shores, Maine has 2486 miles of sea-coast, being the most irregular and deeply indented coast-line in the U. S. There are seventeen large bays on the coast—viz. Passamaquoddy, Machias, Little Machias, Englishman's, Narraguagus, Frenchman's (protected by Mount Desert Island), Isle au Haute, Penobscot and Belfast bays (forming together the fine estuary of the Penobscot River), Muscongus, Damariscotta, Sheepscott, Quohog, Casco, Saco, and Piscataqua Bay or estuary. The lakes and rivers must be considered together. The Saco River drains a dozen or more small lakes and itself falls into Saco Bay. The Umbagog chain of lakes is drained by the Androscoggin, which by a circuitous course finds its way into Quohog Bay. Sebago Lake and the smaller lakes which surround it have for an outlet a small stream called Presumpscot River. The Moosehead chain, which comprises many small lakes, finds an outlet in the Kennebec River, whose course is nearly due S., and which discharges its waters into the ocean by many channels through a wide delta. The Penobscot River drains nearly one-third of the area of the State, and through its E. and W. branches and their tributaries furnishes an outlet for the surplus waters of more than fifty lakes and ponds. Every stream which discharges its waters into the Atlantic forms the outlet of from half a score to a score of these lakes and ponds, and the St. John River, which drains the N. part of the State, has not far from a hundred lakes and ponds attached to it and its tributaries. The area covered by the rivers and lakes is estimated at 3200 square miles, or a little more than one-eleventh of the total area of the State.

Mineralogy.—The principal minerals of economic value are iron, galena, granite, lime, slate, and a fine white marble. Fine colored tourmalines are found at Paris, Oxford co., garnets, etc. at Phippsburg and Parsonsfield, feldspar, etc. at Brunswick and Topsham, and beryls of fine quality at Bowdoinham.

Vegetation, Soil, etc.—The soil in the river-valleys and between the Penobscot and Kennebec is of good quality and yields large crops. In the mountainous districts and along the sea-coast it is sterile and does not repay cultivation; in other parts of the State it is moderately productive. A large portion of the State is still covered with forests, and its timber and lumber trade directly and indirectly gives employment to a large number of its inhabitants. The forests of the N. part of the State are principally composed of pine, hemlock, and spruce. Farther S. there is an admixture of white and red oak, maple, beech, birch, and ash. There are cedar swamps in the N. portion. Butternut and hickory are found, but are not abundant. Poplar, elm, basswood, dogwood, sassafras, juniper, pine, hornbeam, buttonwood, wild-plum, alder, willow, etc. are found in the forests of the S. part of the State. Among fruit trees, the cherry, plum, pear, and apple flourish.

Zoology.—Maine is the only State in the Union where the moose and caribou, or American elk, are yet found. The black bear, deer, catamount, wild-cat, wolverene, badger, marten, sable, weasel, mink, wolf, raccoon, woodchuck, porcupine, rabbit, several species of squirrels, etc. are found. Wild geese, ducks, brant, and teal inhabit the lakes, ponds, and at certain seasons the bays, along the coast. Eagles, hawks, owls, and crows are found in all parts of the State, and gulls, fish-hawks, etc. on the coast, while partridges, pigeons, quails, robins, and generally the birds of passage common to New England, are abundant in their season. Salmon, salmon-trout, shad, trout, pickerel, mascalonge, sturgeon, etc. abound in the rivers and lakes, and cod, herring, mackerel, and halibut are found along the coast in great numbers. The rattlesnake, milk-adder, and a smaller adder are not uncommon; the black snake or racer, a considerable number of harmless snakes, and several of the batrachians are found.

Climate.—The climate, though severe and subject to great extremes, is moderately uniform during each season, and is considered generally favorable to health. The fogs and easterly winds on the coast, as well as the intense cold of the winters, are supposed to increase the mortality from pulmonary diseases, but in the interior there is little or no danger from these causes. Snow lies on the ground on the coast from three and one-half to five months, and in the interior from four and one-half to six months. The summers are short and hot. At Brunswick, in fifty-two years of observation, July was the only month in which no frost occurred. Rainfall, between 36.46 and 45.25 inches.

Agriculture.—The census of 1880 showed—hay, 1,107,788 tons; potatoes, 7,999,625 bushels; oats, 2,265,575 bushels; corn, 960,633 bushels; wheat, 665,714 bushels, and buckwheat, 382,701 bushels. Potatoes are exported largely.

Farm Animals.—The census of 1880 showed horses, 87,848; cattle, 334,421; sheep, 565,918; swine, 74,369.

Manufactures.—The great production of Maine being timber, the manufacture of lumber and wood-work in various forms is a large industry. The iron and steel manufacture employed, in 1880, 700 hands, with a capital of $450,000 and product of $583,328. Of pig iron, 3578 tons were manufactured.

Fisheries.—Maine has extensive cod and mackerel fisheries, and her numerous inland lakes abound in fresh-water fish. This is the only State wherein lobster-packing is pursued as an industry. The total value of the fisheries in 1880 was $3,614,178.

Commerce.—Foreign commerce in 1881 from Portland alone amounted to $4,186,153 exports and $1,809,212 imports. The coastwise trade is also large.

Finances of the State.—The valuation of property in 1881 was $235,978,716, real and personal; State tax, 50 cents on $100, producing $900,000. Total taxation, local and State, $5,182,135; State debt, $7.405,557.

Banks, etc.—In 1881 there were in Maine 69 national banks, with capital of $10,385,000: circulation, $8,211,247, secured by $9,244,300 U. S. bonds; deposits, $9,458,736. There were 2 State banks and trust companies, 54 savings-banks with deposits of $24,116,117, and 7 private bankers with deposits of $169,764. The insurance companies in 1880 insured $63,991,559 risks, receiving $744,227 premiums, and paying $468,874 losses.

Railroads, etc.—Maine had, in 1881, 1013 miles of railway in operation, of which the principal were the Maine Central, Portland and Ogdensburg, Atlantic and St. Lawrence, and European and North American. Cost of railways, $39,434,181; net earnings, $1,589,896. Large numbers of vessels are employed in the coastwise trade, numbering, in 1881, 2471 sailing and 88 steam vessels, with a tonnage of 504,100.

Education.—Number of children of school-age (four to twenty-one years) in 1880, 214,656, of whom 149,827 were enrolled in public schools, with average attendance of 106,763. Total expenditure for public schools in 1880, $991,297, of which $777,692 was for teachers' salaries. There are 3 colleges, with 44 instructors and 501 students, paying tuition in 1880, $19,251. Of periodicals there were, in 1882, 113 newspapers, etc., of which 11 were daily.

Churches.—The Methodists had 232 churches and 25,883 members; Congregationalists, 243 churches and 21,645 members; Baptists, 263 churches and 21,165 members; Free Will Baptists, 281 churches and 15,688 members; Universalists, 89 churches and 1679 members; Protestant Episcopalians, 35 churches and 2103 members; Roman Catholics, 47 churches and 39 priests. About a dozen other denominations have from 6000 to 30 members each.

Population.—In 1860, 628,279; 1870, 626,915; 1880, 648,936 (white 646,852, colored 2084, including 8 Chinese and 625 Indians).

Principal Cities and Towns, Pop. 1880.—Portland, 33,810; Lewiston, 19,083; Bangor, 16,856; Biddeford, 12,651: Auburn, 9555; Augusta (cap.), 8665; Bath, 7874; Rockland, 7599; Saco, 6389; Calais, 6173; Belfast, 5308; Ellsworth, 5052; Gardiner, 4439; Eastport tp., 4006; Hallowell, 3154; Skowhegan, 2609; Brunswick, 2410; Waterville, 1917.

COUNTIES.	* Ref.	Pop. 1870.	Pop. 1880.	COUNTY TOWNS.	Pop. 1880.
Androscoggin	9–B	35,866	45,042	Auburn	9,555
Aroostook	3–E	29,609	41,700	Houlton	1,030
Cumberland	10–B	82,021	86,359	Portland	33,810
Franklin	7–B	18,807	18,180	Farmington	1,482
Hancock	8–E	36,495	38,129	Ellsworth	5,052
Kennebec	9–C	53,203	53,058	Augusta	8,665
Knox	9–D	30,823	32,863	Rockland	7,599
Lincoln	10–D	25,597	24,821	Wiscasset	tp. 1,847
Oxford	8–A	33,488	32,627	Paris	tp. 2,931
Penobscot	6–E	75,150	70,476	Bangor	16,856
Piscataquis	5–D	14,403	14,872	Dover	602
Sagadahoc	10–C	18,803	19,272	Bath	7,874
Somerset	6–C	34,611	32;333	Skowhegan	2,609
Waldo	9–D	34,522	32,463	Belfast	5,308
Washington	7–G	43,343	44,484	Calais Machias	6,173 tp. 2,203
York	11–A	60,174	62,257	Alfred Saco	306 6,389
Total		626,915	648,936		

History.—The first discovery of the coast of Maine was made by the Northmen as early as the year 990. They made occasional visits to it until the middle of the fourteenth century, but from that time to the second voyage of Cabot, in 1498, we have no evidence that the coast was seen by any European until the French expedition under Verazzano in 1524, of Gomez, the Spaniard, in 1525, and of Rut, under the English, in 1527. In 1556, André Thevet, a Roman Catholic priest, sailed in a French ship along the entire coast. The first attempt to settle upon the territory was made by the French under Du Mont in 1604. In 1605 the coast in the neighborhood of the river St. George was visited by Capt. Weymouth, which led to the expedition to the mouth of the Kennebec River in 1607, under command of Capt. George Popham as president and Capt. Raleigh Gilbert as admiral, sent forth by Sir John Popham and Sir Ferdinando Gorges with a view to colonize this portion of the coast, for which, and the whole country from N. lat. 34° to 44°, a charter had been obtained from King James in 1606. But the colony became discouraged. In 1616, Sir F. Gorges sent his agent, Richard Vines, with a small company to Saco. Capt. John Smith took possession of Monhegan Island in 1614, and thence ranged the whole coast to Cape Cod. In 1620, James I. granted to the Plymouth Company in England the whole country lying between the 40th and 48th degrees of N. lat., and to the Virginia Company the S. portion of the original patent. In 1622, Gorges and Capt. John Mason obtained of the Plymouth Company a grant of the territory lying between the Merrimack and Kennebec rivers, and the next year planted a colony at the mouth of the Piscataqua, which was the first permanent occupation of the mainland in Maine. But the settlements commenced at different places were all overthrown in the Indian war of 1675. E. of the Penobscot River the French laid claim to the country, and very little improvement was made there until after the revolution of 1775. On the division of the Plymouth Company of their patent among the proprietors, the portion lying between Piscataqua and Kennebec rivers was awarded to Gorges in 1635, confirmed by the king in 1639, and he forthwith established a regular government over it under his deputy, assisted by an assembly of delegates chosen by the people, and by the king's patent of confirmation it received the name which is now extended over the whole territory. His government continued until 1677, when the heirs sold their interest to Massachusetts for £1250. Two years before this (in 1675) King Philip's Indian war commenced with terrible massacres in Maine. For the next eighty-five years the country was kept in terror by the frequent raids of the savages. Gorges died in 1647. The province between the Kennebec and Penobscot rivers was

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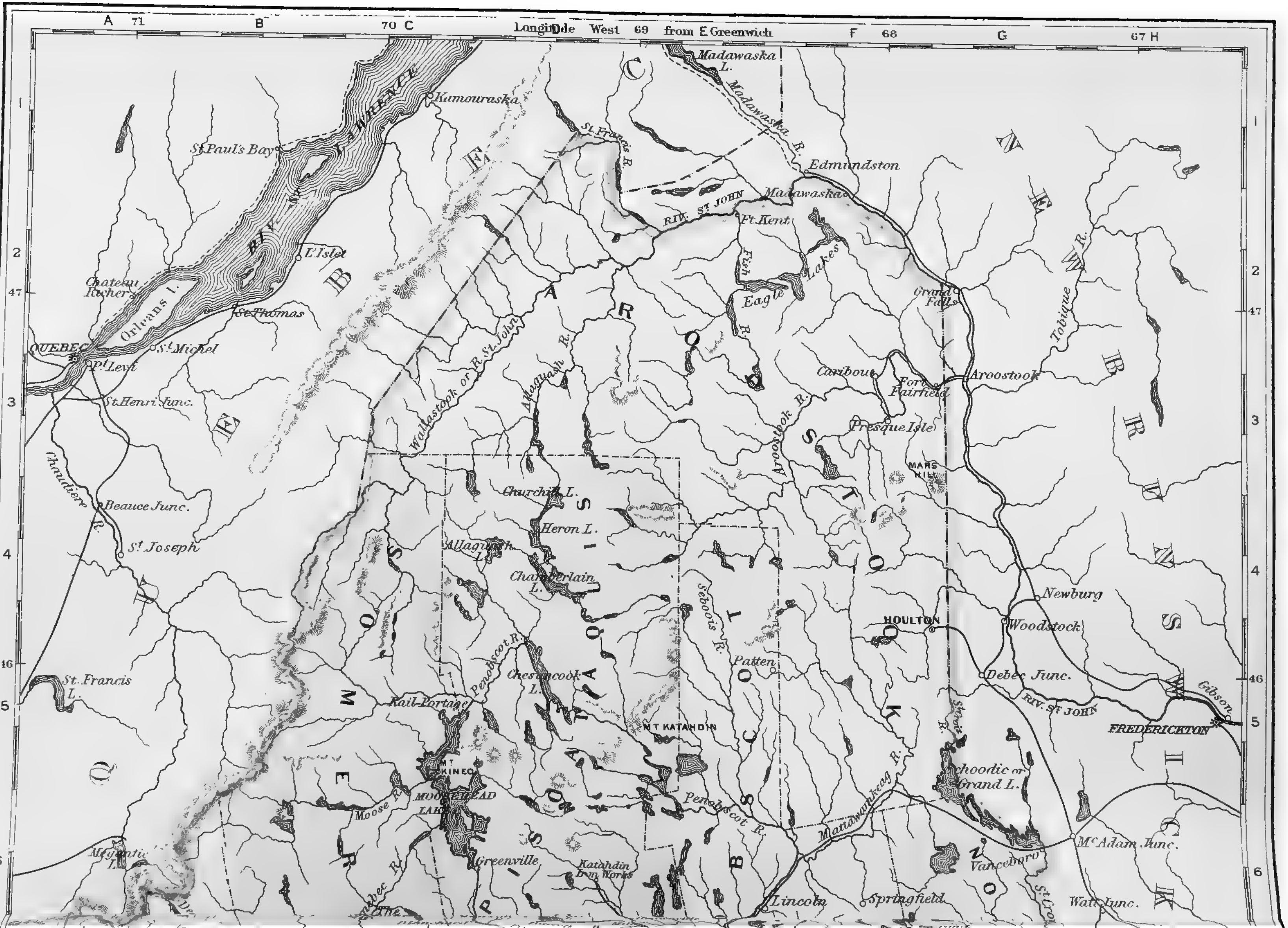
* Reference for location of counties. See map of Maine.


Longitude West 69 from E Greenwich
A 71
B
70 C
F 68
G
67 H
1
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5
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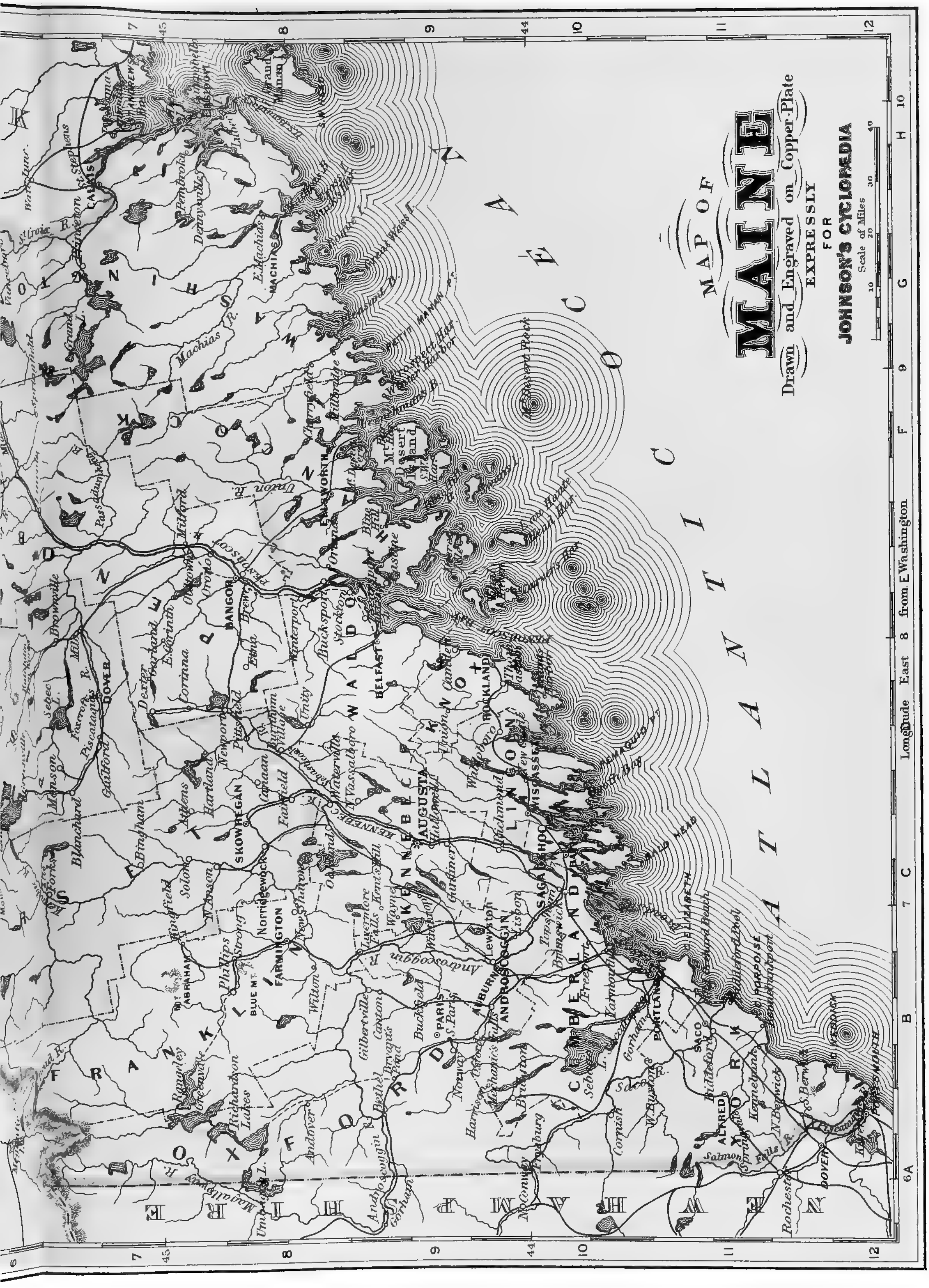
47
46
NEW BRUNSWICK
QUEBEC
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
RIV. ST LAWRENCE
Kamouraska
St Paul's Bay
L'Islet
Chateau Richer
Orleans I.
St Thomas
QUEBEC
Pt Levi
St Michel
St Henri Junc.
Chaudiere R.
Beauce Junc.
St Joseph
St. Francis L.
Megantic L.
Madawaska L.
Madawaska R.
Edmundston
Madawaska
St. Francis R.
RIV. ST JOHN
Ft. Kent
Fish R.
Eagle Lakes
Grand Falls
Tobique R.
Aroostook
Caribou
Fort Fairfield
Presque Isle
MARS HILL
Aroostook R.
Allaguash R.
Wallastook or R. St. John
Churchill L.
Heron L.
Allaguash L.
Chamberlain L.
Seboois R.
Patten
Newburg
Woodstock
HOULTON
Debec Junc.
RIV. ST JOHN
Gibson
FREDERICTON
Penobscot R.
Chesuncook L.
Rail Portage
MT KATAHDIN
MT KINEO
MOOSEHEAD LAKE
Moose R.
Greenville
Katahdin Iron Works
Kennebec R.
Penobscot R.
Mattawamkeag R.
Lincoln
Springfield
St Croix R.
Schoodic or Grand L.
Vanceboro
McAdam Junc.
Watt Junc.
St Croix



MAP OF MAINE
Drawn and Engraved on Copper-Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPÆDIA

granted by Charles II. in 1664 to his brother James, duke of York (afterward James II.). This country was surrendered to Massachusetts in 1686. Between 1687 and 1689, Andros, the royal governor of the New England colonies, visited Maine, and there, as elsewhere, practised great extortion. Massachusetts afterward relinquished Nova Scotia, but all the remainder was secured to her by the treaty of 1783, which established the independence of the U. S. After the organization of Massachusetts as a State, and its incorporation into the Union, Maine became a part of Massachusetts, which exercised jurisdiction over it as "the district of Maine." There were, however, frequent bickerings between Massachusetts and its "district," and conventions were held at Portland between 1784 and 1791 to devise plans for a separation. These difficulties increased, but it was not until after the war of 1812 that they led to decisive measures. After repeated conferences and an amicable adjustment of the public lands and other disputed matters, an act of Congress was approved Mar. 3, 1820, declaring that on and after the 15th of Mar. of the same year Maine should be admitted into the Union on the same terms as the original States. A dispute had existed between the U. S. and the British government in regard to the boundaries between the N. portion of Maine and the provinces of Quebec (or Canada East) and New Brunswick. The British government claimed the territory as far S. as the watershed dividing the affluents of the St. John from those of the St. Croix and Penobscot—a devious line, winding on either side of the parallel of 46° N. lat. The U. S. government, on the other hand, claimed the watershed between the St. John and the St. Lawrence, which would have made the northern boundary not far from the 48th parallel, and took also a considerable tract from Canada East. This dispute, which had been in progress since about 1784 or 1785, had nearly resulted in bloodshed when, in 1842, the boundaries were definitively settled by the Ashburton treaty, by which the St. John and the St. Francis were agreed upon as the N. and N. E. boundaries, with free navigation of the former, and the highlands between the provinces of Quebec and Maine recognized as the N. W. boundary. In 1851 the Maine legislature passed the "Maine Liquor law," prohibiting the sale of intoxicating liquors as a beverage. Since the war she encouraged immigration, and established a large Swedish colony within her territory.

Governors.

Wm. King (resigned)	1820–21	Samuel Wells	1856–57
W. D. Williamson (act.)	1821–22	H. Hamlin (resigned)	1857
Albion K. Parris	1822–27	J. H. Williams (act'g)	1857–58
Enoch Lincoln (died)	1827–29	Lot M. Morrill	1858 61
Nathan Cutler (acting)	1829–30	Israel Washburn, Jr.	1861–63
Jonathan D. Hunton	1830–31	Abner Coburn	1863–64
Samuel E. Smith	1831–34	Samuel Corry	1864–67
Robert P. Dunlap	1834–38	J. L. Chamberlain	1867–71
Edward Kent	1838–39	Sidney Perham	1871–74
John Fairfield	1839–40	Nelson Dingley, Jr.	1874–76
Edward Kent	1840–41	Selden Connor	1876–79
John Fairfield	1841–43	Alonzo Garcelon	1879–80
E. Kavanagh (acting)	1843–44	Daniel F. Davis	1880 81
Hugh J. Anderson	1844–47	Harris M. Plaisted	1881–83
John W. Dana	1847–50	Frederick Robie	1883–87
John Hubbard	1850–53		
W. G. Crosby	1853–55		
Anson P. Morrill	1855–56		

REVISED BY A. R. SPOFFORD.

Maine (Sir HENRY JAMES SUMNER), LL.D., K. C. S. I., F. R. S., b. in 1822; graduated B. A. in 1844 at Pembroke College, Cambridge, and received a fellowship; was regius professor of civil law at Cambridge 1847–54; reader on jurisprudence at the Middle Temple 1854–62; was engaged in India on the great legislative reform 1862–69; became in 1870 Corpus professor of jurisprudence at Oxford, and in 1871 entered the council of the secretary of state for India; has written an essay on *Roman Law* (1856), *Ancient Law* (1861), *Modern Theories of Succession to Property after Death, and the Corrections of them suggested by recent Researches*, and *Village Communities in the East and West*, six lectures delivered at Oxford in 1871; *Early History of Institutions* (1875), and *Early Law and Custom* (1883).

Maine de Biran' (MARIE FRANÇOIS PIERRE GONTHIER), b. near Bergerac, France, Nov. 29, 1766; served in the French Revolution in the army and in the legislature, and after the Bourbon Restoration was a moderate royalist. In 1803 his *Mémoire sur la Habitude* won a prize from the French Institute. His *Sur la Décomposition de la Pensée* (1805), and other essays regarding intuitions without the aid of the sense, and the relations of man's moral and physical constitution to each other, also won prizes. Among his other writings are an *Essai sur les Fondements de la Psychologie*, and *Nouveaux Essais d'Anthropologie*, both published in 1859; but perhaps the best of all are his *Examen des Leçons de M. de Laromiguière*, and his article "Leibnitz" in the *Biographie Universelle*. He was one of the most original and sagacious of recent French philosophers, but his style is obscure, though pregnant with meaning, and—what, no doubt, has been a still greater impediment to his success—the manner in which his works were published was most unfortunate. During his own lifetime only a few of his minor essays were printed. After his death Cousin obtained access to his papers and published *Nouvelles considerations sur les rapports du physique et du moral de l'homme* (1834), and *Œuvres philosophiques de Maine de Biran* (3 vols., 1841). It was well known, however, that some of his most important memoirs were still not found, and a complete edition of his works did not exist until the *Œuvres inédites* appeared (1846–59, 3 vols.), edited by E. Naville. (See Merten, *Étude critique sur Maine de Biran*, 1865; E. Naville, *Maine de Biran, sa vie et ses pensées*, 1874 (2d ed.); Gérard, *Maine de Biran, essaie sur sa philosophie*, 1870.) D. July 16, 1824.

Maine-et-Loire, department of France, on the Mayenne and Loire, which latter traverses the department from E. to W. by a valley varying in breadth from 1 mile to 5 miles. The bed of the Loire is here very wide, but the river is also very shallow and crowded with islands. During summer the depth of the water is often not more than 2 feet, but the inundations are sudden and very destructive. Area, 2755 square miles. The surface is undulating and hilly, and the soil very fertile. The wine, of which the department annually produces 11,000,000 gallons, is much esteemed, especially the white kinds. Large crops of wheat and excellent fruits are raised, and iron and coal are mined. Of the entire area more than one-half is arable, one-tenth is meadow, and the rest is occupied by woods, vineyards, and heath. In 1880 the department owned 225,000 oxen, 100,000 pigs, and 68,500 sheep. Many cattle, sheep, and pigs are brought from the adjacent department for fattening. Horticulture is highly developed, and the fruits and vegetables of Saumur and Angers are much prized. The manufactures produce linen cloth, flannel, and cotton goods, worsted and cotton thread. Pop. in 1881, 523,491. Cap. Angers.

Mai'notes, the people of Maina (Mani), a mountain-district of Laconia, in the Peloponnesus, between the Messenian and Laconian gulfs, so called since the reign of Constantine Porphyro-Genitus (944–959 A. D.). They boast of their descent from the ancient Spartans, although some consider them Slavic. They remained pagan until the reign of Basil (867–886 A. D.). They were virtually independent for many years before the rest of modern Greece. They are handsome, warlike, superstitious, and were formerly noted robbers. Their number is about 60,000.

Mainpuri, the capital of a district of the same name which forms part of the North-Western Provinces, India, stands in lat. 27° 14′ N., lon. 79° 3′ E., and consists of two parts—the old town which dates back to the time of the *Mahabharata*, and the new town which was founded in the beginning of the present century. It carries on a considerable trade in cotton, indigo seed, opium, iron, etc. Pop. 21,217.

Maintenance, in law. The ancient common law stringently prohibited all acts tending to promote litigation done by persons having no pecuniary interest in the controversy. Any such upholding or "taking in hand" the quarrel of another with a design to assist him in its prosecution was in general termed maintenance (*main*, "hand;" *tenir*, to "hold"); the transaction was a criminal offence, and the contracts based upon it were voidable. Advancing money, employing counsel, or aiding in any other manner was illegal, unless done by a person standing in certain close relations, social or domestic, with the litigant party. One species of maintenance was termed "champerty," and was an agreement between a litigant and another to divide the land (*campum partire*) or other subject-matter recovered, the stranger undertaking to carry on the suit in consideration thereof. The law concerning maintenance not only forbade such bargains between attorneys and clients for a share in the recovery, but prohibited all transfers of claims for the purpose of prosecution. Indeed, the ancient rule which prevented the assignee of a thing in action from suing upon it in his own name was originally founded upon this doctrine. The common law as thus described has been greatly modified in this country. Aid given in good faith to a litigant is not illegal; in most of the States agreements to share the recovery, even between attorneys and clients, are sustained; while things in action are transferable, and the assignee not only may, but must, sue upon them in his own name. JOHN NORTON POMEROY.

Maintenon', de (FRANÇOISE D'AUBIGNÉ), MARQUISE, born of noble Protestant parentage in the prison of Niort, France, Nov. 27, 1635; went in 1639 with her parents to Martinique, her father not being allowed to remain in France on account of his alleged treason. She returned in 1646; was sent by her relatives to be educated at an Ursuline convent. Under its influences she became a Roman Catholic after a long resistance. She was (1651–60) the wife of the poet Scarron; and in 1669 she became governess to Louis XIV.'s children by Madame de Montespan, whom she supplanted in the king's affections. She acquired and long maintained a powerful influence over the king, but it is not believed that she was ever his mistress. In 1685 the king married her in private. She procured the Revocation of the Edict of Nantes, and displayed great zeal for the Roman Catholic Church. D. Apr. 15, 1719. She had considerable literary talent, and her *Letters* (9 vols., 1759; improved ed. 1865) are valuable.

Mainz. See Mentz.

Mai′pures, or **Maypures,** an Indian tribe of Southern America, settled on the upper part of the Orinoco and the Rio Negro, and including the Caveres, Guaypunabis, Pareni, Maipures proper, Moxos, and other families. The Moxos were subdued by the inca Yupanqui, and were thus brought into contact with Peruvian civilization. Later on, Christian missions worked among them, and a grammar and vocabulary of their language were published at Lima in 1701 by Father Pedro Marban.

Maisonneuve′ (Jules Germain François), b. at Nantes, France, in 1810; studied at Paris, and graduated in medicine in 1835; was surgeon of the Hôtel Dieu, the Hôpital Cochin, and later of the Hôpital Pitié; and received the cross of the Legion of Honor in 1848. His principal works are—*Le Périoste et ses Maladies* (1839), *De la Coxalgie* (1845), *Sur les Kystes de l'Ovaire* (1848), *Mémoire sur une nouvelle méthode de Cathétérisme* (1855), *Clinique chirurgicale* (2 vols., 1863–64), *Mémoire sur les Intoxications chirurgicales* (1867).

Maisonneuve, de (Paul de **Chomedey**), Sieur, b. in Champagne, France, early in the seventeenth century; entered the army at an early age; was sent in 1641, at the head of a band of colonists, to Canada; founded Montreal in May, 1642; was governor for twenty-two years; brought over a second body of settlers in 1652; displayed vigor and ability in his administration; was removed from office 1664; sent to France 1665; resigned his post 1669, and d. at Paris Sept. 9, 1676.

Maistre, de (Joseph), Count, b. at Chambéry Apr. 1, 1754, was the son of the president of the senate of Savoy, and himself became a senator in 1787; entered the service of the king of Piedmont; was grand chancellor of Sardinia 1799; minister to Russia 1803–17; regent of the grand chancery 1818; became a member of the Turin Academy 1819; d. at Turin Feb. 26, 1821. De Maistre was the most powerful defender of Ultramontanism, the divine right of kings, and the papal infallibility, and advocated with marked ability and shrewdness a return to the mediæval system. The politics and thought of his own and subsequent times were much influenced by his powerful writings, among which may be named *Soirées de St. Petersbourg*, *Considérations sur la France* (1796), *Essai sur la Principe générateur des Constitutions* (1810), *Du Pape* (1819), *De l'Eglise gallicane* (1821), *Examen de la Philosophie de Bacon* (1836).

Maistre, de (Xavier), Count, b. in 1764 at Chambéry; entered the military service of Sardinia; emigrated to Russia after the conquest of Sardinia by the French; participated in the campaigns against Persia, and d. at St. Petersburg June 12, 1852. In 1794 he published at Turin *Voyage autour de ma chambre*, a very pleasant and original book, which in 1825 was followed by *Expédition nocturne autour de ma chambre*. He also wrote *Les Lépreux de la Vallée d'Aoste* (1811), *Prascovie* (1826), etc.

Mait′land, town of New South Wales, Australia, on the navigable river Hunter, which divides it into East and West Maitland. It is a prosperous place, has extensive manufactures of tobacco, active trade in wool, and rich coal-mines in the vicinity. Pop. 7881.

Maitland (Sir Richard) of Lethington, b. in Scotland in 1496; was educated at St. Andrew's and in Paris; became a distinguished lawyer; was successively employed in public affairs by James V., the regent Arran, and Mary of Lorraine; became a knight and lord of session about 1551; lost his sight 1560; was Speaker of the Protestant convention Aug., 1560; became lord privy seal 1562; resigned that post 1567; made a MS. collection of early Scottish poetry and wrote original verse of considerable merit. D. at Edinburgh Mar. 20, 1586. The Maitland Club, established at Glasgow in 1828, published his poems in 1830. He wrote a *Historie and Cronicle of the Hous and Surename of Seytoun*, and his MS. collection of ancient poetry is preserved in the Pepysian Library, Magdalen College, Oxford.

Maitland (Samuel Roffey), D. D., b. in London, England, in 1792; educated at Trinity College, Cambridge; was called to the bar in 1816; took orders in the Church of England in 1821; was perpetual curate of Christ church, Gloucester, 1823–29, and became in 1838 keeper of MSS. at Lambeth and librarian to the archbishop of Canterbury; which posts he retained until his death at Lambeth Palace Jan. 19, 1866. He wrote several works on prophecy, on the history of the Albigenses and Waldenses, on the state of religion and literature in the Middle Ages, and on English ecclesiastical history.

Maitland (William) of Lethington, known as "Secretary Lethington," eldest son of Sir Richard Maitland, b. in Scotland about 1525; was educated at St. Andrew's and on the Continent; became a convert to the doctrines of the Reformation about 1555; was appointed secretary of state 1556; joined the "Lords of the Congregation" 1557; was one of the commissioners who met the duke of Norfolk at Berwick, 1558; was made an extraordinary lord of session 1561; opposed the ratification of the *Book of Discipline*, and conducted the prosecution of Knox for treason 1563; had a debate with Knox on the independence of the Church 1564; took part in the conspiracy against Rizzio; was proscribed and escaped to Germany 1566; was present at the coronation of James VI. 1567; fought against Mary at Langside 1568; attended the conferences at York in the same year; was arrested, but soon liberated, and joined Kirkaldy of Grange in support of the queen 1569; assisted in the defence of Edinburgh Castle 1572–73; surrendered May 30, and d. in prison at Leith June, 1573—whether by suicide or natural death is unknown.

Maize, or **Indian Corn** [*Zea mays;* Sp. *maiz*, from Haytian *mahiz*], a well-known American plant of the grass family (Gramineæ) and tribe Phalarideæ. (See Grasses and Indian Corn.)

Majesty, as a title of royalty, is a reminiscence of the *majestas* claimed by the Roman emperors—a peculiar dignity, or literally *greatness*, which was held to have directly descended to the emperors of Germany. Henry VIII. was the first English king to assume the style of "His Majesty." The French kings after Louis XI. were by papal bull authorized to take the title of "Most Christian Majesty;" those of Spain, after Ferdinand and Isabella, "Most Catholic Majesty;" the kings of Hungary, "His Apostolic Majesty;" the kings of Portugal, "Most Faithful Majesty." The monarch of Austro-Hungary is called "His Imperial Royal Majesty."

Majol′ica [from *Majorca*, where it was once made] was originally the name of those kinds of pottery since called faïence, but it is now applied to a cheap earthenware of colored clay covered with a white glaze. It is much used in Southern Europe.

Ma′jor in the army and marine corps, an officer next in rank below the lieutenant-colonel, and next above the captains.

Major [Lat.]. In music, this term is used to designate any mode, interval, or key which is in certain respects *greater* than others. The major *mode* is that in which the third above the tonic is major, as from C to E, G to B, or D to F♯. On analysis, this interval of a major third will be found to embrace *four* semitones, whereas in a minor third there are only *three*. From this arises the distinction of greater and lesser—*i. e.* major and minor. Several of the intervals are thus variable in their contents—viz. the third, sixth, seventh, and ninth, not comprising in all cases the same number of semitones, and hence needing the discriminating names of major, minor, diminished, etc. The major intervals always contain one semitone more than the minor. (See Interval.) Wm. Staunton.

Major (Georg), D. D., b. at Nuremberg, Germany, Apr. 25, 1502; studied theology under Luther and Melanchthon; became rector at Magdeburg 1529, superintendent at Eisleben 1536, professor of theology and court-preacher at Wittenberg 1539; was a representative of the Protestants in the colloquy at Regensburg 1546; was for a few months in 1547, during the Smalkaldic war, superintendent and court-preacher at Merseburg; returned to his post at Wittenberg 1548; became superintendent of the Mansfeld churches 1552; again returned to Wittenberg, and d. there Nov. 28, 1574. By the active support he gave to the Leipsic Interim (Dec. 22, 1548), which asserted that good works are necessary to salvation, he separated from the strict Lutherans, and became involved in a controversy with Amsdorf (1552), who declared good works prejudicial to salvation, and his doctrine was rejected by the Formula of Concord (1580). In his later years he was involved in the Crypto-Calvinistic controversy, and was forced to sign the Torgau Articles. His principal works, being homilies and commentaries on the New Testament, were printed at

Wittenberg (1569). The "Majoristic controversy" gave rise to the formation of a theological circle called Majorists.

Major (John Richardson), D. D., b. in London in 1797; graduated at Cambridge in 1819; took orders in the Church of England; was for some years head-master of Wisbeach Grammar School, and from 1830 to 1866 head-master of the grammar school connected with King's College, London. In 1871 he was appointed vicar of Arrington, Cambridgeshire. He published numerous classical text-books, including a Latin grammar and reader, a *Guide to Reading the Greek Tragedians*; edited the plays of Euripides, Stephens's *Greek Thesaurus*, the lexicons of Scapula, Schrevelius, and Parkhurst, various parts of Homer, Xenophon, Herodotus, and Virgil, and the Gospels of Mark and Luke, with philological notes. D. Mar. 7, 1876.

Major (Richard Henry), F. S. A., b. in London, England, in 1818: appointed keeper of the maps and charts in the printed book department of the British Museum 1844; was honorary secretary of the Hakluyt Society 1849–58, editing for it the *Select Letters of Christopher Columbus* (1847), *The Historie of Travaile into Virginia Britannica*, by W. Strachey (1849), and *Notes upon Russia* from the Latin of Herberstein (1851–52), and writing introductions for Mendoza's *History of China*, edited by Sir George Staunton (1853), and *The Tartar Conquerors of China*, by the earl of Ellesmere (1854). At a later period he edited for the same society *India in the Fifteenth Century* (1857) and *Early Voyages to Terra Australis* (1859). In 1861 he found in the British Museum, and laid before the Society of Antiquaries, documents showing the discovery of Australia by a Portuguese navigator in 1601, which procured him from the king of Portugal the honor of knighthood. In 1868 he published an elaborate and valuable *Life of Prince Henry of Portugal, surnamed the Navigator*. He was honorary secretary to the Royal Geographical Society and a frequent contributor to its *Journal*.

Major'ca, an island of the Mediterranean, belonging to Spain, and forming the largest of the Balearic group. Area, 1420 square miles. Pop. 262,893. The northern part of the island is mountainous, Silla de Torellas rising 4596 feet. The southern and western parts are lower, and afford several good harbors. The soil is very fertile, and the climate an everlasting spring. All the products of Southern Spain, more especially of the province of Valencia, are raised here to perfection. Cap. Palma.

Ma'jor-Gen'eral. See General Officer.

Majorists. See Major (Georg).

Major Mode. See Mode.

Major Scale, in music, with a major third and seventh. (See Mode and Scale.)

Makal'lah, town of Arabia, situated on its southern coast, in lon. 49° 6′ E., has a good harbor, and many vessels visit it to take in provisions. Pop. 7000.

Makart (Hans), b. at Salzburg, Austria, May 28, 1840, studied painting in Vienna and Munich, and began to exhibit in 1866; visited Italy 1869, and lived for some time in Rome: afterward settled in Buda-Pesth, and finally in Vienna; became insane in Aug., 1884. His principal pictures are *Leda and the Swan*, *The Plague in Florence*, *The Seven Deadly Sins*, *Tannhauser*, *The Entrée of Charles V. into Antwerp*, etc. The last-mentioned picture became, through photographs and engravings, exceedingly popular. D. Oct., 1884.

Ma'ko, or **Makovia,** town of Hungary, on the Maros, which here yields an enormous quantity of fish and aquatic birds, has an extensive trade in corn, hemp, wine, fruit, and cattle. The Mako breeds of horses and cattle are celebrated. Pop. 9776.

Makree'zee, or **Makrizi, Al** (Ahmed), b. in 1360 at Makreezee, near Baalbec, in Syria: lived for the largest part of his life in Cairo, and d. there in 1442. He wrote in Arabic several works on the history and topography of Egypt from the time of the Mohammedan conquest, down to 1327 A. D., parts of which, as well as his essay on Egyptian weights and measures, have been translated into French by Quatremère and Silvestre Sacy. He drew largely from Elmacinus, a Christian writer, who preceded him. Of a large work, which he left unfinished, on the important persons who had visited Egypt, the original manuscript of the first volume is in the National Library in Paris.

Malabar', district of British India, in the presidency of Madras, extending from lat. 10° 15′ to 12° 18′ N., along the Arabian Sea, comprising an area of 6050 square miles, with a population of 1,514,909. The principal products of the district are timber, especially teak, and pepper. The teak tree grows on the plateau formed by the western Ghauts at an elevation of 5000 feet. The trunks, which often reach a length of 120 feet and a diameter of 15 feet, are dragged by elephants from the forests to the river Ponani, and then floated down to the coast, but many trunks are spoiled by the cataracts of the river. The pepper is cultivated on the coast-land. The district swarms with wild elephants, living in herds of 200 or 300, and is infested with tigers. The name *Malabar* is often applied to the whole western coast of the peninsula.

Malabath'rum [Gr. μαλάβαθρον], a drug composed of leaves brought from India, and much esteemed as a perfume and as a medicine by the ancients. The name is considered a corruption of *tamala-putra* ("tamala leaves"), the title of a drug composed of the leaves of several species of cinnamon tree (*Cinnamomum*). Some writers identify it with the betel-leaf.

Malac'ca, district of the Malay peninsula, extending from lat. 2° to 3° N. on the western coast, along the Strait of Malacca, and belonging to Great Britain. Area, 1000 square miles. Pop. 16,000. The surface is mostly swampy, but the soil is very fertile and the climate is salubrious. Rice and timber are the principal products. The hills which stretch inland are rich in tin. The inhabitants are partly Malays, partly Hindoos. The capital, Malacca, was formerly an important city, but has now greatly declined. Pop. 10,000, mostly a mixture of Malays and Europeans.

Malacca, Strait of, separates the Malay peninsula from the island of Sumatra. It is 520 miles long; its breadth varies from 25 to 200 miles.

Mal'achi, the last prophet in order of time whose writings appear in the Old Testament. He lived in the time of Nehemiah (440–420 B. C.). He rebukes the people for despairing of God's mercy, for neglecting the tithes, for offering imperfect animals, and for intermarrying with Gentiles. It is instructive to observe in this catalogue of sins that the tendency which produced the Pharisees was already in motion. The Septuagint takes Malachi not as a proper name, but as an appellative—"the angel" or "messenger" of God. Some modern scholars adopt this idea, but with little reason.

Mal'achite [Gr. μαλακός, "soft"], a natural green carbonate of copper, occurring in certain localities (as Siberia and Australia) in great beauty.

Malachite Green. See Aniline Colors.

Mal'achy, Saint (O'Morgair), b. at Armagh in 1094; became in youth a rigid ascetic, and when twenty-five became a priest; restored the monastery of Bangor; became in 1124 bishop of Connor; in 1134 archbishop of Armagh, primate of all Ireland, and labored with much zeal to bring the Irish Church, thus far independent, under the papal sway. In 1137 he resigned the primacy to its legal possessors (for that see was then a family possession), and became bishop of Down. In 1137 he visited Bernard of Clairvaux: in 1139 was named legate for Ireland by the pope; and in 1142 established a Cistercian monastery in Ireland. In 1148 he induced the synod of Inis Padrig to request the pope to bestow the pallium upon the Irish bishops. D. at Clairvaux Nov. 2, 1148, in the arms of St. Bernard, his biographer and friend. He was one of the most learned, eloquent, and influential men of his time.

Malacology. See Conchology.

Malad City, cap. of Oneida co., Id. (see map of Idaho, ref. 6-C, for location of county), 25 miles W. by N. of Franklin, Ut. Pop. in 1880, 759.

Mal'aga, province of Spain, bordering on the Mediterranean, and bounded by the provinces of Cadiz and Granada. Area, 2824 square miles. Pop. 500,322. It produces excellent and abundant wine, corn, and fruit, and is rich in metals and mineral springs.

Malaga, city of Spain, the capital of the province of Malaga, on the Mediterranean. It is beautifully situated at the foot of a lofty mountain-range, whose highest peak is crowned with the old Moorish castle Gibralfaro, and whose majestically undulating sides are covered with magnificent vines, producing the famous malaga wine. It is an old city, founded by the Carthaginians, having lived through long periods of Roman and Moorish dominion. Many of its streets are narrow, crooked, and quaint alleys, but the newer part, extending along the harbor and the beautiful alameda, is elegant and has a thoroughly modern appearance. It is chiefly a place of commerce, increasing every year, and now competing successfully with Barcelona. Its harbor is spacious and safe, lined with handsome quays, and provided with excellent dockyards. Its trade in wine, oil, figs, almonds, raisins, and grapes is very extensive, and its manufactures of cloth, silk, ropes, and leather are prosperous; besides, it has several large iron-foundries, breweries, and distilleries. Its educational institutions, museums, and scientific collections are good, and its inhabitants reputed for their elegance and civility. Pop. 115,882.

Malakoff. See SEVASTOPOL.

Malamocco. See VENICE.

Malan′ (CÉSAR HENRI ABRAHAM), D. D., b. at Geneva, Switzerland, July 7, 1787, of French Protestant descent; was bred a Socinian, and ordained in 1810; became a Trinitarian under the guidance of Robert Haldane and of Dr. J. M. Mason of New York, and was (1820–63) the pastor of an independent church at Geneva. His sect were called *Mômiers* (comedians) by the people. He was the author of many religious works. His hymns, *Les Chants de Sion* (1826; with original music 1841) and *Les Grains de Sénevé* (1846), are noteworthy. Many of his works have been translated into English. D. May 8, 1864.

Malan (SOLOMON CÆSAR), D. D., son of César Malan, b. in Geneva in 1812; graduated with honors at St. Edmund's Hall, Oxford, in 1837: received in 1838 a professorship in the Bishop's College, Calcutta; returned to England, and in 1871 became a prebendary of Sarum, which dignity he resigned, however, in 1875. He has written several original books on ecclesiastical subjects, ornithology, travels, etc., composed sacred and other music, designed illustrations for his own and others' works, and translated from Chinese, Japanese, Ethiopic, Arabic, Armenian, Coptic, Persian, Russian, and other literatures many books, mostly religious, including *The Gospel of St. John* in 11 translations, from the Syriac, Armenian, Geez, Georgian, Slavonic, Memphitic, Gothic, Ṣahidic, Anglo-Saxon, Persian, and Arabic. Among his most interesting translations are *The Conflicts of the Holy Apostles* and *The Book of Adam and Eve*, both from Ethiopic.

Mä′laren, or **Mälar,** the most beautiful and one of the largest of the lakes of Sweden. With a breadth of from 2 to 20 miles, it stretches 70 miles inland from the Baltic Sea, with which it is connected by a small but deep channel. It contains over 1200 islands, fertile and beautiful, well cultivated, or covered with forests of pine and birch. Stockholm is situated on both sides of the channel and on a number of islands in the Mälar Lake, and several other towns are along its shores or on its islands.

Malaria. See INTERMITTENT FEVER, MIASMA, and REMITTENT FEVER.

Malay Archipelago. See EASTERN ARCHIPELAGO.

Malay Peninsula, the southern extremity of Farther India, projects from Indo-China between the China Sea and the Gulf of Siam to the E., and the Bay of Bengal and the Strait of Malacca to the W., for a distance of about 900 miles; greatest breadth 180 miles. It is traversed by a mountain-range from 3000 to 6000 feet high, bordered with alluvial plains along the coast. The peninsula is supposed to be the cradle of the Malayan race, though a tradition among some Malayan tribes asserts that at one time they immigrated from Sumatra and drove the original inhabitants back into the mountains. Large parts of the country are now dependencies of Siam. The British have several important settlements—PENANG, MALACCA, and SINGAPORE (which see). But there are also independent Malayan states, as Quedah, Patani, and Johori.

Malay Race [called by themselves *Malayu*], the dominant race of Malacca (the Malay peninsula) and the East Indian Islands (Malay Archipelago). In a larger sense, the inhabitants of the greater part of the islands of Polynesia are said to be of Malay race, since physically and in language they are kindred, and the Malay traditions assume an insular origin for their people. Some ethnologists have made the Malays the type of a fifth or brown race of mankind, but others regard them as essentially Mongolian. They are of a brown color, have black and often curled hair, and prominent facial bones, are short of stature, and as a rule courageous, but unstable and subject to fits of indomitable rage. They are treacherous and unforgiving enemies and inconstant friends, idle and revengeful, but are active and useful sailors. Gambling, cockfighting, intoxication, and, until recently, piracy, are the national vices. The Malays are inveterate liars. In religion they are Mohammedans. Fondness for music and disregard of death are almost universal. There are, however, observers who give the Malays a much better character than the one here drawn. It is not improbable that intercourse with Europeans and Chinese has degraded them, as it has most other rude peoples, and the injustice and cheating of traders has done much to make them treacherous and deceitful. Fortunately, the Malays have a patriarchal feudal system of living which has ever prevented this enterprising and unscrupulous people from becoming a far-conquering race. Their so-called civilization is small. There are manufactures of weapons, of ornamental gold and filigree work, and of fast-sailing but small vessels of curious construction. The people are very largely maritime in their pursuits. The language is soft in its sounds, and is easily learned. It is the commercial language of the East, and has been called, for its euphony, the Italian of Asia. The literature is small, and bears strong marks of Sanskrit and Arabian influence. The Arabic alphabet is used. (See the *Dictionary* of Marsden, 1812; Crawfurd, *Malay Grammar and Dictionary*, 1852.)

Malbone′ (EDWARD G.), b. at Newport, R. I., in Aug., 1777; became distinguished as a portrait-painter at Providence, Boston, Charleston, and London; visited the chief cities of the U. S. painting miniatures; went to the West Indies for his health in 1806, and d. at Savannah, Ga., May 7, 1807.

Malcolm (Sir JOHN), b. at Burnfoot, near Langholm, Porthshire, Scotland, May 2, 1769; entered the army at the age of twelve years; became a cadet in the military service of the East India Company, and having familiarized himself with several Oriental languages, successfully performed a political mission to Persia in 1799, and became president of Mysore in 1803, and in the same year accompanied Gen. Arthur Wellesley in the Mahratta campaign, and signed the treaty of peace with Scindia after the latter's defeat at Assaye. During the ensuing years Malcolm was employed in high civil functions under the successive Indian administrations; was again sent as envoy to Persia in 1807 and 1809, but with less diplomatic success than before, and returned to England in 1812. He was knighted, wrote his elaborate *History of Persia* (2 vols., 1815), still an authority, and visited Paris during its occupation by the allied forces. He returned to the East in 1817; engaged in the Mahratta and Pindaree wars in the Deccan as second in command, with the rank of brigadier-general; distinguished himself at the battle of Mehudpoor (Sept. 21, 1817), in which he broke the power of the Mahrattas; was governor of Malwa 1818–22; published his *Memoir of Central India* (1823), and his *Political History of India from 1784 to 1823* (1826); was governor of Bombay 1827–30; was member of Parliament for Launceston 1831; and d. in London May 31, 1833. A monument was erected to his memory in Westminster Abbey, and an obelisk 100 feet high at his native place. (See his *Life and Correspondence*, by J. W. Kaye, 1856.)

Malcom (HOWARD), D. D., LL.D., b. in Philadelphia Jan. 19, 1799; graduated at Dickinson College in 1817; studied at Princeton Theological Seminary; was pastor of Baptist churches at Hudson, N. Y., Boston, and Philadelphia: was president of the college at Georgetown, Ky., 1839–49, and of Lewisburg University in Pennsylvania 1851–59, after which, he retired from the ministry and settled in Philadelphia. He published a *Dictionary of the Bible* (1828), *The Christian Rule of Marriage* (1830); visited the Baptist missions in India, Burmah, Siam, China, and Africa, 1835–36; published his *Travels in South-eastern Asia* (1839), which reached a 10th ed. in 1857, and an *Index to Religious Literature* (2d ed., 1870). He was one of the founders of the American Sunday-school Union and the American Tract Society, and labored in their behalf. D. at Philadelphia, Pa., Mar. 25, 1879.

Malczew′ski (ANTONI), b. in Volhynia in 1792; received a military education; entered the army in 1811; retired in 1816 on account of a duel; travelled in Germany, Switzerland, Italy, and France; returned in 1821, having squandered his fortune, and lived as a farmer in Volhynia, then as a littérateur in Warsaw, where he d. in poverty and misery May 2, 1826. In 1825 he published *Marja*, an epic poem in two songs, at first much criticised, but, since the victory of the romantic school over French classicism, considered one of the finest productions in Polish literature, and translated into French and German.

Maldah′, town of British India, in the presidency of Bengal, on the Mahanunda, an affluent of the Ganges, is poorly built, with narrow and filthy streets lined with decaying houses. Its weaving-factories, once very active, have nearly stopped, and the surrounding districts, which in the rainy season are completely inundated, lie uncultivated. Pop. 15,000.

Mal′deghem, town of Belgium, province of East Flanders, with celebrated lace manufactures. Pop. 7695.

Malden, city and R. R. centre, Middlesex co., Mass. (see map of Massachusetts, ref. 2–H, for location of county), on the Malden River, and on the Boston and Maine and the Saugus branch R. Rs., 4 miles N. of Boston, has gas and water works, a high school, a lyceum, and water-power utilized by various manufactures. Pop. in 1870, 7367; in 1880, 12,017; in 1885, 16,407.

Mal′dive Islands, a group of small islands, numbering in all about 15,000, situated in the Indian Ocean, S. W. of Ceylon, between lat. 0° 45′ S. and 7° 6′ N. They are of coral formation, low, hardly more than 6 feet above the sea, of circular form, and having a lagoon in the centre. On the larger grow figs, palm trees, and citrons, and rice is cultivated; poultry and wild fowls are abundant. As a rule, all the islands of any extent are well wooded, and the woods contain many fine large trees, besides the ordinary shrubs of the Ceylon coast-jungle. But the cocoa-palm is the most characteristic tree. The inhabitants, numbering 200,000, are Mohammedans, and governed by a sultan who resides on Male and pays a tribute to the English government of Ceylon. They are dark-colored, of short stature, but with handsome features and pleasing expression. They resemble both the Singhalese and the Malabar people; their language is a dialect of the former.

Mal′don, town of England, in the county of Essex, at the confluence of the Chelmer and the Blackwater. It has manufactures of salt and silk, and breweries and iron-foundries. Pop. 5476.

Malebranche′ (Nicolas), b. in Paris Aug. 6, 1638, of a rich and respectable family; prevented by a feeble constitution from frequenting any public school as a youth, he when older studied theology at the Sorbonne, and entered in 1660 the congregation of the Oratory. But the incidental perusal of Descartes's *Traité de l'Homme* filled him with such an enthusiasm that henceforth he devoted himself exclusively to philosophy, and after ten years' preparation he produced his principal work, *De la Recherche de la Vérité* (1674), which ran through numerous editions in the course of a few years. His health was still very precarious, but by his quiet and cautious manner of living he reached a good old age. The study of philosophy he alternated with that of mathematics, in order to sharpen his powers without burdening his memory. He made short excursions in the country, and delighted in associating with children. As he was a man of genuine piety, it was to him a most serious task to demonstrate the true relation between the metaphysical ideas set forth in his first book and the doctrines of Christianity, and all his subsequent writings reveal more or less directly the same tendency: *Conversations Chrétiennes* (1677), *De la Nature et de la Grace* (1680), *Méditations Chrétiennes et Métaphysiques* (1683), *Entretiens sur la Métaphysique et sur la Religion* (1688), *Entretiens d'un Philosophe Chrétien et d'un Philosophe Chinois sur l'Existence de Dieu* (1708), etc. On this point, however, he met with much censure and opposition from Arnauld, Régis, and even from Bossuet; but in spite of the fierceness of the controversy, he himself remained calm and benign to the last. D. at Paris Oct. 13, 1715, after a protracted sickness and much suffering. In the history of philosophy Malebranche represents the so-called Occasionalism. With Descartes he assumed a difference between matter and mind so absolute that no transition from one to the other, no influence of one on the other, is possible. The question then became, How is the striking harmony between the material and spiritual phenomena which pervades the whole world to be explained when there is no causal connection between the two spheres? To this Malebranche answered, All that exists, matter and mind, and the movements going on in their respective spheres, rests on God as its sole and immediate cause; and as God is one and the same, there must be a certain consistency between the phenomena of the various spheres, even though that which takes place in one sphere is only a *causa occasionalis*, and not a *causa efficiens* for that which occurs in another. This, the fundamental idea of the metaphysical system of Malebranche, is by itself as artificial as Leibnitz's *harmonia præstabilita*, as obscure in its interior construction, as barren in its practical application; but while Malebranche as a philosopher, as a metaphysician, hardly has any other interest than that of showing certain consequences of the Cartesian speculation, as an author, generally speaking, he occupies a very high rank by the power and purity of his spirit, by the richness and soundness of his psychological observations, and by the lucidity and elegance of his style; he is reckoned among the French classics. Clemens Petersen.

Malesherbes′, de (Chrétien Guillaume de Lamoignon), b. at Paris Dec. 6, 1721, of a rich and influential family; educated by the Jesuits; studied law, and entered very early the civil service, in which he occupied with great honor the most responsible positions. From 1750 to 1771 he was censor of the press and president of the court of aids. In the former office he gained the esteem of all literary men by his liberality and courage; without him the *Encyclopédie* would probably never have been printed. In the latter he attained still greater popularity by the firmness with which he opposed all arbitrary measures of the government and all extortions of the tax-farmers. In 1771, when Louis XV. dissolved the Parliament because they would not register his tax-edicts, Malesherbes presented a memoir to His Majesty, advising the convocation of the States General, for which memoir he was banished from Paris. On the accession of Louis XVI. he was recalled to the court in 1774, and as he now was one of the most popular men in France, he was made minister of the interior in the cabinet of Turgot. He could do nothing, however, against the follies, prejudices, and intrigues of the court; and when he left the ministry in 1776, together with Turgot, he had lost much of his popularity. Many years he then spent in travels in foreign countries and on his estates, always occupied by some plans of public usefulness; and when in 1792 Louis XVI. was arraigned before the National Convention, he undertook his defence, and spoke with admirable courage, and not without making some impression. The immediate result, however, of this noble act was his own arraignment in Dec., 1793, and on Apr. 22, 1794, he was guillotined, together with several members of his family. He wrote several essays and pamphlets, mostly on subjects relating to political economy and finances.

Malet′ (Sir Alexander), Bart., K. C. B., b. in England in 1800; graduated at Oxford in 1822; pursued the diplomatic career; was envoy to the Germanic confederation from 1852 to 1866, and wrote the history of the extinction of that political body under the title *The Overthrow of the Germanic Confederation by Prussia in 1866* (1870). Some years earlier he translated from the Norman-French Master Wace's *Chronicle of the Conquest of England.*

Malet, de (Claude François), b. June 28, 1754, at Dôle, in the department of Jura, France; entered the army in 1771; was brigadier-general in 1799, and commanded in Italy in 1804 under Prince Eugene, but was dismissed from the army in 1807, and confined in La Force, suspected and in a measure convicted of having intrigued against the emperor. While in La Force he plotted a new conspiracy, but was again discovered, and Napoleon now ordered him to be shut up in a state prison. This order was either disobeyed or forgotten, and in 1812 he was allowed to take up his residence for the sake of his health in the house of a physician in Paris, one Dubuisson. Here he found the associates he needed, and planned with great shrewdness and circumspection a *coup d'état*, which he executed in the night between Oct. 22 and 23 with an astonishing audacity and admirable skill. The first rumor of the disastrous retreat from Moscow had just reached Paris. At midnight Malet appeared in the barracks, announced that the emperor had been killed in Russia, represented himself as an emissary from the provisory government, and at the head of a few companies of soldiers arrested the chiefs of the police and the postal department, whom he replaced with his own accomplices, and was just about taking possession of the military command of Paris when Laborde, chief of the military police, recognized him, disarmed and arrested him, and disclosed his fraud to the soldiers. He was shot Oct. 29, 1812. (See the exhaustive representations by Lafon and Dourille, both entitled *Histoire de la Conspiration de Malet*—the former 1814, the latter 1840.)

Malherbe′, de (François), b. at Caen in 1555, d. at Paris Oct. 16, 1628. He was called to the court by Henry IV., received a pension from Marie de Médicis, rich donations from Louis XIII., and many compliments from Richelieu. His statue in bronze was raised in his native city in 1847, and his works, consisting of odes on court occasions, were frequently republished—by Chevreau (1723), by Lefèvre de St.-Marc (1764), by Didot (1797), by Lalanne (1865). By French critics he is generally called the founder of the classical poetry in France, but that can be said only with respect to the form, as his odes are entirely destitute not only of poetical inspiration, but even of that subordinate quality which in French criticism is called *esprit.*

Malheur′ River rises by several head-streams in Baker co., Or., and flows into the Snake River.

Malibran′ (Maria Felicità), b. at Paris Mar. 24, 1808, a daughter of the celebrated singer and singing-master, Manuel Garcia; made her début June 7, 1825, as Rosina in *The Barber of Seville* in London; entered in the same year on an artistic tour through the U. S.; married (Mar. 25, 1826) Mr. Malibran, a French merchant of New York; returned the next year alone to Europe; appeared for the first time at Paris Jan. 14, 1828, as Semiramis; sang for several years alternately in London and Paris, with occasional excursions to Italy and Belgium; married after the dissolution of her first marriage the famous violinist De Bériot, Mar. 29, 1836, and d. at Manchester Sept. 23, 1836, in consequence of a fall from her horse. Her voice, a mezzo-soprano, was beautiful by nature and developed to perfection, and with these musical advantages she connected a considerable dramatic talent, much natural grace, a rich imagination, and an astonishing audacity in following up her momentary inspirations.

Mal'ic Acid [Lat. *malum*, "an apple"], $C_4H_6O_5$. Wöhler represents the molecular constitution thus:

$$\left\{\begin{array}{l} \mathrm{CH.OH.CO.OH} \\ \mathrm{CH_2.CO.OH.} \end{array}\right.$$

Its anhydride (not yet isolated) would be $C_4H_4O_4$, a metamere of *maleic* and *fumaric* acids. First discovered by Scheele in *apples*. It occurs in many fruits and berries; among them, *cherries, gooseberries, strawberries, raspberries,* and the berries of the *sumach* and of the *mountain-ash,* from which latter it is usually procured. It exists also in *pine-apples,* and in the leaves, stems, seeds, and roots of a great many plants. The acid of *tomatoes* is chiefly citric. Mountain-ash (*Sorbus aucuparia*) berries are pressed when not quite ripe, the juice boiled and filtered, neutralized partially with potash, and precipitated with a lead-salt. The liquid is allowed to stand for a few days, during which malate of lead crystallizes, and the crystals may be separated by careful elutriation from other deposits that form. Sulphuric acid then separates malic acid, but its purification is rather troublesome. When pure it crystallizes from a syrupy solution. It is deliquescent, and soluble in alcohol. It is lævo-rotatory to about $-5°$. Malic acid has not yet been prepared synthetically.

Malates.—Almost all the malates are soluble, malate of lead being about the only one soluble with difficulty in the cold, though even this appears soluble in its mother-liquor when heated. The acid often occurs in fruits and plants in the form of acid malates of lime, magnesia, and potash.

Maleic Acid, $C_4H_4O_4$.—Wöhler makes it $C_2H_2(CO,OH)_2$. It is metameric with fumaric acid, from *fumitory* (*Fumaria officinalis*). Both these acids are formed by distilling malic acid, fumaric acid being the solid residue, and maleic the liquid distillate dissolved in the water produced by the decomposition. Maleic acid may also be crystallized. Several chemical agents convert it into fumaric acid. H. WURTZ.

Mal'ice [Lat. *malitia*, "bad"], in law. Primarily, malice imports a wicked purpose towards the person injured, but as a word of strictly legal nomenclature it has acquired a broader technical meaning, and is used to describe and characterize the intentional doing of any wrongful act without just cause or excuse. As was very accurately said by an English judge, "Malice in common acceptation means ill-will against a person, but in its legal sense it means a wrongful act done intentionally, without just cause or excuse. If I give a perfect stranger a blow likely to produce death, I do it of malice, because I do it intentionally and without just cause or excuse. If I traduce a man, whether I know him or not, and whether I intend to do him an injury or not, the law considers it done of malice, because it is wrongful and intentional." In this technical signification malice is an essential element of very many crimes, and of certain civil wrongs for which a right of action is given to the injured party, particularly of libel, slander, and malicious prosecution. Malice is often separated into two classes, express and implied, or, as the division is sometimes very inaccurately made, malice in fact and malice in law. This classification, however, has reference solely to the manner of proving the malice in a given case. It is express when its existence is established by direct evidence showing the intention; if implied, the wrongful intention, which is its principal ingredient, is presumed from certain acts or omissions of the wrongdoer, as by the common law the intent to kill was inferred from the fact of killing. There is, therefore, no substantial distinction between express and implied malice, but simply a difference in proving the single element of malice, which is the same in its effects when established by either method. JOHN NORTON POMEROY.

Mali'cious Mischief, in law. At common law, malicious mischief seems to have been confined to the wilful destruction of personal property from actual ill-will or malice towards the owner or possessor. In the U. S., through a judicial enlargement of this definition, or by means of numerous special statutes, any intentional or wanton injury to property, real or personal, done through malice and committed secretly, or exhibiting cruelty to animals, or accompanied by a breach of the peace, so that the offence would be more than a mere civil trespass on the one hand, and would not amount to arson or any other well-defined crime on the other, is embraced within the general term "malicious mischief." Actual injury, wantonness, and malicious intent are essential elements, and such circumstances as distinguish the wrongful act from a mere trespass. Simply as illustrations of the almost innumerable special offences which have been described by statutes may be mentioned the defacing of buildings, the girdling or other injury to ornamental or fruit trees or to shrubbery, the setting on fire or other destruction of crops, the killing or wounding of animals, and the like. The punishment is generally fine or imprisonment, or both.

JOHN NORTON POMEROY.

Malicious Prosecution, a prosecution at law from malice and without reasonable or probable cause. This is a tortious injury, for which the party against whom the wrongful proceedings have been instituted may maintain an action and recover damages. (See TORT.) It is deemed in law as primarily a violation of the personal right of reputation, but it usually results also in a violation of the right of personal liberty by the arrest or imprisonment of the party prosecuted, and of the right of property by occasioning expense. Proof of injury or damage in either of these respects, however, will be sufficient to support an action against the prosecutor. The fundamental ground upon which actions of this kind rest is, that the processes of law are not to be employed for purposes of injury, extortion, or oppression, but only to enforce claims or demands believed on reasonable grounds to be just and valid, to protect legal rights, or to punish alleged offenders against the laws in regard to whom there is at least reasonable probability of guilt. The form of the malicious prosecution is not material. It may be either criminal or a civil suit at law. Thus, if an indictment be obtained against a person for an alleged crime, or a warrant be procured for his arrest by complaint to a magistrate; or if in a civil action he be arrested and held to bail for a debt not due or for more than is due, or his property be attached upon a groundless claim; or if a commission of lunacy or of bankruptcy be sued out against him; or if he be put under bonds to keep the peace; or if any other proceedings of a like nature are taken against him, and in any case the law be put in motion maliciously and without probable cause, an action is maintainable. If a person is arrested and imprisoned or held to bail in a civil suit, the offence is commonly termed a "malicious arrest," but the general principles of law relating to it are the same as are applicable to other modes of malicious prosecution. To sustain an action for a malicious arrest or prosecution the plaintiff must prove (1) that the defendant caused or instigated the proceedings complained of; (2) that they were instituted maliciously and without probable cause; and (3) that they are at an end and terminated in favor of himself, the party therein prosecuted.

(1) If the alleged prosecutor directly and personally instituted the malicious proceeding, as by bringing an unfounded civil action or by procuring an indictment or the issue of a warrant upon testimony known to be false, he is undoubtedly responsible. But he is also liable if he merely instigated or excited the prosecution, or if it was brought by his agent, who was duly authorized to institute such proceedings. An attorney-at-law is not, however, liable, unless he acted without authority from his client in commencing the prosecution, or conspired with his client to injure and oppress the other party. If a person makes a malicious accusation of a crime against another before a magistrate without reasonable cause, and the magistrate, relying upon the charge, causes the arrest of the party accused, an action will lie against the complainant; but if the magistrate, relying upon his own judgment, mistakenly deems the alleged offence to be a crime when it is not such in reality, it has been held that the issue of a warrant and an arrest upon this ground will not make the complainant responsible, since the injury is attributable to the magistrate's error. It was formerly questioned whether corporations could be sued in an action for malicious prosecution, but actions of this kind are now generally held maintainable.

(2) The existence of malice and the want of probable cause must both be established by the plaintiff by affirmative proof. Malice in the legal sense of the term, and as it is used in this connection, is not confined in meaning to actual malevolence, animosity, or ill-will against the person to whom the injury is done, but signifies also that habit, disposition, or intent of mind from which proceed wrongful acts done intentionally, without cause or excuse. In the former meaning it is termed technically "malice in fact"—in the latter, "malice in law." Adequate proof that the prosecutor was actuated by a malicious intent in either of these senses of the expression will be sufficient to sustain the action against him. (See MALICE.) Malice in fact may be proved by evidence of expressions or conduct showing that the prosecutor was conscious of the innocence of the accused, and was influenced by a positive intent to do him injury rather than to bring him to justice for the alleged offence. But malice is usually inferred in actions of this kind from the want of probable cause, which is therefore essentially the gist of the action. Probable cause is defined as a reasonable suspicion supported by circumstances sufficiently strong in themselves to warrant a cautious and prudent man in the belief that the person accused is guilty of the offence charged. If this ground of justification be absent, it is a natural presumption that the prosecution was instituted from an indirect motive of wrong or with an intention to subserve some improper or unworthy pur-

pose; and the existence of malice in law is therefore established without more specific proof. If it be shown, however, by appropriate testimony, that the defendant acted in entire good faith in prosecuting a groundless claim, or was actuated solely by an honest desire to bring a supposed offender to justice, proof of actual malice will be necessary in rebuttal, or the action will not be sustainable; for proof that there was want of probable cause, without malice, will not be sufficient, since a wrongful intent is an essential ingredient in this offence. A case of this kind, however, occurs but rarely. In like manner, proof of the most express actual malice will not be sufficient to support an action if it appears that there was reasonable ground for the prosecution, since otherwise damages would be awarded by the law for the assertion of a valid legal right or for the prosecution of an actual offender; which would be both illogical and inexpedient. While malice is ordinarily inferable from the want of probable cause, the converse of the proposition is never true. Want of probable cause must always be directly proved, and cannot be implied, for a man may, though actuated by positive malevolence, undertake a prosecution for real guilt, or upon credible grounds of belief proceed upon apparent guilt; and under such circumstances the law favors legal measures of redressing the real or supposed grievance. Probable cause does not depend upon the actual guilt or innocence or responsibility of the person prosecuted, nor upon the fact that any offence has been committed or any liability incurred, but upon the belief of the prosecutor concerning such guilt or innocence or responsibility. Belief and reasonable grounds of belief are both essential elements in the justification. The prosecutor must not act from mere conjecture, impulse, or passion, or upon suspicion not warranted by facts or by appearances which would seem to a reasonable man indicative of guilt or liability. What proof will be sufficient to show the existence or absence of probable cause will depend chiefly upon the circumstances of each particular case. A discharge by the examining magistrate of a person apprehended upon a criminal charge is *prima facie* evidence of the want of probable cause, and is sufficient to throw the burden of proving the contrary upon the defendant. The same is true if the suit complained of as malicious was voluntarily discontinued. But the mere omission or neglect to prosecute a suit commenced does not of itself afford adequate evidence that there was no reasonable ground for the prosecution. Nor is the acquittal of a person prosecuted adequate evidence that no probable cause existed, for the party making the charge might have adduced evidence which considered by itself would have constituted a reasonable justification of his action, but was contradicted and nullified at the trial; or he may have been compelled to abandon the prosecution by reason of the death or absence of witnesses or the difficulty of procuring sufficient legal proof. But if the trial resulted in conviction or in a judgment in the plaintiff's favor, and no appeal has been taken from the judgment, there is conclusive evidence of probable cause. If, however, the judgment be reversed upon appeal, upon the ground that it was procured by fraud, conspiracy, perjury, or other like means which prevented a trial upon the merits and misled the jury, it ceases to be adequate proof that probable cause existed. But if the ground of reversal be of a different character, this result will not follow, for if the case were fairly tried, and the jury concluded from a survey of the evidence that the charge was substantiated, their concurrence is adequate to establish the fact that the action of the prosecutor, though it may have been erroneous, was based upon reasonable grounds. These are the rules generally sustained by the more recent decisions, though the authorities are not in entire accord upon the subject. If a prosecution be undertaken in accordance with the advice of counsel, this will be sufficient evidence of probable cause, provided a full and fair statement of the facts of the case is made to the counsel, and his advice is based upon the information which he thus receives. But if the client mislead his counsel by fraudulent misstatements or the suppression of important facts, or by giving him erroneous impressions in regard to the matter in controversy, the advice given will furnish no defence to the action for malicious prosecution. Malice is a question of fact to be determined by the jury; probable cause is a mixed question of law and of fact. When the facts are in dispute, it is the duty of the court to instruct the jury what facts if established will constitute a probable cause for the prosecution, and to submit to them only the question as to the existence of those facts. But where there is no conflict as to the circumstances, the question is one of law to be determined exclusively by the court.

(3) The rule that the plaintiff must prove a termination of the previous prosecution in his favor grows out of the doctrine that the existence of probable cause is a complete defence to the action. For until the proceedings are ended, there is a possibility that they may result adversely to the party prosecuted, and if such were the case the existence of probable cause would be fully established. It is not necessary, however, that the prosecution be brought to trial, for it may be sufficiently terminated at an earlier stage. It is only requisite that the proceeding be so far ended that nothing more can be done by the prosecutor without commencing anew. But if the case be actually tried, an acquittal of the party prosecuted must be shown. If a *nolle prosequi* be entered upon an indictment by the prosecuting attorney representing the government, this will not be a sufficient termination; for the finding of the grand jury is some evidence of probable cause, and another indictment may still be found upon the same complaint. Some authorities hold that a *nolle prosequi* does not even terminate proceedings upon the indictment on which it is entered, but that it may in process of law be withdrawn. If the prosecution is commenced by complaint to a magistrate who has jurisdiction only to bind over or to discharge, it will be sufficiently ended by an abandonment of the charge and a discontinuance of the prosecution by the party instituting it. The discharge of the accused in such a case is equivalent to an acquittal. If the accused, after being arrested, is discharged by reason of the grand jury's finding no indictment, this shows a legal end to the prosecution. When the suit complained of is a civil action, a voluntary discontinuance thereof by the plaintiff, or a discharge of the defendant without judgment or verdict, is a sufficient termination of the suit.

Analogous to the action for malicious prosecution is the action for "malicious abuse of legal process," as the offence is called. This consists in making use of legal process for some unjustifiable and unauthorized purpose, as by extorting money from a person illegally, or by compelling the delivery of property which the process does not require to be attached or seized. To maintain an action for this injury it is not necessary to prove that the process improperly employed is at an end, nor that it was sued out without reasonable or probable cause. No probable cause can exist for such an act, and the fact that this justification is lacking, therefore, does not need to be established by positive evidence, being conclusively presumed from the wrongful nature of the act itself. On the same ground also the existence of a malicious intent is inferable.

(For the general rules as to the damages to be given in actions see the article MEASURE OF DAMAGES. Consult on this subject the works of Hilliard and Addison on *Torts*.)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Malignant Diseases. See CANCER.

Malig'nant Pus'tule, a disease communicable from the lower animals to man (and especially from horned cattle), though sometimes, apparently, originating in man without contagion. It is apparently the same as "black quarter" in neat cattle and "murrain" in sheep. It sometimes attacks those who handle the hides, and especially the hair, of the lower animals; and is believed to be sometimes propagated by insects, which, flying from the animal which is diseased, may alight upon some abrasion or pimple on the skin of a human subject, and thus transmit the disease. In its inception it resembles a boil, or sometimes a carbuncle, seldom very painful; the pustule soon becomes the seat of gangrene, sometimes emitting a remarkable fetor; there is an intense fever, with profound septic symptoms; and unless active treatment be employed death is certain to follow; which, indeed, is often the case with the best treatment. To be effectual the treatment should be undertaken early. But, unfortunately, it is often impossible to distinguish the disease early, unless it assumes a quasi-epidemic character, as sometimes happens. The use of powerful caustics upon the pustule, with general stimulants, tonics, and concentrated food, is sometimes effectual in saving life.

Malines. See MECHLIN.

Mal'lard, or **Greenhead,** the most common wild-duck in North America and Europe (*Anas boschas*). It is the original from whence have sprung almost all the varieties of the domestic duck, excepting some which are bred in China and Japan. It is nearly two feet long, and has a grass-green neck and head, with a tint of violet: a white ring around the neck, brownish chestnut below. The speculum is a violet purple. The female is smaller, and her plumage is plain brown. It is strictly monogamous, unlike the common domestic duck. (See DUCK.)

Malleability. See METALS, by PROF. H. B. CORNWALL.

Mal'leus (in comparative anatomy), [Lat., "hammer"], a small bone forming one of the chain of three bones in the internal ear of mammals, but morphologically answering to the quadrate bone with which the lower jaw articulates in the Ichthyopsida and Sauropsida.

Malleus (in zoology), [Lat., "hammer"], a genus of monomyarian lamellibranch mollusks, closely allied to the pearl-oysters, and with them belonging to the family Pteriidæ (Aviculidæ), or wing-shells. It is a very odd-looking thing, but otherwise is of little interest.

Mal'lory (Stephen R.), b. in Nassau, N. P., in 1810, was the son of a shipmaster of Connecticut; settled with his mother at Key West, Fla., in 1821; was educated at the North; admitted to the bar at Key West in 1833; was inspector of customs under Jackson, and became county judge and judge of probate for Taylor co., Fla.; became in 1845 collector of the port of Key West; was U. S. Senator from Florida 1851–61; became secretary of the Confederate navy. After the war he was imprisoned, released on parole in 1866, and pardoned in 1867 by Pres. Johnson. He afterwards practised law in Pensacola, where he d. Nov. 9, 1873.

Mal'low. See Malvaceæ.

Malmes'bury (James **Harris**), K. B., first Earl of, b. in Salisbury, England, Apr. 21, 1746, was son of James Harris, the author of *Hermes*; studied at Oxford and Leyden; became secretary of legation at Madrid 1767; ambassador in Berlin 1772; in St. Petersburg 1777; at the Hague 1784; supported Fox in the House of Commons; knighted 1780; made a baron 1788 in reward for treaties of alliance negotiated with Holland and Prussia; was again ambassador in Berlin 1793; negotiated the marriage of the prince of Wales with Caroline of Brunswick 1794; was engaged in unsuccessful negotiations for peace with the French republic 1796–97; was created earl of Malmesbury and Viscount Fitz-Harris 1800. D. in London Nov. 20, 1820.

Malmes'bury (James Howard **Harris**), third Earl of, grandson of the first earl, b. at London Mar. 25, 1807; studied at Eton; graduated at Oxford 1828; succeeded to the title Sept., 1841; was secretary of state for foreign affairs under the earl of Derby 1852, and again 1858–59; was lord keeper of the privy seal 1866–68; edited his grandfather's *Diaries and Correspondence* (4 vols., 1844), and published *The First Lord Malmesbury, his Family and Friends, a Series of Letters from 1745 to 1820* (2 vols., 1870).

Malmesbury, William of, b. in Somersetshire, England, about 1095; became a monk and librarian of the monastery at Malmesbury, whence he took his name, and wrote in Latin a historical work which, next to the *Saxon Chronicle*, is considered the most valuable authority for Anglo-Saxon times. D. in Malmesbury about 1143. His *History of the Kings of England*, and its continuation, the *Modern History*, were published in Latin by Sir Henry Savile (1596) and by T. D. Hardy (1840), and a translation of the former by Rev. John Sharpe appeared in 1815, and again in Bohn's "Antiquarian Library" (1847).

Mal'mö, town of Sweden, on the Sound, opposite to Copenhagen. Its fortifications, which date back to the fifteenth century, are now transformed into public promenades, and its manufactures of stockings, woollens, soap, gloves, and sugar, and its trade with Copenhagen and the Baltic ports, are steadily increasing. Pop. 38,054.

Malm'sey [Fr. *vin de Malvoisie*], originally a sweet white or red wine from Monembasia (or Napoli di Malvasia). The name afterwards came to be applied to other sweet Levantine wines, and still later to any other very sweet wines. It is at present applied especially to "malmsey madeira," a wine which is much weaker than standard madeira wine. It is understood that all wines of this class are produced from over-ripe and partly dried grapes. They have a peculiar bouquet. These wines are not now very popular.

Malone, cap. of Franklin co., N. Y. (see map of New York, ref. 1–I, for location of county), on Salmon River and the Ogdensburg and Lake Champlain R. R., 60 miles from Ogdensburg, and an equal distance from Rouse's Point, is situated in a fine agricultural district and is the centre of a large trade. The village is engaged in manufactures. Pop. of tp., including v., in 1870, 7186; of tp. in 1880, 7909, including 4193 in v.

Malone (Edmond), b. at Dublin, Ireland, Oct. 4, 1741; studied at Trinity College 1756; was called to the bar 1767; inherited a considerable fortune soon after, and thenceforth devoted himself to literary pursuits in London. He wrote on the Rowley poems (1782), edited the works of Sir Joshua Reynolds (1797), of Dryden (1800), and of W. G. Hamilton (1808), in each instance accompanied by a memoir, and published a *History of the English Stage* (1790), but is chiefly known by his exposure of Ireland's Shakspearean forgeries (1796), and by his critical edition of Shakspeare (11 vols., 1790). Hallam characterizes him as a dull commentator, but laborious and truth-loving. D. in London May 25, 1812.

Malpi'ghi (Marcello), b. near Bologna in 1628; held the chair of medicine successively at Bologna, Pisa, and Messina; was called to Rome in 1691 by Innocent XII. as his chief physician, and d. there Nov. 29, 1694. He was the first to apply the newly-invented microscope in the study of anatomy, and showed himself a sagacious observer. His principal discovery was that of the transition of the blood from the arteries to the veins, described in his *De Pulmonibus* (1661). Various parts of the epidermis, spleen, and kidneys bear still his name.

Malplaquet', a v. of France, in the department of Nord, famous for the battle which took place here (Sept. 11, 1709) between the French under Villars and the allied English, Dutch, and Austrians under Marlborough and Eugene, resulting in favor of the allies.

Malpractice. See Jurisprudence, Medical.

Malt [Ger. *Malz*, from *malen*, to "grind"] is barley which has been allowed to pass through the earlier stages of germination, and then dried to destroy its vitality and prevent further change. (See Beer.) C. F. Chandler.

Mal'ta, an island in the Mediterranean, belonging to Great Britain, situated in lat. 35° 53′ N. and lon. 14° 31′ E., 58 miles from Sicily and 180 from Africa. It is the principal island of the Maltese group, which, besides Malta, comprises Gozo, Comino, Cominotto, and Tilfla. Area of the whole group 115 square miles; of Malta, 95. Pop. in 1880, 154,892, exclusive of British troops and their families, but including about 24,000 foreigners. The surface is elevated and rocky and has only a shallow layer of soil, but it is well cultivated, and produces corn, cotton, figs, oranges, and grapes in abundance. Many potatoes are raised for the English market. The climate is hot, but healthy. Snow is unknown, though hail-storms occur. The *sirocco*, a hot wind from the African desert, and on its way across the Mediterranean becoming loaded with salty moisture, is almost unbearable, but occurs only in August and September, and blows for only a few hours at a time. Excellent marble is quarried. The chief importance, however, the island derives from its position as a station on the route from England *viâ* Egypt to India, and its most remarkable features are the immensely strong fortifications which the English have built around the capital, Valetta, the foundations of which were laid by the Knights of St. John. Malta was known to the Greeks under the name of Ogygia; it was the residence of the nymph Calypso, whose grotto is still shown. In the fourth century the Carthaginians colonized the island, but at the close of the Second Punic war it became a Roman possession. In 56 A. D. Paul was shipwrecked here, and the legend tells us that he founded the first Christian congregation here. After the fall of the East Roman empire the island was conquered by the Vandals in 454, the Goths in 494, the Byzantines in 533, the Arabs in 870, and the Normans in 1090, who united it to Sicily. In 1530, Charles V. gave it to the knights of the order of St. John of Jerusalem, who shortly before had been driven by the Turks from Rhodes. Here, too, they were besieged by the Turks in 1557 and in 1565, but at the latter siege Sultan Solyman was compelled to re-embark with a loss of over 25,000 of his best troops. In 1798, Bonaparte took the island by treachery; in 1800 it was taken by the English, and they have held it since. (See Valetta.)

Malte-Brun', b. at Thisted, Jutland, Aug. 12, 1775; his true name was Malte Conrad Bruun. He was destined for the Church, but preferred literature, theatricals, and politics, and very early in his life became the favorite in all literary circles in Copenhagen. The boldness, however, with which he advocated the principles of the French Revolution, and the rather unprincipled violence with which he attacked the state of affairs in Denmark, caused considerable excitement, and after several conflicts with the government he was exiled. He went to Paris, where he applied himself with zeal to the study of geography and politics. D. Dec. 14, 1826. For several years he was joint editor of *Journal des Débats*, and several of the papers he wrote for this journal have been collected and republished by Nachet. But his fame rests on his geographical works. From 1803–05 he published, in connection with Mentello, *Géographie, Mathématique, Physique et Politique*, in 16 vols., and from 1810 to 1825 he published his *Précis de Géographie Universelle*. Geography was at the beginning of this century something almost unknown. Voltaire had told his readers that Copenhagen was a city in Skaane, and nobody laughed at him. But Napoleon's campaigns roused attention at once to this branch of knowledge; they made geography a necessary element of a man's education, and to this new want Malte-Brun administered with great talent and earnestness. Clemens Petersen.

Maltha [Gr. μάλθα], a name originally given to a mineral tallow from Kirwan, which resembles wax, and probably consists of paraffine. It has been more recently applied to certain varieties of mineral oil. (See PETROLEUM.)

Maltheidæ. See APPENDIX.

Mal'thus (THOMAS ROBERT), b. at the Rookery in Albury, Surrey co., England, in 1766. His father was a gentleman of good family and independent fortune, of considerable classical and philosophical culture. He kept his son under private tuition from the age of nine or ten till he was admitted at Jesus College, Cambridge, in 1784. There the young man attained a high standing as a classical scholar, won prizes for declamation, and in 1788 graduated with the honors of ninth wrangler. He gave himself to the cultivation of history, literature, and poetry for a few years. In 1797 he received his master's degree and a fellowship at Cambridge. About the same time he was admitted to holy orders, and took the charge of a small parish in Surrey, dividing his time between parochial duties there and his studies in the university. In 1798 the first edition of his work on population was published anonymously—*An Essay on the Principles of Population as it Affects the Future Improvement of Society, with Remarks on the Speculations of Mr. Godwin, Condorcet, and other Writers* (1 vol., 8vo). This work created quite a sensation at the time, and gained for Malthus his chief reputation. It went through several editions, the last of which appeared in 1826 under the modified title, *An Essay on the Principles of Population, or a View of its Past and Present Effects on Human Happiness, with an Inquiry into our Prospects respecting the Future Removal or Mitigation of the Evils which it occasions.* Its leading idea is, that population unchecked increases in a geometrical ratio, while food can be made to increase at most only in an arithmetical ratio. Hence the inference, that in order to avoid the evils of a population in excess of support, some checks must be applied to the increase of population. Vice and misery, shortening human life, come in as natural checks. That which is most insisted on in the essay is the moral check of abstinence from marriage and sexual intercourse on prudential considerations. The facts and reasonings of Malthus on the subject have been disputed and opposed by both economists and moralists. The theory disregards the vast undeveloped resources of that large portion of the earth's surface which is still uncultivated, and the effect of freedom of emigration and commercial intercourse between different parts of the world, the facilities for which have been greatly multiplied in the half century since the essay appeared. (For further discussion of the subject see POPULATION.) In 1799, Malthus travelled through Sweden, Norway, Finland, and a part of Russia, and during the interval of peace in 1802 through France and Switzerland, gathering by direct observation facts bearing on his favorite subject. He married in 1805, and the same year received the appointment of professor of history and political economy in the East India College at Haileybury, in which position he continued till his death. The other published writings of Malthus are—*Observations on the Effects of the Corn Laws, An Inquiry into the Nature and Progress of Rent* (1815), *Principles of Political Economy* (1820), and *Definitions in Political Economy* (1827). None of these have attracted much attention. Mr. Malthus passed the later years of his life in his family, occupied with his clerical and official duties. He was honored by sovereigns and scientific societies, particularly the National Institute at Paris and the Royal Academy of Sciences at Berlin. D. at Bath, of an affection of the heart, Dec. 29, 1834.
A. L. CHAPIN.

Malus' (ÉTIENNE-LOUIS), b. at Paris July 23, 1775; studied mathematics and engineering at Mézières, and afterwards at the École Polytechnique; was employed in the reconstruction of the fortifications of Antwerp and Kehl; became examiner at the École Polytechnique in 1811, and d. at Paris Feb. 23, 1812. He was the discoverer of the polarization of light by reflection, and his memoir on the subject, entitled *Sur une Propriété de la Lumière réfléchie par les Corps diaphanes*, received a prize from the Academy.

Malva'ceæ [Gr. μαλάχη, "mallow"], an important but not very large order of dicotyledonous plants, in habit either herbaceous or shrubby, only in the tropics attaining the dignity of trees. The order is largely dispersed over the globe, but is chiefly warm, temperate, and tropical. The species are most abundant in America, but the most useful plants are all natives of the Eastern continent. There are, in all, nearly 1000 species. These have a great general similarity to each other in appearance and in properties, and are all innocuous and mucilaginous. The mucilage abounds in the roots of the herbaceous species, and makes these valuable for various medicinal purposes—to allay irritation or to serve as an emollient. The well-known marshmallow (*Althæa officinalis*) is thus used in Europe. The seeds of all contain a fixed oil; that of cotton-seed is used in the arts. The flowers of Malvaceæ are often beautiful, but sometimes fugitive. This fact, which would be an important drawback to their use as ornamental plants, is compensated for by the rapid and long-continued succession of blossoms during the flowering season. The hollyhock, for instance, presents for a long period in summer large and showy flowers of red, yellow, white, or purple hues. It is the *Althæa rosea* of botanists. The natural group Columniferæ, established by Linnæus, to which the Malvaceæ belong, is very decided in its characters. The plants agree in having the calyx valvate, and the corolla convolute in æstivation; the stamens usually monadelphous in a column, and the embryo large, with foliaceous cotyledons. The leaves are alternate, and furnished with stipules. The true mallow family is readily separable from the remainder of the group by its strictly monadelphous stamens, one-celled reniform anthers, and simple leaves. The anthers open by a longitudinal slit at the top. The flowers are regular, and generally large, furnished, as a rule, with an involucre like a sort of outside calyx. The true calyx consists of five sepals, more or less united at the base. The petals are of the same number. Ovaries united in a ring, or forming a several-seeded capsule. The flower-stalks have a joint just beneath the flower. The pubescence is stellate. The bark is tough and fibrous. The leaves are petioled, palmately-veined and lobed. The stipules are sometimes deciduous. All the Malvaceæ have globose pollen, beset with minute hairs, and the flowers are with one exception (*Napæa*) hermaphrodite. The rounded fruits of *Malva rotundifolia*, remarkable for the elegance of their outline, are known as "cheeses," and by the French as *fromagions*. The leaves of this species and of *Malva sylvestris* were used by the Romans as salad, and are still employed for this purpose in some portions of Europe. The elongated young capsules of *Hibiscus esculentus*, forming the ochra or gumbo, are used in thickening soups. The showy, deep-red corolla of *Hibiscus rosa-Sinensis* is used by the Chinese for imparting a black tint to their shoes and eyebrows. Cordage is produced by several species of Malvaceæ. The whips with which the negro slaves of the West Indies were punished were made of the fibres of *Hibiscus arboreus*. Cuba bast, familiar to gardeners and cigar-makers, is the inner bark of *Hibiscus tiliaceus*. All these economic uses are insignificant in comparison with those which the one genus *Gossypium* offers. There are many species of the genus, but the best known is the *Gossypium herbaceum* or cotton-plant, so largely grown in our Southern States, and so important in commerce and manufactures. It is a native of Asia. The hairy or flocculent covering of the seeds yields the familiar fibre.
W. W. BAILEY.

Malvasia [the Italian *Napoli di Malvasia*, from the Greek *Monembasia*, "the city with one entrance"] is now a small town with about 1000 inhabitants, situated on the eastern shore of Morea, but was in the Middle Ages a fortress of first rank and carried on an important trade in wine (malmsey).

Mal'vern, R. R. junction, Mills co., Ia. (see map of Iowa, ref. 7–D, for location of county), 28 miles S. E. of Council Bluffs. It has a high school, elevators, wagon manufactory, and is surrounded by a rich agricultural district. Pop. in 1880, 748.

Malvern, Great, town of England, in Worcestershire, on the eastern side of the Malvern Hills, and celebrated as a watering-place, the waters of its springs being much recommended for certain skin diseases. It has an interesting church in Gothic style and 5847 inhabitants.

Malvern Hill, Va., an elevated plateau about 1½ miles by ¾ mile in area, near the James River, and the position occupied (June 30–July 1, 1862) by the Union army on its retreat after the battle of GAINES'S MILL (which see) from its position on the Chickahominy towards the banks of the James River. In front of the elevation are numerous defensible ravines, with ground sloping N. and E. to the woodland, allowing clear range for artillery in those directions, falling off more abruptly towards the N. W. into a ravine which leads to the James River. The left and centre of the Union lines rested on Malvern Hill, the right curved backward through a wooded country towards Haxall's, on the James. The plateau itself is well cleared of timber, with several converging roads running over it. The left wing of the Union army, being most exposed to attack, was strengthened by massing the troops here, and disposing the artillery so that a fire of sixty pieces could bear upon its front and left; several siege-guns were also got into position on the highest part of the hill. Towards 3 P. M. (July 1) the battle was commenced in earnest by the Confederates, who opened a heavy fire of artillery along the right of their lines, followed by an assault of infantry, which fell upon Couch's division, by whom it was repulsed in disorder, the Federal lines advancing some 800 yards, and during which time a very effective fire was maintained by the Federal artillery. The attack was renewed by the Confederates about 6, with the whole strength of their artillery, upon the left of the Union lines, held by the divisions of Porter and Couch, followed at once by columns of infantry to carry the hill. Under cover of the woods column after column formed and started out at a run across the intervening opening, but were met in every case with an overwhelming fire from the batteries and infantry, and repelled with great loss, the desperate efforts of the Confederates being vainly continued until darkness put an end to the battle; the fire of the Union batteries did not cease until 9 P. M. During this battle the navy, under Com. Rodgers, maintained a constant and annoying fire of shells. Although the result of the battle was a decided victory, Gen. McClellan continued his retreat to the James, the army arriving in great disorder at Harrison's Landing on the day and evening of July 3. The loss on the Union side exceeded 300 killed and 1800 wounded, the Confederate loss being more than double.

Malvern Junction, cap. of Hot Spring co., Ark. (see map of Arkansas, ref. 4–C, for location of county). Pop. not in census of 1880.

Mamar'oneck, Westchester co., N. Y. (see map of New York, ref. 8–J, for location of county), on New York and New Haven R. R., and on L. I. Sound, 22 miles N. E. of New York. Pop. of tp. in 1870, 1483; in 1880, 1863.

Mame'li (GOFFREDO), surnamed "the Italian Körner," b. at Genoa in 1826, was the son of an admiral; d. in 1849 on the walls of Rome, bravely fighting against the French. His patriotic hymn, beginning with "Fratelli d'Italia," was the true Marseillaise of Italy during 1848 and 1849. Mazzini, who loved the young hero tenderly, has left this sketch of him: "Mameli was beautiful and graceful in person, of a very fair and ruddy complexion, with hair inclining to blonde. His eyes were flashing and full of command, and his expression, naturally sweet, became stern and determined whenever his mind was resolutely bent to accomplish an object."

Mamelu'co [Sp.], in parts of South America, the offspring of a negro father and an Indian mother; called also *Cariboco* and *Zambo*.

Mam'elukes [Arab. *mamlûk*, a "slave"], a former class of slaves in Egypt, who became and long remained the dominant people of that country. The Mamelukes are mentioned before 950 A. D. In the twelfth century the sultan of Egypt bought of Genghis Khan 12,000 Circassian, Mingrelian, Tartar, and Turkish slaves. Soon after 1240, Malek Sulah made them his body-guard. In 1250 they killed Turan Shah and became masters of Egypt. Ibeg was the first sultan of the first (Baharite) or Tartar-Mameluke dynasty, which gave place in 1382 to the Borjite or Circassian-Mameluke dynasty. In 1517, Selim I. deprived them of the sultanate, but they retained much power, and gradually regained the virtual government of the country. The battle of the Pyramids (1798) demonstrated their excellence as cavalry soldiers, but almost annihilated them; and in 1811 the greater part of their number were massacred by Mehemet Ali. A small remnant escaped, and for a few years maintained themselves at New Dongola. The Mamelukes kept up their numbers by the purchase of Circassian and Georgian slaves. Their wives, of the same stock, and also acquired by purchase, usually proved childless in the untoward climate of Egypt. Their inheritance was therefore usually from master to slave, instead of from father to son. The Egyptian-born Mamelukes were, as a rule, feeble and short-lived, and generally childless. The Mamelukes of New Dongola were exterminated in 1820.

Mamers', town of France, department of Sarthe, has manufactures of linens, calicoes, serges, etc. Pop. 6070.

Mamia'ni (TERENZIO), COUNT, b. at Pesaro in 1800; educated in Rome by the Jesuits, and became in 1831 a member of the revolutionary provisional government of Bologna. Being afterwards proscribed, he was captured by an Austrian vessel in the waters of Ancona, was conducted to Venice, where he was kept a prisoner four months, and then allowed to retire to France. He remained at Paris, devoting himself to philosophical and literary studies until 1847. In 1848, Pius IX. named him minister of the interior, and after the death of Pelegrino Rossi he assumed, temporarily, the duties of minister of foreign affairs. Having been elected deputy to the Roman constituent assembly, Mamiani voted against the republic. On the arrival of the French he retired to Genoa, where he founded the Academia di Filosofia Italica. In 1859 he was elected deputy to Parliament, and afterwards appointed senator. In 1860 he became minister of public instruction, occupying at the same time the chair of philosophy and of history in the University of Turin. Afterwards he was sent as minister from Italy to city of Athens. He presided in Rome over the superior council of public instruction and edited a philosophical review. His principal writings (besides a volume of poems, in which the sacred hymns are particularly noteworthy) are the following philosophical works: *Rinnovamento della Filosofia Antica Italiana* (Paris, 1834), *Dialoghi di Scienza* (Paris, 1848), *Le Confessioni di un Metafisico* (Florence, Barbera), *Le Meditazioni Cartesiane* (Florence, Barbera), *D'un nuovo Diritto Europeo* (Turin, 1859). D. May, 1885.

Mammalia. See MAMMALS.

Mammal'ogy [a hybrid word, compounded by ellipsis from *Mammalia* (see MAMMALS) and λόγος], or **Theriol'ogy** [from the Greek θηρίον, "animal," and λόγος, a "discourse"], that branch of zoology which treats of the mammals. The word "mammal" is of comparatively recent coinage, and was the outcome of the scientific recognition of the organic similarity of the several forms comprised under that name.

The close relations of those several types were not appreciated by the older naturalists. It has often, indeed, been asserted that Aristotle fully recognized the class with its present limits under the name *zootoka*, but this statement is quite erroneous, inasmuch as Aristotle by the term zootoka simply meant to include all those vertebrates which are viviparous, including thus, besides the mammals, certain reptiles and fishes. In fact, he widely separated the terrestrial and quadruped mammals from the aquatic and fishlike forms: in his second book he enumerated (1) man, (2) quadrupeds, (3) birds, (4) fishes (including selachians), (5) whales, (6) serpents, and (7) the crocodile, in the sequence indicated; and this seems to have expressed, as nearly as may be, his vague ideas as to their relations. The statements frequently made respecting his classification of the mammals are equally baseless, and it is evident that he simply intended to describe the superficial prominent characteristics of the groups which he is credited as having recognized. The successors of Aristotle and the naturalists of the Middle Ages, as well as those that flourished up to the seventeenth century, were equally devoid of any scientific ideas respecting the class.

In 1693, John Ray, an English clergyman, published a work [*] which contains the best attempt at classification that had been up to that time proposed. In this attempt he dichotomously divided the viviparous quadrupeds—(1) into (*a*) Ungulata, including most of the true ungulates, and (*b*) Unguiculata, including all the others, as well as the camels, which are true ungulates, and the elephants, which have the essential characteristics of ungulates; (2) the Unguiculata were divided into (*a*) those whose feet were bifid, including the camels, and (*b*) those whose feet were multifid; (3) the latter were subdivided into (*a*) those with undivided digits, as the elephant, and (*b*) those with separate digits, as in all others; (4) the latter were again distinguished into (*a*) those with flat nails, as the apes, and (*b*) those with compressed claws, as in the remaining species; (5) these last into those with several incisors, as in most, or with two incisors in each jaw, as in rodents; (6) finally, the first section was divided according to size, (*a*) the larger species (Felidæ and Canidæ) being grouped together on the one hand, and (*b*) the smaller (Mustelidæ) on the other. This will suffice to show the inaptness of the classification.

Linnæus, in the early editions of his *Systema Naturæ*, adopted the prevalent ideas of classification, and accepted the name Quadrupedia for the four-footed mammals, and confounded the mutilate or fish-like types with the true fishes. In those early editions he divided the Quadrupedia into orders distinguished chiefly by their dentition and feet; these were (1) Anthropomorpha, (2) Feræ (afterwards divided into Feræ and Agriæ), (3) Glires, (4) Jumenta, and (5) Pecora. In the tenth edition,[†] published in 1766, he for the first time combined together in one class the quadruped and mutilate mammals, and gave to this new group the name "Mammalia," in allusion to the development of the mammary glands in all the members of the class. This is the first great scientific advance that was made in the improvement of their classification. He then divided the class into seven orders—viz. (1) Primata, (2) Bruta, (3) Feræ, (4) Glires, (5) Pecora, (6) Bellua, and (7) Cete. Of these the first, second, third, and fourth were combined under the name Unguiculata, the fifth and sixth as Ungulata, and the seventh (Cete) was contrasted with the others under the name Mutica.

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[*] *Synopsis methodica Animalium Quadrupedum et serpentini Generis* (Londini, 1693).

[†] *Caroli Linnæi, etc., Systema Naturæ per Regna tria Naturæ, secundum classes, ordines, genera, species, etc.* (*editio decima, Holmiæ,* 1758).

It is, however, proper to recall that Brisson[*] in 1756 had recognized the intimate relationship of the viviparous quadrupeds and cetaceans, and had approximated them as allied but distinct classes. The class of quadrupeds was divided into eighteen orders, based upon various characters, the first to third being Bruta; the fourth to fifth, Pecora; the sixth to eleventh, Belluæ; the twelfth, Glires and Agriæ; the thirteenth and fourteenth, Primates; and the fifteenth and sixteenth Feræ, of the Linnæan arrangement; while the seventeenth was proposed for the genus Talpa, and the eighteenth for Philander (= Didelphis).

Passing over several authors who are generally referred to, but who are unworthy of special mention in this historical sketch, we come to Vicq d'Azyr. Inasmuch as he introduced groups with the terminations of families into the class; as many of these groups were approximately coequal with now recognized families; and as it doubtless influenced the subsequent course of mammalogy, his system for these reasons is worthy of detail. In 1792, in one of the series of volumes of the *Encyclopédie Méthodique*,[†] he published and adopted, in great part from Daubenton, the characteristics of his system; reversing the names *class* and *order*, he employed the latter for the higher group and the former for the subordinate ones. The mammals, exclusive of the cetaceans, were primarily divided into two orders—man (*l'homme*) and animals (*les animaux*). The order of animals or viviparous quadrupeds was divided into fifteen "classes" (*i. e.* orders)—viz.:

I. Pédimanes (Pedimani), with the genera Singes, Makis, Loricans, Tarsiens (Tarsii), and Boursons (Marsupiales).

II. Rongeurs (Rodentes), with the genera Sciuriens (Sciurii), Ecureuils volans (Sciuri volantes), Glirins (Glirini), Murins (Murini), Surmurins (Surmurini), Essorillés (Inauriti), Planiqueues (Planicaudati), Sauteurs (Saltatores), Double-dents (Duplici-dentes), Epineux (Spinosi).

III. Alie-pieds (Pteropodii).

IV. Taupins (Talpii).

V. Soriciens (Soricii).

VI. Edentés (Edentati), with the genera Paresseux (Pigri), Cuirassés (Loricati), Mangeurs de fourmis (Myrmecophagi), and Ecailleux (Squammei).

VII. Carnivores (Carnivori), with the genera Oursinins (Ursini), Mustelins (Mustelini), Ichneumons (Ichneumoni), Felins (Felini), Hyænins (Hyænini), Canins (Canini), and Loutrins (Lutrini).

VIII. Empêtrés (Involuti) with the genera Phocins (Phocini), Manatins (Manatini), and Rosmariens (Rosmarii).

IX. Chevaux-d'eau (Hippopotamii).

X. Elephantins (Elephantini).

XI. Tapiriens (Tapiri).

XII. Rhinocéros (Rhinoceri).

XIII. Porcins (Porcini).

XIV. Ruminans (Ruminantes), with the genera Branchus (Ramosi) and Cornus (Cornuti).

XV. Solipèdes (Solipedes).

It should be added that the nomenclature of the species is not binomial, the names being the current vernacular terms, or Gallicized, and the generic designations not being used in the singular number.

In 1811, Illiger, in his *Prodromus Systematis*,[‡] published a system which demands notice, inasmuch as it is always referred to in the histories of the science, and really contains some features of special interest. He fundamentally differed from his predecessors in the arrangement, dividing the class into 14 orders and 39 families, and was the first to distinguish orders and families with anything like the limits now understood in the class. His system in brief, with the orders and families, is as follows, the representation of the families by those now admitted being indicated in brackets when they are at all similar with natural groups:

ORDER I. Erecta, with family 1, Erecta [Hominidæ].

ORDER II. Pollicata, with families 2, Quadrumana [Anthropoidea]; 3, Prosimii [Lemuridæ]; 4, Macrotarsi [=Tarsiidæ + Lemuridæ galagininæ]; 5, Leptodactyla [Daubentoniidæ]; 6, Marsupialia.

ORDER III. Salientia, with family 7, Salientia [= Macropodidæ].

ORDER IV. Prensiculentia, with families 8, Macropoda; 9, Agilia; 10, Murina; 11, Cunicularia; 12, Palmipeda; 13, Aculeata; 14, Duplicidentati; 15, Subungulata.

ORDER V. Multungula, with families 16, Lamnunguia [= Hyracidæ]; 17, Proboscidea [= Elephantidæ]; 18, Nasicornia [= Rhinocertidæ]; 19, Obesa [= Hippopotamidæ]; 20, Nasuta [= Tapiridæ]; 21, Setigera [= Suidæ, etc.].

ORDER VI. Solidungula, with family 22, Solidungula [= Equidæ].

ORDER VII. Bisulca, with families 23, Tylopoda [=Camelidæ]; 24, Devexa [= Giraffidæ]; 25, Capreoli [= Cervidæ, etc.]; 26, Cavicornia [= Bovidæ].

ORDER VIII. Tardigrada, with family 27, Tardigrada [= Bradypodidæ, etc.].

ORDER IX. Effodentia, with families 28, Cingulata [= Dasypodidæ]; 29 Vermilinguia [= Myrmecophagidæ].

ORDER X. Reptantia, with family 30, Reptantia [= Monotremata].

ORDER XI. Volitantia, with families 31, Dermoptera [= Galeopithecidæ]; and 32, Cheiroptera.

ORDER XII. Falculata, with families 33, Subterranea [Insectivora vera]; 34, Plantigrada; 35, Sanguinaria; 36, Gracilia.

ORDER XIII. Pinnipedia, with family 37, Pinnipedia.

ORDER XIV. Natantia, with families 38, Sirenia; and 39, Cete.

No natural groups, except such as are superficially defined, were recognized in this classification, and the approximation, as well as severance, of forms did equal violence to true method. It will be noticed that he applied first the name "Marsupialia" to a group, but the little credit due him for this will be apparent when it is noticed that he associated the group so called by him in the same order with the monkeys, and distinct from the kangaroos. He is, however, entitled to the credit of having recognized and tolerably well defined a number of genera (over 40), for which he has coined euphonious names.

In 1798 and succeeding years Cuvier worked on the classification of the mammals; and in 1816,[§] in the first edition of his *Règne animal*, recognized eight orders, with families and tribes—viz. (1) les Bimanes, ou l'homme; (2) les Quadrumanes; (3) les Carnassiers, with four families (1, les Cheiroptères, 2, les Insectivores, 3, les Carnivores—this with three tribes, les Plantigrades, les Digitigrades, and les Amphibies—and 4, les Marsupiaux, ou animaux à bourse); (4) les Rongeurs; (5) les Edentés, with three tribes (les Tardigrades, les Edentés ordinaires, and les Monotrèmes); (6) les Pachydermes, with three families (les Proboscidiens, les Pachydermes ordinaires, and les Solipèdes); (7) les Ruminans (Pecora, L.); and (8) les Cétacés, with two families (les Cétacés herbivores and les Cétacés ordinaires). It will be thus seen that the groups called "families" by Cuvier are very different from those designated by the same term by modern naturalists, and that they rather correspond, in extent, to sub-orders. There is little that indicates improvement in this classification, save the recognition of the marsupials as a natural group; and even this group is inadequately valued. The separation of man from the Primates is a backward step we should scarcely expect in so able an anatomist. In 1829, in the second edition of the *Règne animal*, he raised the "Marsupiaux" to the rank of an order interposed between the "Carnassiers" and "Rongeurs."

A far superior classification was that which appeared (also in 1816) from the pen of De Blainville,[‖] the celebrated antagonist of Cuvier. This naturalist recognized a number of types around which he congregated the various forms of animals. The mammals were primarily separated into two sub-classes: (1) Monodelphes and (2) Didelphes, but it was suggested that the latter should be subdivided, and that the Echidnas, etc. should form a distinct sub-class—a suggestion that was afterwards carried out by himself. In brief, his classification was as follows:

SOUS-CLASSE I. Monodelphes.
  I^{er} degré d'organisation, ou ordre. Quadrumanes?
    Normaux: Singes du continent ancien = Pitheci, les Singes; Singes du continent nouveau = Pitheciæ, les Sapajous; Makis = Pithecoides, viz. les Makis, les Loris, l'Aye-Aye.
    Anomaux: Pour le vol, Galeopithèques; pour grimper, Tardegrades.
  II^{e} degré d'organisation, ou ordre. Les Carnassiers?
    Normaux: Plantigrades = Omnivores; Digitigrades = Carnivores; Insectivores.
    Anomaux: Pour volor, les Cheiroptères; pour fouir, les Taupes; pour nager, les Phoques.
  III^{e} degré d'organisation, ou ordre. Les *Édentés?*
    Normaux = *Édentés;* Anomaux = Pour nager, Cétacés.
  IV^{e} degré d'organisation, ou ordre. Les Rongeurs? ou Célérigrades, Grimpeurs, Fouisseurs, Coureurs, Marcheurs.
  V^{e} degré d'organisation, ou ordre. Les Gravigrades = Elephans.

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[*] *Le Règne animal divisé en IX. classes, etc.* (Paris, 1756).

[†] *Système anatomique: Quadrupèdes* (Paris, 1792), *Encyclopédie Méthodique.*

[‡] *Prodromus Systematis Mammalium et Avium, etc.* (Berolini, 1811).

[§] *Le Règne animal, distribuée d'après son Organisation, etc.* (Paris, 1817, t. i.).

[‖] *Prodrome d'une nouvelle Distribution systematique du Règne animal*, in *Bull. Scienc. Soc. Philom.* (1816, pp. 105–124).

VI° degré d'organisation, ou ordre. Les Ongulogrades.
Normaux : Doigts impairs = Pachidermes et Solipèdes ; Doigts pairs = Brutis ou non Ruminans, et Ruminans.
Anomaux : Pour nager. Les Lamantins.
Sous-classe II. Didelphes.
Normaux : Carnassiers, Rongeurs.
Anomaux : Pour fouir, l'Échidné ; pour nager, l'Ornithorinque.

Besides the improvement evinced in the separation of the class into the primary categories, special attention is called to the classification of the hoofed mammals, and the recognition of the elephants as one distinct order, and the typical ungulates as another (marred, however, by the inclusion of the sirenians). The order "Ongulogrades" was also very naturally subdivided. A less trustworthy, and indeed vicious, innovation was the inclusion of the true edentates and cetaceans in one order, but it was suggested that they should be differentiated as distinct orders. On the whole, this classification exhibits a more decided advance than any since the foundation of the class by Linnæus.

In 1821, J. E. Gray published a new scheme of classification of the mammals,[*] distinguished by many eccentricities, and unworthy of mention but for the fact that he, for the first time, introduced the names of most of the families in current use; he evidently adopted, but without credit, the suggestion of William Kirby, made in 1811, to introduce a regular system of families, with terminations in "*-idæ*," in the zoological system. This article, notwithstanding its historical importance, has been almost overlooked on account of its mode of publication. The families, when superficially well distinguished, are often natural, but unless their characters are very obvious, the author almost always erred in his restrictions and applications of the groups. The following synopsis gives the names of the families, with the abundant errors observable in the orthography of the original, and will serve as a starting-point for the modern nomenclature:

Class I. Bimanes.

Ord. 1, Primates.

Class II. Quadrumanes.

Ord. 1, Platyonychæ, with families 1, Pithecidæ ; 2, Cercopithecidæ ; 3, Callitricidæ.

Ord. 2, Gampstonychæ, with family 1, Harpaladæ.

Ord. 3, Heteronychæ, with families 1, Lemuridæ, and 2, Loridæ.

Class III. Cheiroptera.

Ord. 1, Fructivoræ, with families 1, Pteropodidæ, and 2, Cephalotidæ.

Ord. 2, Insectivoræ, with families 1, Noctilionidæ, and 2, Vespertilionidæ.

Class IV. Quadripedes.—*Sub-class* 1, *Unguiculata.*

Ord. 1, Pterophoræ, with family 1, Galeopithecidæ.

Ord. 2, Plantigradæ, with families 1, Erinacidæ ; 2, Soricidæ ; 3, Myaladæ ; 4, Tenrecidæ ; 5, Ursinidæ.

Ord. 3, Digitigradæ, with families 1, Mustelladæ ; 2, Canidæ ; 3, Viveridæ ; 4, Hyænadæ, and 5, Felidæ.

Ord. 4, Amphibiæ, with families 1, Phocadæ ; 2, Trichecidæ.

Ord. 5, Rosores, with families 1, Castoridæ ; 2, Arvicolidæ ; *2*, Myosidæ ; 4, Dipsidæ ; 5, Muridæ ; 6, Spalacidæ ; 7, Halamydæ ; 8, Arctomydæ ; 9, Sciuridæ ; 10, Histricidæ ; 11, Leporidæ ; 12, Caviadæ ; and 13, Agoutidæ.

Ord. 6, Tardigradæ, with family 1, Bradypidæ.

Ord. 7, Oligodontæ, with families 1, Megatheriadæ ; 2, Dasipidæ ; and 3, Orycteropidæ.

Ord. 8, Edentulæ, with family Manidæ.

Class IV. Quadripedes.—*Sub-class* 2, *Ungulata.*

Ord. 9, Proboscidiæ, with families 1, Elephantidæ, and 2, Mastodonadæ.

Ord. 10, Tesserachenæ, with families 1, Hippopotamidæ ; 2, Suidæ ; and 3, Anoplotheriadæ.

Ord. 11, Trichenæ, with families 1, Rhynocerotidæ ; 2, Hyracidæ ; and 3, Taperidæ.

Ord. 12, Monochenæ, with family 1, Equidæ.

Ord. *12*, Hydrophoræ, with family Camelidæ.

Ord. 13, Ruminantes, with families 1, Moschidæ ; 2, Cervidæ ; 4, Giraffidæ ; *4*, Antilopidæ ; 5, Capridæ, and 6, Bovidæ.

Class V. Pedimanes.

Ord. 1, Feræ, with families 1, Didelphidæ ; 2, Phalangistadæ.

Ord. 2, Brutæ, with families 1, Potoridæ ; 2, Macropidæ ; and 3, Koladæ.

Ord. 3, Glires, with family Phascolomidæ.

Ord. 4, Rosores, with family 1, Cheiromydæ.

Class VI. Cetacæ.

Ord. 1, Herbivoræ, with families 1, Manatidæ ; 2, Dugongidæ.

Ord. 2, Carnivoræ, with families 1, Delphinidæ ; 2, Monodontidæ ; 3, Physeteridæ ; 4, Balanadæ.

In 1825, Gray, entirely casting aside his previous classification, proposed a new one, radically different.[†] The explanation of this may be found in the fact that William Sharp MacLeay had originated a fantastic theory—that the entire animal kingdom was divided in a definite number of successive groups *ad infinitum;* that these groups were always five of a kind ; each completing a circle of its own ; and each with five constituents, representing, in an analogous manner, the five constituents of each of the other groups. Baseless as such an idea was, and strange as it may appear, it was widely accepted in England, and perhaps the majority of English naturalists gave their adherence to the wild chimera. Among these, to a limited extent, was Mr. Gray, who then divided the class of mammals into five orders, and those genera into five (or in one case six) families, etc. His classification in brief was as follows :

Order I. Primates, with families 1, Hominidæ ; 2, Simiadæ ; 3, Cebidæ ; 4, Lemuridæ ; 5, Galeopithecidæ ; 6, Vespertilionidæ (with sub-families *a*, Phyllostomina, *b*, Rhinolophina, *c*, Vespertilionina, *d*, Noctilonina, *e*, Pteropina).

Order II. Feræ, with families 1, Felidæ (with sub-families *a*, Felina, *b*. Hyænina, *c*, Viverrina, *d*, Canina, *e*, Mustelina) ; 2, Ursidæ (with sub-families *a*, Ursina, *b*, Procyonina, *c*, Cercoleptina, *d*, Ailurina) ; 3, Talpidæ (with sub-families *a*, Talpina, *b*, Chrysochlorina, *c*, Tupaina, *d*, Erinacina, *e*, Centetina) ; 4, Macropidæ (with sub-families *a*, Phalangistina, *b*, Macropina, *c*, Peramelina, *d*, Dasyurina, *e*, Didelphina) ; 5, Phocidæ (with sub-families *a*, Stenorynchina, *b*, Phocina, *c*, Trichecina, *d*, Cystophorina, *e*, Otariarina).

Order III. Cete, with families 1, Balænidæ ; 2, Delphinidæ ; 3, Manatidæ ; 4, Halicoridæ ; 5, Rytinidæ.

Order IV. Glires, with families 1, Muridæ (with sub-families *a*, Murina, *b*, Arvicolina, *c*, Saccomyna, *d*, Castorina, *e*, Echimyma) ; 2, Hystricidæ (with sub-families *a*, Hystricina, *b*, Cercolabina, *c*, Dasyproctina, *d*, Hydrochœrina, *e*, Caviina) ; 3, Leporidæ ; 4, Jerboidæ (with sub-families *a*, Chinchillina, *b*, Pedetina, *c*, Dipina, *d*, Myoxina, *e*, Sciurina) ; and 5, Aspalacidæ.

Order V. Ungulata, with families 1, Bovidæ (with sub-families *a*, Bovina, *b*, Camelopardina, *c*, Camelina, *d*, Moschina, *e*, Cervina) ; 2, Equidæ ; 3, Elephantidæ (with sub-families *a*, Elephantina, *b*, Tapirina, *c*, Suina, *d*, Rhinocerina, *e*, Hippopotamina) ; 4, Dasypidæ (with sub-families *a*, Manina, *b*, Dasypina, *c*, Orycteropina, *d*, Myrmecophagina, *e*, Ornithorhynchina) ; 5, Bradypidæ.

One reason for referring to this is that it is an unexaggerated type of a series of classifications that were proposed in England and on the Continent with a numerical basis. But it is also more especially worthy of note, because in it were for the first time introduced sub-families with the uniform termination "*-ina.*" As to the procrustean number, it is sufficient to state that probably no idea has done more to retard and interfere with true method than this. The classifications of Oken, MacLeay, Swainson, Kaup, Fitzinger, etc.—all accepting this idea of dominance of some number (3 or 5)—may therefore be passed over as unworthy of further mention.

In 1837,[‡] C. L. Bonaparte, prince of Musignano, availing himself of suggestions and information conveyed to him by Prof. Jourdan of the natural history museum of Lyons, proposed a remarkable arrangement of the mammals, dividing the class into two sub-classes: (1) Placentalia and (2) Ovovivipara. He distributed the placental mammals into orders characterized by the development of the brain. The first section, named *Educabilia*, was distinguished by the bi- or tri-lobate cerebrum, and included the orders Primates, Feræ, Pinnipedia, Cetacea, Belluæ, and Pecora; the second section, designated *Ineducabilia*, was characterized by the uni-lobate brain, and included the orders Bruta, Cheiroptera, Bestiæ [= Insectivora], and Glires. The sub-class Ovovivipara included the remaining orders, Marsupialia and Monotremata. The idea thus developed was a pregnant one, and destined to yield excellent fruit, although for a long time neglected. It was, perhaps, the most important improvement in general classification of the Mammalia subsequent to De Blainville's recognition of the primary divisions. The groups Educabilia and Ineducabilia are not only distinguished by the characters of the brain indicated, but others are coincident with them, and they being taken as a basis, all the groups fall in natural array to a much greater extent than when arranged under any other system.

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[*] *On the Natural Arrangement of Vertebrose Animals* (Part I. Mammalia), in *London Med. Rep.* (vol. xv., pp. 296–310, 1821).

[†] *An Outline of an Attempt at the Disposition of Mammalia into Tribes and Families, etc.*, in *Ann. Phil.* (vol. x., pp. 337–344, 1825).

[‡] *A New Systematic Arrangement of Vertebrated Animals* (1837) in *Trans. Linn. Soc. London* (vol. xviii., pp. 247–304, 1841).

A number of years afterwards, Prof. Richard Owen, a distinguished naturalist and palæontologist, promulgated *de novo* an essentially similar classification[*] but not on as good grounds, and less perfect than Jourdan's and Bonaparte's. He divided the mammals into four sub-classes, to which he assigned equal rank—viz. (1) *Archencephala*, characterized by the great development of the cerebrum and its deep gyri and sulci, for man alone; (2) *Gyrencephala*, including forms whose cerebrum was alleged to be less developed, but also provided generally with deep gyri and sulci, including the Quadrumana, Carnivora, Artiodactyla, Perissodactyla, Proboscidia, Toxodontia, Sirenia, and Cetacea; (3) *Lissencephala*, characterized by the much smaller cerebrum and its smooth surface, and including the orders Bruta, Cheiroptera, Insectivora, and Rodentia; and (4) *Lyencephala*, said to be distinguished from all the others by the want of a corpus callosum and the very small cerebrum, including Marsupialia and Monotremata. The characters alleged to distinguish these several classes are not constant, and therefore not diagnostic. The classification erred, too, in the equal rank assigned to the four primary divisions, and especially in the differentiation of the Archencephala and Gyrencephala. It was, however, for some time quite generally adopted, and the superior one published by Bonaparte overlooked.

The combination of the primary groups or sub-classes, established by De Blainville, Huxley, etc., with the subdivisions of the monodelph or placental mammals, suggested by Jourdan and Bonaparte, has recommended itself to several recent authors, and is adopted in the article on Mammals (which see).

Sir Everard Home, in 1823, in the third volume of his *Lectures on Comparative Anatomy* (pp. 470–472), noticed some of the modifications of the placenta in mammals, and suggested their employment in classification, but his own use of these means was too imperfect to deserve mention.

In 1828, however, K. E. von Baer gave the principal modifications exhibited by the mammals in this respect in a tabular form in a very intelligent manner, thus:

Mammalia with an umbilical cord.
  α. Which disappears early;
    1°. Without connection with the mother: Monotremata.
    2°. After a short connection with the mother: Marsupialia.
  β. Which is longer persistent;
    1°. The yolk-sac continues to grow for a long time.
      The allantois grows little: Rodentia.
      The allantois grows moderately: Insectivora.
      The allantois grows much: Carnivora.
    2°. The yolk-sac increases slightly.
      The allantois grows little; umbilical cord very long: Monkeys and man.
      The allantois continues to grow for a long time; placenta in simple masses: Ruminants.
      The allantois continues to grow for a long time; placenta spreading: Pachyderms and Cetacea.

He also exhibited the modifications of the placenta under the following form:

The fœtal placenta consists everywhere of the same elements, but offers the most remarkable differences in its external disposition. It is

Either (1) merely applied to the maternal placenta [= Non-deciduata, Huxley], and
  (*a*) continuous and zone-like: first form.
  (*b*) divided into many parts: second form.
Or (2) it and the maternal placenta grow together [Deciduata, Huxley], and they lie
  (*a*) in a zone round the egg: third form [= Zonoplacentalia].
  (*b*) at one end of it: fourth form [= Discoplacentalia].

This placental system was subsequently developed in greater detail by Eschricht, Milne-Edwards, Gervais, Vogt, and especially Huxley; the latter in his most recent works has differentiated the mammals into the following primary groups: (1) sub-class Ornithodelphia, with the order Monotremata; (2) sub-class Didelphia, with the order Marsupialia; and (3) sub-class Monodelphia. The Monodelphia are first discriminated into (*a*) those with median incisor teeth developed (Edentata), and (*b*) those with median incisor teeth developed, and the latter into (1) *Non-deciduata*, including the orders Ungulata, Toxodontia, Sirenia, and Cetacea; and (2*a*) *Deciduata with a zonary placenta* (Hyracoidea, Proboscidea, and Carnivora), and (2*b*) *Deciduata with a discoidal placenta* (Rodentia, Insectivora, Cheiroptera, and Primates). This classification has met with great favor in recent times.

While the general system was being thus perfected, numerous monographers and specialists made known new species from various parts of the world, and the number of described representatives of the class was rapidly increased; thus, Linnæus at most (1756, etc.) recognized but about 230 living species; Brisson in 1756 admitted 275; Pennant in 1771, 412; Erxleben in 1777, 345; Boddært in 1788, 344; Buffon and his continuators in 1769–85, 333; Gmelin in 1789, 440; Desmarest in 1820–22, 622; Temminck in 1827, 860; and Fischer in 1829–30, 1126 good and 220 doubtful species. There are now recognized about 2250 species, but many of these are doubtless at most geographical races or varieties.

Numerous extinct forms have also been made known and incorporated into the mammalian system. The earliest scientific introduction of extinct forms is due to Cuvier, who exhumed and restored the remains of numerous remarkable species from the Tertiary beds near the city of Paris. Successive palæontologists have largely added to the number; and in this country Harlan, Cooper, Wyman, Warren, and especially, in later times, Leidy, Cope, and Marsh, have described many new and remarkable types.

Such have been the principal stages of progress towards the perfection of the classification of the mammals. The numerous improvements in the arrangement of subordinate groups cannot, of course, be enumerated. Suffice it to say, that the laborers have been numerous and effective; and chief of them have been Owen, Huxley, Flower, Mivart, Peters, Brandt, Gervais, Milne-Edwards, Gaudry, etc. The most recent literature respecting the groups and species may be found in the following: *A Manual of the Anatomy of Vertebrated Animals*, by Thomas H. Huxley (1872); *An Introduction to the Osteology of the Mammalia*, by William Henry Flower (1870); *Histoire naturelle des Mammifères*, par M. Paul Gervais (1854–55, 2 vols.); *Arrangement of the Families of Mammals*, by Theodore Gill (1872); *Catalogue of Monkeys, Lemurs, and Fruit-eating Bats in the Collection of the British Museum*, by Dr. J. E. Gray (1870); *Catalogue of Carnivorous, Pachydermatous, and Edentate Mammalia in the British Museum*, by Dr. J. E. Gray (1869); *Catalogue of Ruminant Mammalia* (Pecora, *Linnæus*) *in the British Museum*, by Dr. J. E. Gray (1872); *Hand-list of the Edentate, Thick-skinned, and Ruminant Mammals in the British Museum*, by Dr. J. E. Gray (1873); *Catalogue of Seals and Whales in the British Museum*, by Dr. J. E. Gray (1866), and *Supplement to the Catalogue of Seals and Whales in the British Museum*, by Dr. J. E. Gray (1871); *Hand-list of Seals, Morses, Sea-lions, and Sea-bears in the British Museum*, by Dr. J. E. Gray (1874). The several volumes by Dr. Gray will be found useful for the notices of species of the respective groups and references to other publications, but they require to be consulted with extreme caution, and their classification must be completely ignored. For American mammals the chief recent authorities are Baird (*Mammals of North America*, 1859), Harrison Allen, J. A. Allen, Cope, and Coues. The extinct North American species have been almost exclusively described, in recent times, by Leidy, Cope, and Marsh. Theo. Gill.

Mam′mals [Lat. *mamma*, "teat"] are the first and highest class of the vertebrate branch of the animal kingdom, and include all the vertebrates with a quadrilocular heart, warm blood, the lower jaw composed of simple rami and articulated directly with the skull, and the body covered wholly or partially with hair. It thus includes man, as well as all the hairy quadrupeds, and the cetaceans (whales, porpoises, etc.) and sirenians (manatee, etc.). Notwithstanding the great external differences manifested in the several types thus embraced, the group is perhaps the best defined and most exclusively limited of any of the polymorphic classes of the animal kingdom. The chief characteristics (excluding all but such as have acknowledged systematic significance) are as follows:

Tegumentary System.—Hair is a characteristic feature of the mammals, and, although approximated by the feathers of some birds, is developed as such in no other class. It is found in more or less abundance in all mammals; only in the embryos of whales, and in them only in the upper lip; over the greater portion of the skin in all others. Sometimes, however, the hairs assume the strength of spines. In a few forms, also, the body is covered with a regular case, as in the armadillos, and the extinct Hoplophoridæ had a shell resembling that of a turtle; some also (Manididæ) have scale-like appendages.

Osseous System.—The skeleton is always completely developed, and is quite constant in the number and relations of the constituent parts in comparison with the lower vertebrates, exclusive of the birds.

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[*] *On the Characters, Principles of Division, and Primary Groups of the class Mammalia*, in *Journ. Proc. Linn. Soc. London* (vol. ii. pp. 1–37, 1858).

The vertebral column is divided into five distinct regions—viz. (1) the cervical, containing always seven vertebræ, except in *Trichechus* (*Manatus*) and *Cholœpus Hoffmannii*, which have each six, and the three-toed sloths (*Bradypus*), which have nine; (2) the dorsal vertebræ, quite variable in number, to which the ribs are attached; (3) the lumbar vertebræ; (4) the sacral vertebræ, connected with the sacral bones of the pelvis; and (5) the caudal vertebræ, which vary greatly in number. These grade into each other, and in the cetaceans and sirenians, in which the pelvis is wanting or aborted, the posterior regions are practically undistinguishable. In the cervical series the first and second vertebræ are decidedly differentiated, as (1) the "atlas" and (2) the "axis."

The skull is very characteristic, and may be divided into four parts: (1) the cranium, (2) the lower jaw, (3) the auditory ossicles, and (4) the hyoidean apparatus. It may be regarded as the anterior continuation of the vertebral column.

(1) The cranium is most uniform in all the types at the posterior part, and deviates most at the distal and peripheral parts. The hindmost segment has an axial element (the *basioccipital*), with which, on the respective sides, are connected two lateral ones (the *exoccipital*), chiefly bearing the condyles for the articulation of the "backbone;" and these are connected above by a keystone element (the *supraoccipital*): these four elements, always separately developed in early life, in some of the lower forms (*e. g.* marsupials) are persistent as separate bones throughout life, but in the higher forms early coalesce into a single bone, the OCCIPITAL; they all bound the aperture through which the nervous system enters the skull, the "foramen magnum." On the axial line, in front of the basioccipital, also an unpaired bone, is the *basisphenoid;* with the upper sides of this are connected dilated wing-like elements, one on each side (the *alisphenoids*); with the anterior surfaces another axial element (the *presphenoid*) articulates; and with the upper margins of this and the anterior of the alisphenoid two lateral elements (the *orbitosphenoid*) are connected; finally, with the inferior surface of the previous axial bones, as well as with processes of the alisphenoids, is connected a median vertical element (the *pterygoid*): these several elements (*i. e.* basisphenoid, alisphenoid, presphenoid, orbitosphenoid, and pterygoid) are in various degrees combined, all being united in the higher animals, including man, in a single bone—the SPHENOID: this itself, in its axial portion, finally coalesces behind with the occipital. The roof of the skull is formed, in front of the supraoccipital element, first, by two bones (the *parietal*), which are chiefly connected by their lateral margins with the alisphenoid elements, and these are followed forward by two other bones (the *frontal*), connected below with the orbitosphenoid elements; in front are the *nasal*. The foremost axial bone is the *mesethmoid*, which together with two lateral ones (the *ethmoturbinal* and *maxilloturbinal*) form the compound ETHMOID. All the bones thus far enumerated, or at least the combinations, concur together and with the periotic bones (hereinafter mentioned) to form the cerebral chamber or calvarium. The olfactory chamber is in advance; its floor, and partly its sides, are constituted in front by the *intermaxillary* and *supramaxillary* bones, and behind by the *palatine;* its roof by the *nasal* and in part the *frontal* bones. Lodged between the frontal, supramaxillary, and palatine bones is one which enters into the front margin of the orbit, is in most a thin laminar bone, and, being generally provided with a canal for the lachrymal gland, is called the *lachrymal* bone. The periotic bones, already referred to, are interposed between the occipital, parietal, and sphenoid ones, and are represented, it is alleged, in the embryo by three centres of ossification: these, however, very soon unite and form a single bone (the *periotic*), which includes the labyrinth of the inner ear; the antero-internal portion of this forms the so-called "petrous" portion, and the postero-internal the "mastoid" portion. With this bone is connected, and often ankylosed (as in man), a scale-like bone called the "*squamosal*," which emits from its anterior borders the zygomatic process to meet the malar or cheek bone; from the inferior portion is developed the *tympanic* bone, which forms the auditory bulla so ordinarily developed in mammals. These several elements frequently coalesce and form a compound TEMPORAL bone.

(2) The lower jaw is composed of two simple rami (*mandibles*), connected together at the symphysis, and each has a more or less convex condyle by which it articulates with a "glenoid cavity" at the base of the zygomatic process of the squamosal bone. In this simplicity of the rami and direct articulation with the skull the mammals differ widely from all other vertebrates.

A bar-like bone (*malar* or *jugal*) generally connects the zygomatic processes of the squamosal and frontal bones, but is frequently absent, as in many Insectivores, Edentates, and Cetaceans.

The next two series of bones are the results of ossifications of the Meckelian (3) and hyoidean (4) cartilages.

(3) In a chambered space formed by the periotic bones—the tympanic cavity—are three ossicles or small bones devoted entirely to the organ of hearing; these are the (1) malleus, (2) incus, and (3) stapes; the names recall their shapes. (1) The *malleus* is hammer-like; the handle connected with the tympanic membrane and the head articulated with the incus; it is homologous with the quadrate bone of the other vertebrates; (2) the *incus* is anvil-shaped, or like a human molar tooth, situated in the upper and posterior part of the tympanic cavity, and corresponds with the supra-stapedial element of other vertebrates; (3) the *stapes* is stirrup-shaped, the lowest down in the tympanic cavity, and answers to a corresponding ossicle in birds and reptiles. (See Huxley in *Proc. Zool. Soc. of London* for 1869, pp. 391–407.) A fourth ossicle, frequently developed, and called orbiculare or lenticulare, is simply a separate element of the incus. The malleus and incus are peculiarly characteristic of the mammals.

(4) The hyoidean apparatus must also be regarded as an appendage to the skull, although chiefly subservient to the respiratory apparatus: it is composed of two pairs (anterior and posterior) of "cornua." The anterior is connected with the periotic bone, and each cornu, although sometimes with a single proximal cartilage or bone, has generally three long bones—a proximal ("*stylohyal*"), middle ("*epihyal*"), and distal one ("*ceratohyal*"); the last are connected with a cross-piece (the "*basihyal*"), and from the sides of this diverge backward the posterior cornua ("*thyrohyal*"), which are directly united with the thyroid cartilage of the larynx.

The skull undergoes considerable change in development from the low forms to the high ones, as well as with age. In the lower types the segmented or quasi-vertebrated character is much more evident, and is in correlation with the development of the brain, whose several parts are more nearly on a longitudinal axis. In the progress from the low to the high forms the several regions of the brain become concentrated and subordinated to the cerebrum. The skull follows, and in man the cerebral cavity forms the largest portion. In the lower forms the brain, and consequently the cerebral cavity, increases but little, if any, after birth; the subsequent growth being chiefly due to the development of ridges for muscular insertion, air-cells, and the extension of the jaw-bones. The brain also differs comparatively little in size in the members of a natural family, although the skulls may vary greatly: the differences as to the skulls between large and small animals are due chiefly to the outgrowth of bone. The skull is also modified to adapt the animal to its surroundings, and consequently in the aquatic forms, as the cetaceans, it is excessively modified.

With the anterior ribs at least, at their distal ends, are connected a chain of median bones or cartilages designated by the common name of *sternum*. This apparatus is very variable in its development. In the most primitive mammal type (the Monotremes) it is composed of a chain of bones (forming the *mesosternum*), of which (1) several are small; (2) one at the fore-end is enlarged (*presternum*); (3) in front of this is a small central piece (the *proosteon*); and (4) enclosing and foremost of all is a peculiar large T-shaped bone (*interclavicle* or *episternum*), whose forward border is connected with the clavicles lengthwise. This episternum is wanting in all other forms. In all normal types the sternum is represented by (1) an anterior piece (*presternum*); (2) a series of succeeding bones (the *mesosternum*); and (3) a posterior piece (the *xiphisternum*). These are alike developed in the lowest (marsupials) and the highest (man), but by ossification and various combinations later in life the sternum sometimes loses this character, as in man, and in the sirenians and cetaceans it is extremely modified.

The members are specialized upon a common principle, although they may be externally very much modified, and adapted for walking with the hind pair and manipulation with the fore, as in man; for quadrupedal progression, as in ordinary mammals; for flying, as in bats; or for swimming, as in sirenians and cetaceans. The terrestrial forms have always four members; the aquatic frequently only two, the posterior being greatly atrophied or entirely wanting. The anterior members have each successively (1) a single long proximal bone (*humerus*); (2) two following long and parallel ones (*radius* and *ulna*); (3) a group of two rows of small (most frequently 8 or 9) wrist (*carpal*) bones, varying much, however, among themselves by reason of different modes of coalescence, but always differentiated from the fore arm as well as palm-bones; (4) a row of longish *metacarpal* or palm-bones; and (5) three rows of *pha-*

langes or digital bones in variable numbers, the normal number of carpal and phalangeal bones or series (5) being often much abridged by the suppression of the lateral elements.

With the humerus is connected a single flattened bone (the *scapula*) at the sides or back of the thoracic cavity. Between a process of the proximal end of the scapula (the acromion) and an angle of the xiphisternum a long bar-like bone is generally developed (the *clavicle*), but is, however, frequently wanting; *e. g.* in many Carnivores, all Ungulates, one Insectivore, some Rodents, etc.

Apposed to the sacral bones, and indeed distinguishing them as such, are two compound bones (the *innominata*), which, together with the sacrum, form the pelvis. Each innominate bone is composed of three elements—(1) a proximal bone (the *ilium*), obliquely inserted on the processes of the sacral vertebræ, and (2–3) two distal bones parallel with each other, and connected together at their extremities, but leaving between them a space (the thyroid or obturator foramen) occupied only by membrane; (2) the dorsal or posterior of these pieces is the *ischium*, and (3) the lower or anterior one is the *pubis*. At the junction of the three bones is the acetabulum, or socket for the head of the femur or proximal joint of the hind leg.

The hind legs are composed of bones similar to those of the fore limb—viz. (1) a proximal long bone or *femur;* (2) two succeeding long bones, the *tibia* and *fibula;* (3) two rows of small bones, the *tarsal*, interlocking among themselves, and completely differentiated from the leg as well as metatarsal bones; (4) several parallel moderately long ones (the *metatarsal*); and (5) several parallel rows of small-longish ones, the *phalanges*, three or two in each row. These last, like the corresponding bones of the fore limbs, are normally in five parallel rows, but there is a tendency to the atrophy or suppression of the lateral ones. A large sesamoid bone, the *patella* or kneepan, is also almost always developed in the tendon of the "rectus femoris" muscle, and caps the knee-joint, being connected with the femur as well as the tibia.

Finally, it should be added that there is much difference in the development of the long bones of the fore arm and corresponding segment of the hind limb, one being frequently atrophied, and both frequently uniting at their extremities.

Muscular System.—This is so variable that there are few generalizations that can be specified as applicable at once to all the mammals and to no other vertebrates. The modifications coincident with the variations in form and the development of the several parts are extreme. The muscles connected with the mandibulary apparatus and the ossicles of the ear may be regarded as among the most characteristic. The muscles have, however, furnished no characters for systematic purposes, except in the "*diaphragm*," which is a development peculiar to the mammals. This arises from "the eighth to the twelfth ribs by fasciculi which interdigitate with those of the 'transversalis abdominis' muscle," is convex headward, and separates the thoracic and abdominal cavities: in most mammals it is nearly transverse to the axis of the trunk, but in the cetaceans and sirenians is very oblique backward.

Nervous System.—The brain is highly developed; the cerebrum always larger than the cerebellum—much more so in the lower forms, and excessively preponderant in the higher ones (especially in man). While in the lower forms it leaves exposed the entire cerebellum, as well as the optic lobes and the olfactory ones, its increasing volume in the higher forms overlaps those parts, until finally in man all are covered from view from above. The hemispheres of the cerebrum are connected together (1) by an *anterior commissure*, and (2) by a great superior commissure, the *corpus callosum:* these are developed in inverse proportion, in the lower forms the anterior commissure being very large, while the corpus callosum is very small; in the higher forms the corpus callosum is greatly developed, while the anterior commissure is extremely reduced. The cerebral hemispheres in the smaller and inferior forms are nearly smooth, while in the larger and more highly organized ones they are deeply convoluted or provided with gyri and sulci. The most characteristic feature in the brain of mammals is the development of the corpus callosum.

Dental System.—Although when the teeth are developed they are quite characteristic of mammals in their mode of insertion, etc., they are not infrequently entirely wanting, as in the Tachyglossidæ, Manididæ, Myrmecophagidæ, and whalebone whales. They vary in others in number from one (in the narwhal) to nearly 200 (as in some porpoises). They may be all nearly uniform in appearance (as in the porpoises) or differentiated into several kinds (as is usually the case). They are indeed generally distinguished as incisors, canines, and molars, which last are further separated into premolars and true or postmolars. They are almost always implanted by roots in the jaws. They do not grow in size *pari passu* with the jaws, but the series are accommodated to the size of the animal in a peculiar way. In the typical diphyodont mammals (*i. e.* those forms which have two sets of teeth), shortly before or after birth a set of teeth becomes gradually evolved, but after the animal has well advanced in growth these are shed, and are succeeded by a second and final set of larger ones, and somewhat differing in other respects; and still later, in the back of the jaws, teeth come up where none had appeared before. Thus, in the human child the teeth in the first set are finally 20—viz. deciduous incisors $\frac{4}{4}$, deciduous canines $\frac{1}{1}$, deciduous molars $\frac{2}{2}$ on each side; in the adult these are replaced by 20, and 12 new ones are added—viz. second incisors $\frac{4}{4}$, second canines $\frac{1}{1}$, second premolars $\frac{2}{2}$, *permanent molars* $\frac{3}{3}$ on each side. In the marsupials a different system of growth prevails. The teeth are successively evolved, the lateral incisors and hindmost molars last, and when once cut and lost are not succeeded by others, save one in each jaw-bone. As expressed by Flower, "the tooth in which a vertical succession takes place is always the corresponding or homologous tooth, being the hindmost of the premolar series, which is preceded by a tooth having the characters, more or less strongly expressed, of a true molar." Although the names of the teeth have been derived from form or function (the incisors from their adaptation for cutting—*incido;* the canines from their likeness to the fangs of a dog—*canis;* and the molars from their millstone or grinding function), the application of names is determined by the position of the teeth; thus, the upper incisors are those in the intermaxillary bone, and the lower those opposite to them; the canines, those in the supramaxillary behind the suture with the intermaxillary, while those in the lower jaw project in front of the ones in the upper; the premolars are all those next behind which have had deciduous predecessors; and the molars those only which have had none. The form is no certain criterion, as incisors may be fang-like or like canines, and canines like incisors (as in all the ordinary ruminants). The variations in the number and character of the teeth furnish the most generally striking characters for the diagnoses of families and genera.

Alimentary System.—The alimentary canal and its appendages exhibit great variations, but the common characters contrasting with those of all other vertebrates are not evident, and have furnished no material to the systematist for the diagnosis of the class.

Circulatory System.—The blood has its red blood-corpuscules non-nucleated. The circulation is complete and closed, the stream being received and transmitted by the right half of the quadrilocular heart to the lungs for aëration, therein oxygenated and warmed, thence sent to the left side of the heart, and finally transmitted through the system. Thus, although resembling birds, mammals are distinguished from the reptiles and inferior vertebrates. The aorta is single and reflected over the left bronchus.

Respiratory System.—Respiration is effected in all cases, in aquatic as well as terrestrial forms, by inhalation of the air direct, and consequently by means of the lungs. These are, in common with the heart, in a special thoracic cavity, separated, as already indicated, from the abdominal cavity by the diaphragm. This diaphragm, by its alternate contraction and expansion, assists the lungs in their inhalation and expulsion of air. The windpipe or trachea bifurcates in its distal portion, and sends special branches to the respective lungs.

Reproductive System.—The male and female organs, although strictly homologous and in early embryonic life undistinguishable, become greatly differentiated in after life. In the female the chief organs are the ovaries, which by oviducts communicate directly with the uterus, and thereby with the vagina. The so-called clitoris is the homologue of the penis of the male, but is rarely (as in the lemurs and some Rodents and Insectivores) perforated by a urethral canal. In the male the testes (which are homologous with the ovaries), although in the lower types abdominal, in the higher descend into external "scrotal" pouches, and the penis is almost always external, and often pendulous and free. The eggs are in the lowest type of considerable size, but in the others extremely small. Impregnation is always effected internally. The fœtus in the lower type is not long carried in the mother's womb, but is born in a comparatively immature state, and attached to the teats by the mother; in the higher type it is nourished by means of a peculiar outgrowth in connection with the embryo and wall of the uterus (the *placenta*) in the womb, and when born is of considerable size and quite mature in development.

The development of the uterus and its relations to the vagina, as well as the development of the vagina and its connections, exhibit several modifications in the various groups which are coincident with other phases of progress, and indicate successive stages of differentiation towards the type exhibited in man and the kindred mammals. The placenta also exhibits several modifications, which have been employed by some systematists to group the various orders of Monodelphs. (I.) Those in which the uterus develops a "decidua" are combined under the name of *Deciduata*, and then differentiated into (1) those whose placenta is discoidal, as in the Rodents, Insectivores, Cheiropters, and Primates; and (2) those whose placenta is zonary, as in the Proboscideans, Hyracoids, and Carnivores; (II.) those in which the uterus develops no "decidua" are designated *Non-deciduata*, and are the Ungulates and Cetaceans, and probably Tillodonts, Toxodonts, and Sirenians. The Edentates exhibit examples of each kind, and consequently convey a caution against the ascription to those modifications of an undue value.

For the nourishment of the new-born young a peculiar provision is made in the development of certain glands (*mammary*), which in the female are highly specialized and secrete the milk. The position and number of these mammæ vary greatly; they are without teats in the Monotremes, but have them in the marsupials and ordinary mammals. They are almost always on the inferior surface of the trunk, and either abdominal, inguinal, or on the breast.

The chief modifications of the class of mammals are expressed in three types, which have been differentiated as sub-classes—viz. Monodelphia, Didelphia, and Ornithodelphia; these are themselves opposable under two categories, Eutheria and Prototheria.

In the Eutheria the sternum has no element in front of the manubrium or presternum; the coracoid is not connected with the sternum, but early ankyloses with, and develops as a simple process of, the scapula; the brain has its superior tranverse commissure (*corpus callosum*) composed of a body as well as "psalterial" fibres; the ureters discharge into the bladder the renal secretion, which then passes into the urethra. In the males the testes are variable in position to the vasa deferentia, and open directly or indirectly into a distinct or complete urethra (and not into a cloacal cavity); in the females the oviducts debouch into a double or single vagina, and not into a cloacal chamber: the mammary glands have well-developed nipples.

Some of these (the Monodelphia) have the cerebral hemispheres of the brain connected by a more or less well-developed corpus callosum and a reduced anterior commissure. In the male the scrotum is always behind the penis; in the female the vagina is a single tube, but sometimes has a partial longitudinal septum; the young are retained within the womb till of a considerable size, and derive therein nourishment from the mother through the intervention of a placenta (which is developed from the allantois) till birth. This sub-class includes the orders Primates, Feræ, Ungulata, Toxodontia, Hyracoidea, Proboscidea, Sirenia, Cete, Cheiroptera, Insectivora, Rodentia, and Bruta.

Monodelphs are the chief sub-class of the class of mammals, and are so called on account of the development of a single uterus and vagina, thus contrasting with the Didelphs or Marsupials, and Ornithodelphs or Monotremes. The group is divisible into sections distinguished by modifications of the brain and placenta. The former gives the most natural combinations. These are primarily two—the "super-orders" Educabilia and Ineducabilia. These exhibit two principal modifications in their brains, with which, however, other characters are co-ordinated.

In the Educabilia the brain is highly developed; the cerebrum is bilobate or trilobate (the sylvian fissure being always well defined and a posterior lobe sometimes developed), and covers the greater part or all of the cerebellum as well as the olfactory lobes; the corpus callosum extends in an arch backward to or beyond the vertical of the hippocampal sulcus in the inner face of each hemisphere, and has a well-defined rostrum in front. This super-order includes the orders Primates, Feræ or Carnivores, Pinnipedia, Ungulata, Hyracoidea, Proboscidea, and Sirenia, and Cete, as well as the extinct groups Taxodontia, Dinocerata, and Tillodontia.

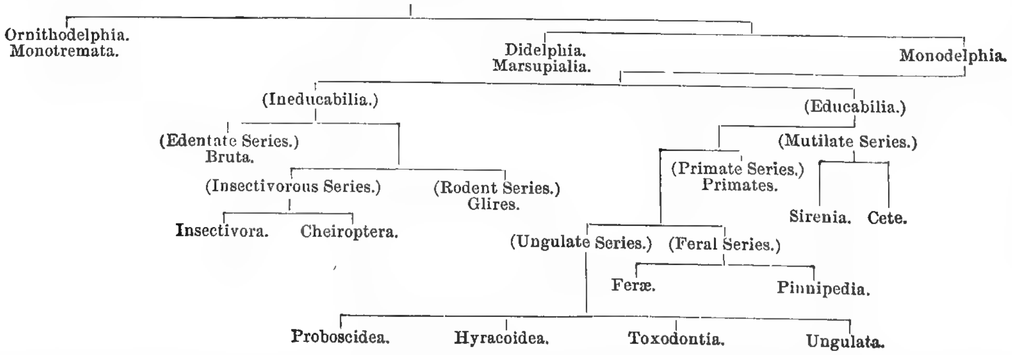
In the Ineducabilia the brain has the cerebral hemispheres relatively small and unilobate (the sylvian fissure being obsolete and the posterior lobe undeveloped), leaving exposed the cerebellum (and sometimes the optic lobes), as well as the olfactory lobes; the corpus callosum extends more or less obliquely upward, terminating in front of the vertical of the hippocampal sinus, and has no well-defined rostrum interiorly. The super-order includes the orders Cheiroptera, Insectivora, Glires or Rodentia, and Bruta or Edentata.

The others (the Didelphia) have the cerebral hemispheres of the brain chiefly connected by a well-developed anterior commissure, the corpus callosum being rudimentary. In the male the scrotum is always in front of the penis; in the female the vagina is more or less completely divided into two separate passages: the young are born when of very small size and imperfect development, and are never connected by a placenta with the mother; when born they are placed by her upon the nipple, from which the milk is forced, partly by herself, into the mouth of the young. Only one order (Marsupialia) is generally recognized.

In the Prototheria the sternum has a T-shaped bone (episternum or interclavicle) situated in advance of the manubrium or presternum; the coracoid extends from the clavicle to the sternum, and only towards maturity is ankylosed with the scapula; the brain has a superior transverse commissure (corpus callosum), with no well-defined "psalterial" fibres; the septum is very much reduced in size. In the male the testes are abdominal in position throughout life, and the vasa deferentia open into the cloaca, and not into a distinct urethral passage; the ureters discharge the renal secretion, not into the bladder, which is connected with the upper extremity of the cloaca, but into the latter cavity itself; in the female the oviducts are enlarged below into uterine pouches, but, opening separately from one another, as in oviparous vertebrates, debouch, not into a distinct vagina, but into the cloacal chamber, common to the urinary and genital products of the fæces; the mammary glands have no distinct nipples. The only known representatives are the Australian families Ornithorhynchidæ and Tachyglossidæ, constituting the order Monotremata.

Evolution and Genetic Relations.—The class of mammals is so decidedly differentiated from all others, and its early history is so fragmentary, that its exact phylogeny is not apparent. It is, however, most probable that the original progenitors of the class were modified from the Dinosaurian reptiles, or rather near allies of those animals, and that they culminated into the present types at a comparatively early epoch, the earliest known forms—those found in the Liassic formation—being quite specialized. But the relations between the existing and known fossil forms render the genealogical development of the type itself more readily appreciated. Unquestionably, the Ornithodelphs or Monotremes are the most reptile-like; of the other the Didelphs, or marsupials, and the Monodelphs, or placental mammals, are successively divergent and specialized from the primitive type. The successive differentiation and development of the various orders of the class may be best exhibited in a diagrammatic form or genealogical tsee. In this the more generalized forms, or quasi-eldest, are represented in each case by the left branch or fork:

PRIMITIVE MAMMALS.



Geographical Distribution.—Mammals exist in almost every region of the globe, but were wanting, previous to their introduction by man, in the Polynesian Islands, as well as New Zealand. There are many noteworthy combinations, but only a few can be referred to. Monotremes are peculiar to Australasia. Marsupials are now confined to Australasia and outlying islands and America; in the former numerous types being represented, and in the latter but one, the opossums. Insectivores are wanting in the regions where marsupials abound, but are well represented in the entire northern hemisphere, as well as in Asia and Africa. Primates are represented especially in the tropical regions of Africa, Asia, and America, but in very different forms, the lowest type (Lemuroids) being now peculiar to the Old World, and best developed in Madagascar; and in Africa and Asia the highest type (catarrhine monkeys and apes) is also existent, while in America all the species are of an inferior type of monkeys—the platyrrhine group. The Edentates are represented still more exclusively than the Primates in warm countries, and have most members in America (the sloths, ant-eaters, armadillos, and pichiegos), but some also in the Old World, the earth-hogs (Orycteropodidæ) being confined to Africa, and the pangolins (Manididæ) occurring in both Africa and Asia. The carnivorous mammals, on the other hand, are quite widely distributed, extending almost between the extremes of the northern and southern hemispheres, and under the same generic forms on at least the continental areas of both the Old World and the New, Australia alone having no representatives except of a single species of dog (*Canis dingo*). The Felidæ (cat) and Canidæ (dog) families are especially thus distributed. The others are more limited, or have a greater number of genera restricted to limited countries. The most striking examples of this restriction are afforded by families of the arctoid super-family, the Procyonidæ (raccoons, etc.) and Cercoleptidæ (kinkajous) being peculiar to warm America, and the Æluridæ (pandas) to Southern and Eastern Asia. The ungulates are at present generally more restricted; the Equidæ (horses) and Rhinocerotidæ (rhinoceroses) being peculiar to the warmer regions of the Old World, although horses have become feral and greatly increased in numbers on the plains of America. The Tapiridæ (tapirs) and Camelidæ are distributed in an anomalous manner. Of the former about four species are found in South and Central America, and one in Sumatra; of the Camelidæ, one generic type (camel) is represented in Africa and Asia, while one (llama) inhabits Chili and Peru. The proboscidians (elephants) are now restricted to the Old World; one generic form (*Loxodonta*) being represented in Africa, and another (*Elephas*) in Asia. Bats, fitted by their organization for extensive migrations, are found nearly everywhere, and some genera are almost cosmopolitan; but many generic types, notwithstanding their apparent equal capability of extension, are quite confined in their range. The cetaceans are abundantly represented in the polar regions by peculiar genera and species, but are also rich in tropicopolitan genera (*i. e.* types which are common to the entire tropical zone), and have also several peculiar fresh-water types in the tropics. The Sirenia are cosmopolitan in their genera, one of which (*Trichechus* or *Manatus*) is common to both sides of tropical and sub-tropical America, as well as the western shores of Africa; another (*Halicore*) is represented in the Red Sea, Indian Ocean, and Australia; and a third (*Rhytina*) was, till within a century ago, abundant in Behring's Sea.

Geological Range.—Although the discovery of the remains of fossil mammals in rocks as far back as the Oolitic was announced as early as 1823 on the authority of Cuvier, much skepticism prevailed respecting them, the great anatomist De Blainville expressing the strongest doubts so late as 1838 and after. For a long time it was believed that no representatives of the class existed previous to the Tertiary epoch. The evidence, however, is now conclusive of their existence in the Mesozoic, both in the Triassic and Oolitic periods, although only fragments, chiefly of lower jaws, have been found. These remains have been mostly attributed, and probably with right, to the order of Marsupials. In the Tertiary epoch numerous remarkable extinct types, representing even orders without living members, existed, and have furnished clues for the appreciation of the genetic relations of the several groups of the class. Those of this country have been chiefly elucidated by Leidy, Marsh, and Cope.

A consideration of the extinct forms is necessary in order to correct the impressions that might be derived from the geographical range of the existing forms, and will explain some apparent anomalies in their distribution.

The families of Rhinocerotidæ and Equidæ, for example, were formerly abundantly developed in America, as well as in the Old World; and such was also the case with the proboscidians. The tapirs, too, which are now so remotely separated, one being in India and several in America, had formerly a number of relatives which lived in North America and Europe. The family of camelids also was formerly not only well represented in America, but in that country related types were so numerous, and some of those early types were so generalized in their characters, as to make it possible, if not probable, that the camel type originated in the New World rather than the Old, and that those now living in the latter were derived from progenitors originating in the American hemisphere. THEO. GILL.

Mam'mary [Gr. *μάμμα*, "breast"] **Glands,** one of the most characteristic and distinctive marks of the mammalian class of vertebrates, the organ which produces milk. No animal except the mammals produces milk, or has anything approaching the character of a mammary gland. In most species the mammary glands of the male are undeveloped, save in exceptional instances; but, according to Dr. Curtis and Mr. Merriam, both males and females of the *Lepus Bairdii* (Baird's hare, an animal of the Rocky Mountain region) produce milk. The male of the human race has also been known to secrete milk and actually nurse a child. The mammary gland is of various structure in different animals. In the ornithorhynchus it is a collection of simple cæcal follicles, opening on the surface, without a nipple; and the mother appears to possess the power of extruding the milk into the mouth of the young animal. The cetaceans have very simple mammary glands, and the teat is enclosed in a slit. The marsupial mammals attach their young, in an exceedingly embryonic state, to the nipple, and the gland is provided with a muscular apparatus by which the mother feeds the feeble young creature at will, expressing the milk, which flows into the stomach of her offspring. In the higher animals the young are fed by suction. The mother does not feed her suckling, though her *consensus* is apparently needful to the free secretion of milk. Thus, it is well known that if cows are beaten or irritated before milking, the flow of milk is small. The mammary glands are always in pairs, and placed symmetrically on either side of the mesial line and on the ventral aspect of the body, but in number and in position they vary greatly in the various species. Some animals, like the cow, have often a pair or two of abortive or undeveloped nipples, besides those which yield milk. In the human species the mammæ consist of lobes and lobules of gland-tissue, with interlobular fibrous and fatty substance. The lobules consist ultimately of little groups of vesicles which open into minute ducts; the ducts converge into larger ducts, which at the base of the nipple open into *ampullæ* or reservoirs of milk. The nipple is slightly erectile, and in the human species has several orifices for the discharge of milk. The milk-ducts are lined with pavement epithelium. The gland itself is subject to many inflammatory, malignant, cystic, and other diseases. Of these, one of the most frequent is acute inflammation, an extremely painful affection occurring almost always during lactation. Hot stimulating lotions and the careful drawing of the milk are very useful. The gland should be suspended in a bandage. If it be not desirable to prolong the lactation, a solution of atropia should be applied, which often arrests lactation at once, and thus alleviates the disease remarkably; but if this be applied, the infant should not be fed from the breast, unless after the poisonous atropia has been carefully removed from the surface by washing.

Mammee' [Haytian, *mamey*] **Apple,** the fruit of *Mammea Americana* and *Africana*, trees of the order Guttiferæ, growing respectively in South America and the West Indies and in Africa. The former is one of the most delicious of tropical fruits. The tree is very valuable for its timber.

Mam'mola, town of Southern Italy, in the province of Reggio di Calabria, in a luxuriant district especially abounding in fruit. Pop. 7804.

Mam'moth [of Samoied origin, applied to burrowing animals], (*Elephas primigenius*), an extinct species of elephant, about twice the weight of the living species, formerly abundant in the higher latitudes of both the Old and New Worlds. (An engraving of the mammoth is given in GEOLOGY.) Their remains are abundant in Siberia and Alaska, where their tusks are gathered as an article of export. The mammoth was closely related to the existing Indian elephant, and some authors have even considered them identical. It differs, however, in many respects, and one of the most important of these differences is found in the molar or grinding teeth. These teeth are broader than those of *E. Indicus*, and have narrower, more numerous, and close-set transverse plates and ridges. They exemplify the extreme type of the peculiar elephantine dentition. The tusks are long and much curved, in some cases forming a complete circle, but being directed outward they clear the head, and the points are directed outward, downward, and backward. Two principal sizes of tusks are found—the larger averaging 9½, the smaller 5½, feet in length. They seem to have belonged to males and females respectively. Tusks have, however, been found over 12 feet in length. This animal is better known than any other species extinct before the historic period, as its remains have been perfectly preserved in the ice and frozen soil of the Arctic regions. A fine specimen was discovered at the close of the last century, in a cliff at the mouth of the river Lena. The flesh was so well preserved that dogs and wild animals fed upon it. The skin was thick, and covered with a reddish wool and long black hairs. This skeleton is now preserved at St. Petersburg, and measures 16 feet 4 inches from the fore part of the skull to the end of the tail, which is imperfect. Parts of the skin of the head, the strong ligament of the nape, which principally sustained the head, and the hoofs remain upon the skeleton. The hairy covering enabled the mammoth to endure a much colder climate than that to which the existing elephants are confined. Its food consisted of the leaves and branches of northern pines, willows, birches, and other hardy trees, such as may now be found along the isothermal of 40°, which in that age may have run as high as Northern Siberia, where these animals then lived in large herds. They roamed also over Europe, where they were contemporary with at least two kinds of two-horned rhinoceroses, a hippopotamus, gigantic deer, three kinds of wild oxen (two of which were of large size, and one shaggy and maned), a tiger as large as that of Bengal, and another fierce carnivore of equal size, the *Machærodus*, together with troops of hyænas, and a savage bear larger than the grizzly of the Rocky Mountains. During the Palæolithic and Reindeer eras they were contemporary with men, who have left rude delineations of this animal engraved on the ivory of its own tusks. Much confusion has existed among naturalists in regard to the species of mammoth. Cuvier referred to the single species, *E. primigenius*, teeth from Europe, Northern Asia, and all North America, from strata as early as the Lower Pliocene and as late as the frozen drift and ice-cliffs of Siberia. De Blainville included the existing Indian elephant in the species, thus giving it a range both in time and space unequalled by any known mammal in a state of nature. Later naturalists have more carefully discriminated the species, and restricted its range to Europe, Northern Asia, and North-western North America above the parallel of 40°, and in time to the Quaternary age. The mammoth of the warmer parts of North America is regarded as a different species, *E. Americanus*, and is comparatively little known, as the remains hitherto found have consisted principally of teeth. These have often been found associated with more numerous and better preserved remains of the mastodon. Remains from the Later Pliocene have been doubtfully referred to this species by Dr. Leidy, and represent the oldest known fossil elephants of this country. From the Tertiary of Europe and Asia, Dr. Falconer enumerates ten species of the genus *Elephas*, which he divides into three sub-genera—*Euelephas*, *Loxodon*, and *Stegodon*. In *Euelephas* the worn crowns of the molars present nearly parallel ridges of enamel, alternating with cement and dentine, as in the mammoth and Asiatic elephant. In this sub-genus belong also two Pliocene species—*E. antiquus*, from England and Southern Europe, and *E. nomadicus*, from Central India, and the *E. Hysudricus*, from the Miocene of the Sewalik Hills, India. *Loxodon* has the tracts of dentine lozenge-shaped, as in the living African species, *Elephas* (*Loxodon*) *Africanus*. With these are grouped two Pliocene species, *L. priscus* and *L. meridionalis*, from England and Southern Europe, and *L. planifrons* from the Miocene of the Sewalik Hills, India. The sub-genus *Stegodon* had the molars intermediate in form between *Elephas* and *Mastodon* (see article on MASTODON), and was represented by three species from the Miocene of the Sewalik Hills, *S. bombifrons*, *S. Ganesa*, and *S. insignis*, and *S. Cliftii* from the Miocene of Southern India. No remains of elephants have yet been found below strata referred to the Miocene. O. C. MARSH.

Mammoth Cave. This celebrated cavern is situated in Edmonson co., Ky., about 80 miles S. S. W. of Louisville, and about 10 miles from the railway which connects that city with Nashville, Tenn. It is but one of a great series of caverns which occupy nearly every part of the sub-carboniferous limestone, and are thus found over an area of at least 6000 square miles in Kentucky, besides a part of the neighboring States of Tennessee and Indiana. Within the county of Edmonson there are at least 500 cavern-mouths, many of which lead into vast, beautiful, but mostly little-explored caverns, often rivalling the Mammoth Cave in some of its features. This particular cavern is situated on the left bank of the Green River; the entrance is about 200 feet above the stream, and a quarter of a mile from its borders. Access is had to the floor of the cavern by means of a breaking down of the roof, and it is over the broken fragments that we descend to the floor. From this point the cavern is excavated in a series of chambers and passages descending in successive stages to the level of Green River, 200 feet below the entrance; the river communicates freely with the cave. A voyage of some hundreds of yards on the winding branches of Echo River brings the visitor to an extensive system of passages beyond its borders far more beautiful from the incrustations than anything on the entrance side of the stream. It requires a walk of about 7 miles to attain the farthest point, but as the survey of the cave has not been permitted, it is not possible to say how far in a direct line from the entrance this point really is. In the bewildering variety of curious and unaccustomed facts the cave affords we may recognize certain distinct divisions. In the first place, there are several levels or stories to the cavern, ranging from the level of Green River to 200 feet above it; all these show the action of water, and doubtless mark in succession the stages of downward cutting of the main river. These passages range in width from 70 feet or more to narrow rifts which just admit of passage. As a general rule, the highest level passages are the loftier and broader. Cutting through from the upper part of the cave to the lowest level are a set of gigantic pits commonly called "domes," such as Gorin's Dome, Mammoth Dome, the Maelstrom, etc. These have been, and sometimes still are, the seat of waterfalls which have cut all the way from the sandstone roof down to the permanent water-level, or to some harder bed which still resists their action. Besides these excavated features, there are a number of downfalls which make passages from one level to another, and some rifts which may possibly be the work of earthquakes. This is the framework on which the processes of excavation and deposit have built many beautiful structures. The flutings of running water and the incrustations arising from the crystallization of carbonate of lime on the walls in very fantastic forms have together done much to give grace to what is else only weird and peculiar.

Though the cave furnishes some scenes of great beauty, its most imposing effects arise from the great size of some of the halls and the majestic dignity of its domes. In detail of ornament it is much exceeded by the grottoes of Adelsburg in the Tyrol, by Wyers' Cave in Virginia, as well as by many of the other caves of this immediate neighborhood; but for grandeur none can excel some of the scenes of this cave. Perhaps the finest of its effects will be found in the Star Chamber, where pendent stalactites, each tipped by a bright reflecting point, catch the gleam of a concealed light, and imitate with their faint twinkling glow the stars of the firmament in a manner which is bewilderingly like.

To get the general history of this cavern it is only necessary to take what is now going on in this and neighboring caves. In all of them which extend down to the water-level of the region where they are found we find the water, gathered in the surface-beds, on its road to the main river in streams some of which are rivers in volume. This water, by its passage through the humus bed, has become charged with a certain quantity of carbonic acid gas. This gas while it is present in water gives to it the power of taking up a certain amount of carbonate of lime, and thereby of dissolving the walls of the channels through which it flows. Where the water courses in a considerable stream this dissolved limestone is carried away into the open river and thence to the sea; when, however, the stream is minute and trickling, the atmosphere may take up most of it, when it appears on the ceiling, and the result is a rapid precipitation of the lime in the shape of stalagmite or stalactite. Even when the evaporation is small, the loss of the carbonic acid from the exposure of the water in a thin sheet to the air causes a large part of the suspended lime to be thrown down. Thus, to the same process under different conditions we owe the formation of chambers and channels and their more or less complete closure by stalactitic masses. In this as in many caverns entire chambers have been closed by the deposit of these masses. There is a regular passage from the formation of a cavern to its obliteration; while strong currents sweep through it, everything tends to enlarge it to the limit of strength of the walls and roof; as soon as the water-currents weaken, then begin the actions which lead to its closure. As a whole, the Mammoth Cave is now shrinking in size. The accumulation of dust upon the floor has already gone far to diminish its size in the larger chambers. This dust is composed of the waste from the roof and walls, together with the waste of living and the remains of the dead animals, chiefly rats and bats, which inhabit the cavern. There are at least three species of fish and a number of insects peculiar to this and the neighboring caves, which with a blind crayfish make up the list of cavern-animals to about twenty species. Nearly all these insect forms are more or less closely allied to those of the neighboring outer world, yet the differences are quite enough to entitle them to rank as distinct species. It is impossible to exaggerate the value of this evidence in the great questions connected with the origin of species. There can be no doubt that we have here organic forms—not only insects, but vertebrates as well—in the very process of becoming fitted for changed conditions of life. There are several forms where the eyes, the most highly organized of all the organs, are disappearing or have quite vanished.

Upon the important question of the antiquity of these caverns the geological evidence leads to the conclusion that less than 1,000,000 years has sufficed for their production. As this period is less than the hundredth of the time which has doubtless elapsed since the introduction of life on the earth, the rapidity of the process is relatively great. It might be expected, from the fact that organic life generally has been profoundly affected by existence in the conditions afforded by caverns, that human beings would find some peculiar effects from spending much time in them. As far as observed, the effect upon tourists is much the same as that obtained by a great change of climate. The temperature of the cave is uniformly at 59° F. The air is very clear, being free from dust and from the odors of vegetation. Coming from it out into the forest, we perceive, in summer-time, a wonderful transition from the pure to the impure air. The utter change from the ordinary conditions of life without to this air of marvellous purity gives great relief to many diseases of the respiratory, digestive, and nervous systems. Some unintelligent efforts to increase these effects by prolonged residence within the cave have been attended by damaging results from the want of sunshine. But taken in moderation, exercise within the cave has undoubted therapeutic value. Tourists desirous of getting the best effects in the way of health, as well as enjoyment, should spend a month in the study of this and a half dozen other neighboring caverns. N. S. SHALER.

Mamoon′, or **Mâmûn, Al** (ABUL ABBAS ABDALLAH), the seventh caliph of the Abbasside dynasty, b. at Bagdad in 786, a son of Haroun-al-Raschid; was invested with the government of Khorassan in 800, and ascended the throne Oct. 4, 813, after the deposition of his elder brother. He was a great patron of science and literature, collected many Greek and Hindoo manuscripts, and made Bagdad the centre of learning. But in other respects his government was weak; the outlying provinces declared themselves independent, and even over Egypt and Syria his authority was merely nominal. Visiting Cairo in 820, Al-Mamoon was induced, by the current legends of immense treasures concealed in the pyramids of Gizeh, to attempt an entrance into the Great Pyramid, of which the proper entrance-passage, though previously known to the Romans, had been lost. His workmen, after long and toilsome labor, succeeded in striking the descending passage, which the Romans, Greeks, and Persians had known, at its point of junction with the ascending passage, which had been sealed up by the builders and had remained undiscovered for 3000 or 4000 years. Effecting a forced passage around the obstruction, he made his way at length into what has since been called "the king's chamber," and found, to reward his pains, no other object but the solitary sarcophagus of Cheops. The forced passage above referred to is still the only way of access by which visitors can reach the interior of the pyramid. In 827 he joined the heterodox sect, Motasalis, which considered the Koran a created work and not eternal. D. Aug. 9, 834, on the outbreak of a war with the Byzantine emperor.

Man [Teutonic, from Aryan *man*, "to think:" Sanskrit, *menu*, "thinker"]. The scientific study of man is now quite generally pursued under two designations—Anthropology and Ethnology. These can hardly be considered two sciences, for the two departments of inquiry are in so many ways connected, in subject-matter, method, and aims, that the division seems somewhat arbitrary and indistinct. The division in question is comparatively recent, is not universal nor sharply defined, and is mainly due to the different ends at which investigators have aimed.

Anthropology, as the term is now used, may be defined as the study, according to scientific methods and processes, of the relation of man to the whole body of lower animals. If the hypothesis of evolution, as taught by the Greek philosophers before Socrates, and formulated and expounded by Democritus and Lucretius, and in later times by Spencer, be accepted, the department of inquiry involves the relation of man to all the forms, forces, and phenomena of nature. Thus considered, anthropology is but an insignificant branch of the general science of life, whether animal or vegetable; which itself is again included in the still wider range of general physics. All alike are included in the discussion of the hypothesis of evolution, which supposes all beings and things to have been developed by inherent dynamic agencies from universally diffused and infinitesimally minute particles of inorganic matter. Giving to anthropology this breadth of meaning, distinctness of definition and classification passes away, and the tendency of thought is to become vague and speculative. Observation is likely to give place to hypothesis, and we are in danger of reproducing in all its essential elements the methods of the pre-Socratic era in Greece. Hence, cautious investigators who seek to establish the affiliation of man to the lower animals by descent confine themselves to the study of the relation of man to the animal kingdom, and take the name of anthropologists, from the fact that the discovery of the origin of man, rather than his migrations and tribal relations, is the ultimate aim of all their studies.

When we assume the origin of man on the earth as scientifically beyond the limits of human observation, a series of problems present themselves, all of which are of great interest and importance. Among these are (1) the geological period of the introduction of man among the fauna of the earth; (2) whether man has had his origin in one centre or many; (3) whether man belongs to one species or many; (4) what modifying effect the external agencies of nature have exerted upon him; (5) what influence natural selection and survival of the fittest have had in developing and improving varieties; (6) the influence of intermixture of different stocks or races; (7) the direction and influence of migration as connected with food, climate, and institutions. In all these problems it will be seen that the objective point in the investigation is (in general) man's relation to his fellows.

Whether man is considered as belonging to the same species or different species of the same genus, the aim of the investigator is the tribe, the race, the nation. Hence we see the propriety of the name ethnology for such inquiries. Whether it is wise thus to confine the attention exclusively to specific points in a general subject in which the facts and laws involved are so related that they all modify and affect each other, and where nearly the same range of investigation is required for each, may well be doubted. Possibly, all that is gained in simplicity and exactness is lost in breadth of view and correct interpretation of the phenomena. Leaving out of view the attempt to separate these branches of inquiry as such, we shall present a rapid outline of the points of most importance in the general subject of man's relations to the animal kingdom and to his fellows.

The greater part of the problems involved in the study of man belong to what Whewell calls the palætiological sciences, in which we reason from effect to cause, seeking from phenomena actually existing, described, and classified to ascertain their origin and causes. The existing facts of the science of man must be sought out and classified before there can be any adequate solution of problems which lie beyond observation. Those inquiries with which anthropologists are mostly conversant lie in the direction of search after origins and causes of existing facts. As analysis must always precede synthesis, and as phenomena must be known and classified before we can make any legitimate search after causes, so ethnology should precede the discussion of the problems which of late have been included under the name of anthropology. It may be suggested that a division of the science of man analogous to that adopted in astronomy would be more conducive to clearness of thought than that which has prevailed. If inquirers had been willing to subdivide ethnology into descriptive and physical, much misapprehension and confusion would have been avoided. The early investigators, like Buffon and Blumenbach, assumed man to be a distinct species, and devoted themselves first of all to a survey of the elements which distinguish and describe him individually and in society. They laid a basis in carefully classified facts before they proceeded to attack the problems which these suggest without solving. The natural method in this study is that which has been so fruitful in the allied science of geology. In an exposition of the science of man it is requisite to take account of all the elements, both moral, intellectual, and physical, which enter into his constitution. We must look at man as connected with inorganic nature; as connected with the vegetable and animal world; as an intellectual and moral being; as a social being, adapted to political organization: as a religious being, showing everywhere the disposition to worship; as an economical being, showing the disposition to accumulate possessions far beyond the necessities imposed by the vicissitudes of the seasons; as a being capable of forming an articulate and written language, and gathering up in it the facts and experience of preceding ages in the forms of science, history, and literature. The subject is therefore one of the broadest which can engage the human mind. It touches, on the side of man's material organization, the facts and laws of physics, of chemistry, astronomy, meteorology, geology, general zoology, anatomy, and physiology. On the side of his moral and intellectual nature it involves all that man has accomplished in the whole range of thought and action. In this study we occupy a peculiar and unique position, for the student is himself the type and representative of the subject-matter of his study. He is both subject and object. He surveys the whole field of objective nature to distinguish, to classify, and to interpret, and then turns upon himself to ascertain the relation which he sustains to the facts and laws which he has collected and arranged into a reasoned and coherent system. Moreover, man finds that the world of external nature and the world of self-conscious and reasoning activity within him are mysteriously united in his own person. By his physical organization he is a part of the vast plan of external nature. By his intellectual and moral being he is conscious of standing above every other form of animal nature, and dwelling in a world of thought apart from them all.

When we apply to this subject the methods of scientific investigation, and survey the whole phenomena of our complex being, we find the elements of free-will, self-conscious intelligence, and capacity for moral distinctions factors so important that they throw all physical phenomena into the shade to such a degree that it is only by conscious, and often severe, effort that we are able to examine with adequate attention the elements of our nature which we have in common with the inorganic and animal world. The history of man is so much that of his moral and mental nature and activity that we are in danger of undervaluing the study of man as an *animal*—closely related to the world of matter around him, and of which his body forms a constituent part. These more obvious and important elements in man's nature first claimed attention. It was only after these had been studied and classified that the study of man as an animal became prominent as a branch of science. Like all neglected subjects of inquiry, when at last it gained the ear of the world extravagant expectations were raised and extravagant claims put forth on its behalf; and a tendency is now shown in the direction of the other extreme. With many naturalists the moral and intellectual is sunk in the physical, and those elements which so widely separate man from beast are considered as simply developments of the animal instincts. But however this may be, no student of the nature of man can ignore his relations to other parts of the animal and inorganic world. These relations throw the most important light upon all the problems of life, mind, and society, and are equally important to the psychologist, the historian, the theologian, and the statesman. In the investigation of this, as of every department of nature, sound method requires that we take into account all the phenomena presented, each in its completeness and natural relations, and estimate their value in accordance with their relative weight and bearing on the problems before us. Unfortunately, psychologists, naturalists, and linguists, while properly confining themselves to their own specialties as bearing on man's nature and origin, have quite generally undervalued the labors of each other, and too much neglected the results of each other's inquiries in drawing their conclusions.

When we contemplate carefully the order of nature, we find the elements of a plan or system which shows progress in the unfolding of its parts from the lower and simpler forms of existence to the higher or more complex. Each department of nature becomes higher through the addition to itself of something in organization and endowment which the next below it does not manifest or possess. Consequently, each department above the lowest subsumes into itself all that is inferior, and varies from the order next below it by something new and real which is added. Upon the reality, distinctness in character and function of these *added* elements of difference rests the possibility of real scientific classification in natural history. As the differences of the animal and vegetable world form successive additions to a common original plan or system of organization, we may expect to find in each some vague foreshadowings or prophecies of the attributes and characteristics which when actually added will mark the next higher forms. The crystal suggests to the imagination by its recurrent uniformity the hereditary life and organization of the plant. The plant, as it turns to the sun or shrinks from the heat of the hand, foreshadows without exemplifying the nervous system. When in the animal kingdom we examine the various genera and species, we find an economy of thought, so to speak, in the principles which underlie their organization. We see the development of single sets of organs by additions which constitute specific differences, while the generic character remains unchanged. The higher animals have capacities which are vague and indistinct analogues of the vast endowments and godlike reason of man. Hence, we find in the earliest thought a tendency to look upon all the varied forms of nature as outgrowths of one substance, endlessly modified, but without essential and fundamental differences. The doctrine of a chain of beings, all the links of which are connected with each other—a disposition to sink all the varieties of nature into one multiform unity of existence—shows itself among the early Greek philosophers, and, under various modifications, the same idea prevails in the systems of the East. At some times the tendency has been to assume a material substance as the common basis of all forms of physical and mental existence in the universe, and at others to assume an ideal or spiritual one. Philosophers in ancient and modern times have oscillated between these opposite assumptions, and idealism and materialism have been alternately predominant throughout the history of thought. These alternations in modes of thought agree in the resolution of all things into a unity of existence without will or consciousness, and in referring all the varieties of present existence to the dynamic agency of laws which are independent of all intelligence. This search after unity is common to both schools of thought, and the method and formulas of each may be interchanged. Hence the surprising facility with which men have passed from a system of idealistic to a system of materialistic development. In each theory the unconscious passes into the conscious. The cosmos begins without thought or will, but finally works out both by a necessary process of differentiation. The unconscious has its outcome in the conscious, the necessary in the free, the chaos in the cosmos. The one system supposes a universally diffused, ideal existence without specific form, will, or consciousness; the other, a universally diffused, undifferentiated matter, uncreated, and uncontrolled by mind or will. In each of these systems the search is for unity of things as distinguished from a unity of creative power and formative intelligence.

These theories, substantially one in method, stand over against that which finds the unity that satisfies the thought in an intelligent and free First Cause of all things. As distinguished from the theories which find the origin of beings in a necessary dynamic and unconscious agency working in a self-existent substratum, this theory regards nature as the outcome of a mind and will working out, in form, space, and time, a complicated series of ideas or thoughts which antedate as plan or thought their exhibition in the universe of matter. Both systems make use legitimately of the term "development." But with the one development is of the unconscious by the unconscious, without foreseen aim or purpose or volition; with the other, "development" is conversant with a series of ideas consciously apprehended, the order and relations of whose appearance in time are determined by a free intelligence and will adequate to the results produced. It implies a self-existent cause, to whose agency the substance and form of all the varieties of nature are due, and whose continuous existence in time and space is the permanent basis, ground, and cause of that universal, orderly activity which we designate collectively as the laws of matter and mind. The idealist affirms that the universally diffused non-material substance becomes self-conscious in the mind of man; the materialist finds that the diffused unorganized matter reaches self-consciousness and the power of thought by successive differentiations, and increasing complexities of combination in the human body. Both find the origin of the universe of things and beings in a unity of chaotic existence, without a presiding mind. Both alike are compelled by their systems to deny any distinction between mind and body—the one resolving the body and all forms of matter into mind; the other resolving mind and conscience into modes of matter.

Hence it will be seen that speculations on the origin of man logically take their rise and coloring from the speculator's view of the origin and constitution of the universe. If there is no dualism of mind and matter in man, it naturally follows from the same method of reasoning that there is no mind which controls the agencies and forces of nature. It follows also that he who denies the dual form of existence in the universe is driven to the task of showing the adequacy of inorganic material forces to produce the phenomena of life and thought, either by discovering the actual process of such production, or by something like an approximate verification of such an hypothesis—by appealing to analogous facts in nature, and showing also that the hypothesis of mind in nature and man is essentially out of accord with the phenomena to which both schools of thought must alike appeal.

The subject of evolution in general cannot here be taken up. It has been discussed under its appropriate head. In speaking of the doctrine, now so widely advocated, of the origin of man from anthropoid apes, we must be allowed to caution the reader against confounding the words "evolution" and "law" with concrete and intelligent forces. Many seem to suppose that these terms denote a causal agency instead of a process. When the origin of species is said to be due to evolution we use a figure of speech only, and give concrete existence to a mere abstract term. The term is legitimately used when it expresses the opinion of the writer that the creative process was slow rather than sudden, and that the processes of creation were orderly and followed a thought or plan. Creation through evolution or law has to do with the time and order of action of the creative force, and cannot, in any intelligible sense of the terms, refer to the concrete orderly-acting force whose mode of action these abstract terms describe.

In all departments of scientific inquiry we soon reach profound mysteries and insoluble problems. Around these both dogmatic skepticism and dogmatic credulity have fought their battles. Questions regarding origins have been most fruitful in suggesting these mysterious problems. Regarding the most of these, scientific investigation (and with this alone this discussion is conversant) gives us no solution which commands our confidence and excludes all difficulties. The hypothesis of evolution gives us no clue to the origin of those substances which, resisting all chemical reagents, are called simple; it gives us no clue even to the origin of that cosmic vapor which is postulated as the material basis of all things. The origin of life, even if we admit the unverified hypothesis of spontaneous generation, is wrapped in mystery, for no one has detected the real nature of the change by which inorganic matter is supposed to pass into living tissue. If we deny the maxim *omne animal ex ovo*, we have only pushed the difficulty one step farther back. We may attempt to trace the origin of consciousness to reflex or unconscious activity of the nerves, but in the attempt we are obliged to assume the existence of all the facts and laws which we seek to account for. The origin of volition is equally dark. We are conscious of freedom, and equally conscious of external conditioning agencies which we must take into account. But the precise relation to each other of these two elements entering into an act of will no one can determine. We find the consciousness of freedom and those elements which we call motives, whether external or internal, coexisting in our consciousness; but he who denies the existence of either for the sake of referring the phenomena to a unit of explanation sets aside the very problem which he seeks to solve. This has been the battle-ground of the ages, but we are no nearer the solution of the difficulty than were the Greeks in the age of Zeno. The origin of human language is beset with the same difficulties. We must assume the two factors of conscious intelligence and instinctive animal impulse in all our attempts at explaining the phenomena. He who seeks the origin of speech by referring it either to intelligence or the unconscious motions of the nervous organism alone will fail. The resolution of the originating or causal agency into one and the same force must assume the existence of a part of the facts for whose origin we would account.

We have referred to this general problem of origins as analogous in character to that involved in the origin of life or the origin of man. This origin cannot, of course, have been a matter for observation. No man can be supposed present for the purposes of testimony at his own birth, nor can he have been a witness of the mode or process of his own creation. An exhaustive discussion of the problem of origins would be an important contribution to scientific method. We propose to state in outline the principal hypotheses which have been suggested to account for the origin of man, naming some few objections by which these hypotheses have been met. (1) The hypothesis of Darwin is that man has grown by a series of modifications in geological time from some extinct form of the anthropoid apes—"from a hairy quadruped furnished with a tail and pointed ears, arboreal in its habits, and an inhabitant of the Old World." (*Descent of Man*, p. 372.) Darwin also states that man "since he attained to the rank of manhood has diverged into different races, or, as they may be more appropriately called, sub-species." . . . "Nevertheless, all the races agree in so many unimportant details of structure, and in so many mental peculiarities, that they can be accounted for only through inheritance from a common progenitor."

(2) Mr. A. R. Wallace, who, independently of Darwin, formulated and defended the hypothesis of natural selection, denies that it will account for the origin of man. Like Darwin, Wallace affirms the original unity of man. He says that "man may have been—indeed, must have been—once a homogeneous race." (*Natural Selection*, p. 321.) On the basis of man's exemption from the action of the law of natural selection as applied to animals, he finds an "argument for placing man apart, as not only the head and culminating point of the grand series of organic nature, but as, in some degree, a new and distinct order of being." (*Nat. Sel.*, p. 324.) The argument in the work here alluded to, showing that man is by his nature independent of the law of natural selection, is familiar. We have not space to reproduce it. Wallace's general conclusion is that an external intelligent force, acting independently of those laws which control the differentiation of the animal kingdom, must be postulated to account for the special physical, mental, and moral endowments which make up the specific and unique nature of man. He concludes that "a superior intelligence has guided the development of man in a definite direction and for a special purpose, just as man guides the development of many animal and vegetable forms." (*Nat. Sel.*, p. 359.)

(3) Another hypothesis of the origin of man, differing from both these just named, is that of Carl Vogt. He adopts Darwin's idea, that the law of natural selection accounts fully for the origin and endowments of man; but he positively rejects the idea put forth by Wallace, that a higher and controlling intelligence is necessary to account for the capacities of man, and assumes that man has descended not from one form of anthropoid apes, according to the judgment of Darwin, but from three forms, and possibly from several. His words are: "In short, we cannot see why American races of man may not be derived from American apes, negroes from African apes, or negritos perhaps from Asiatic apes." After speaking of the "plurality of races as a fact" "well established," he adds: "Then all these facts do not lead us to one common fundamental stock, to one intermediate form between man and ape, but to many parallel series, which, more or less locally confined, might have been developed from the various parallel series of the apes." (*Lects. on Man*, p. 467.) He further says: "Our savage ancestors stand opposed to each other, stock against stock, race against race, species against species." (*Lects.*, p. 468.) We thus find Carl Vogt, while adopting the methods of Darwin, arriving at the conclusion that the different types of men constitute different species, from the fact that they have been developed from different types of monkeys.

(4) In addition to these we have the evolutionist hypothesis proper, which finds the origin of man, as well as of all inorganic, vegetable, and animal forms, in successive and continuously connected differentiations and integrations of a universally diffused ether. With this school man is but an animal more highly differentiated than the mass of his congeners who have preceded him in the cosmical process. The complexity of his organization constituting the only difference between man and the other animals, to this complexity the genesis of his moral and intellectual capacities is solely to be attributed. This view is best represented in the works of Herbert Spencer.

(5) Other theories are thus described by Dr. Dawson (*Story of Earth and Man*, p. 320): "One school assumes an innate tendency in every species to change in the course of time. (*Owen.*) Another believes in exceptional births, either in the course of ordinary generation or by parthenogenesis. (*Mivart, Ferris.*) Another refers to the known facts of reproductive acceleration or retardation observed in some humble creatures. (*Hyatt* and *Cope.*) New forms arising in any of these ways or fortuitously may, it is supposed, be perpetuated, and increased and further improved by favoring external circumstances and the efforts of the organism to avail itself of these. (*Lamarck.*)" Closely in harmony with these views are those adopted by the ancients, especially of the Epicurean school, as set forth in the brilliant poem of Lucretius on the *Nature of Things*. The difference between these speculators and the moderns in knowledge of natural history is enormous, but the similarity in methods of thought and statement is remarkable.

When we examine these various hypotheses we find a general agreement in assuming that man has been derived by generation from some one or more forms of lower animal life. But we are struck, on closer examination, with the great want of agreement in the methods of reasoning and the arguments adduced. Spencer and Häckel seem to consider the problem of the origin of man and his faculties as included in the broader problem of the origin of life. In this they see no insuperable difficulty. Indeed, the whole system of evolution as taught by Spencer grounds its claim to acceptance as a philosophy of the universe in its ability to give a scientific explanation of the origin of life through observed modifications of matter and force. Darwin, on the other hand, postulates the existence of living animal germs as his point of departure, and intimates his belief that the origin of life and intelligence in the lower animals is a hopeless inquiry. "In what manner," he says, "the mental powers were first developed in the lowest organisms is as hopeless an inquiry as how life at first originated. These are problems for the distant future, if they are ever to be solved by man." (*Descent of Man*, p. 35.) Prof. Tyndall as a physicist says: "The passage from the physics of the brain to the corresponding facts of consciousness is unthinkable. Granted that a definite thought and a definite molecular action in the brain occur simultaneously, we do not possess the intellectual organ, nor apparently any rudiment of the organ, which would enable us to pass by a process of reasoning from the one to the other. They appear together, but we know not why." (*Scientific Materialism*, Am. ed., p. 117.)

As we have already remarked, Wallace denies that "natural selection" can be made to account for the origin of man. His great ability as a naturalist, and his relation as an independent discoverer to the law in question, give to his views a special value and importance. In his article on the "Limits of Natural Selection as applied to Man" (pp. 334–362), referring to Mr. Darwin's care to impress upon his readers that natural selection has no power to advance any being much beyond his fellows, but only so far as to enable him to survive them in the struggle for existence, and also that it has no power to produce modifications which are in the least injurious or even useless to its possessor, or out of proportion to its degree of development, he proceeds to give a series of points in which the law of natural selection fails to meet the considerations which Mr. Darwin himself lays down as requisite for its legitimate application. Hence, Mr. Wallace utterly rejects Darwin's conclusions regarding the origin of man from the anthropoid ape, while he accepts them so far as they bear upon the origin of species among plants and animals in general.

Equally trenchant and irreconcilable differences may be pointed out in the applications and modifications of this hypothesis in the works of naturalists who have in some of its forms adopted it. These differences tend to confirm the impression that, however imposing the authority under which these methods of accounting for our origin have been put forth, they still await scientific verification, and have no claim to be accepted as catholic truths tested by the severe processes of scientific method. As working hypotheses they may all be useful. They may aid investigators to bring out new or neglected truths; but so long as no transition fossils bridging over the gulf between man and the apes can be produced, so long as the system depends upon what *may possibly have been*, and not upon what is proved as fact, we may reasonably place the various suppositions regarding the origin of man by generation from lower animals among the immense mass of unverified hypotheses which active minds are continually bringing to the surface in the progress of inquiry. In addition to the difficulties of accounting for the origin of man by the hypothesis of evolution, apart from an informing and directing agency (such as are suggested by Wallace, Mivart, and others), there are those which affect the system as a whole. Thoughtful naturalists in large majority affirm that no well-authenticated instance of spontaneous generation has been shown; that no new species able to maintain itself has been produced by the hybrid union of allied families of animals; that palæontology has revealed few if any of the manifold series of transitional forms between animal species which the system necessarily implies and requires for its maintenance. All that Darwin really claims for his hypothesis in its application to man is that it *may* be true. It is noteworthy that Darwin is much less positive in his conclusions than his pupils and followers. He concedes that his hypothesis is an inference from premises which are not seldom speculative or doubtful. In all sciences in which we reason from phenomena to their causes we can only infer a possible past from the actual and ascertained present. When we take into account the nature of the inquiry, and the serious difficulties which have led so many naturalists of the highest reputation to reject it entirely, we can safely say that, whatever may become true in the future, at present the hypothesis is unverified, and has no legitimate standing among the settled theories of natural science.

When we take into account the laws of man's mind, his use of articulate language, his social, moral, and religious constitution, we are met by problems which are extremely difficult of explanation on any hypothesis of evolution. Speaking generally, the opinions of those who deny to man the possession of a mind, with its constitution and laws of action, as an inherent part of his original being, fall naturally into two classes. The first, which includes the immense majority of materialists, hold that man comes into the world endowed with sensibility alone, and that contact with the external world through the nervous system comes, in the course of his life, to generate the capacity for acquiring knowledge, the power of thought, and all those fixed modes of mental action which psychologists of a different school call the primordial laws of action that are native to mind, whether necessary or contingent in their nature. With these the development of intelligence originates in the *matter* of the nerves, and is completed in the lifetime of each human being. They deny that the laws of mental and moral activity which limit and condition all possible thought are laws of the mind as a distinct entity. They find by analysis no such elements. They resolve these laws or limitations of all thinking into habits or associational residua which have been developed by the activity of the nervous system. Whatever this school may attribute to the development of capacity by hereditary influence does not essentially modify these statements. This school is best represented by the elder Mill in his *Analysis of the Human Mind*. The second school of sensational psychologists is best represented by Spencer. In contradiction to the views of Mill, Spencer finds the human mind conditioned and limited, in all its activity, by necessary laws which are a part of the natural furniture of every human mind now existing. In this respect he agrees with the spiritualistic school of psychologists, but he attributes the existence of these constitutive laws of thought, which do not yield to analysis in the present state of man, to an accumulation of hereditary influences, continued through an indefinite period, which had their origin in the relation of an undifferentiated sensibility to its material surroundings. He disagrees entirely with Mill and his school in his estimate of the actually existing facts of the human mind, and the analysis of these facts into irritations of the nervous tissue of each man after birth. He agrees with Mill in reference to the process by which these laws of mental action have been generated, but extends the time indefinitely backward, giving almost unlimited influence to the law of heredity. What Mill finds to be built up in a man's lifetime, Spencer assumes to be possible only as the accumulated result of hereditary influences, gaining infinitesimal increments through innumerable ages. However much these two schools differ regarding the facts of the human mind and their analysis, the systems are both liable to similar criticism and present similar defects of method. Both James Mill and Spencer found their systems upon association and habit. The question naturally arises: What are the conditions necessary for the beginning of mental habits and the processes of association? A mental habit is formed by going through a mental process, or a series of mental processes, so frequently that the subject of them acquires great facility in the operation—possibly, a facility so great that the processes are possible without a conscious act of will. Association is the power to recall in memory mental acts or processes which have, in any manner, been connected with each other. Now, habit and association are unintelligible terms except on the assumption of the fundamental laws of intelligence as already existing. For two objects of knowledge to be associated with each other there must be the intelligence to apprehend them as objects of knowledge—the power to discriminate them from the self and from each other, to note their distinguishing marks and attributes in time and space. They must both be held in thought at the same instant as actual knowledge, or one as a fact of knowledge, the other of memory, or both as facts of memory. If, as we have said, a mental habit is formed by frequently going through a mental process or mental processes, manifestly habit, like association, postulates those very laws of mental activity to account for which it is brought forward. Both the system of Mill and that of Spencer are vitiated by this fatal defect, while in vitally important particulars they contradict each other.

The difficulties which attach to all systems that seek to account for the powers and laws of the mind by habit and association alone are illustrated by the laws of human speech. Language is the instrument of human thought more emphatically than it is a means for its transmission. The rudest forms of human speech involve the presence of all the germs of a complete human mind. We hear, it is true, of languages which have no abstract terms, and which indicate no powers beyond the rudimentary instincts and intelligence of animals. But when we attempt to analyze a sentence in any language, however uncultivated, we recognize abstract terms, and some of a high degree of generality. We find always subject, object, and predicate; we can detect the agency of all the laws and limitations which make up what we call the constitution of the mind. So completely are these wrought into language that their absence from it is impossible to thought. The fundamental postulate of the broad distinction between the thinker and the object of his thought is a recognized element of universal grammar, and language becomes unintelligible or absurd whenever the universal laws of human thought fail of recognition. A complete psychology can be readily deduced from the rudest language ever spoken. No system which fails to recognize the broad distinction between that in man which thinks and feels and acts, and the phenomena of the external world, can be stated in human language without an implied contradiction. This dualism of thoughts and things strikes so deep into language, and is made so necessary by the constitution of the human mind, that failure to recognize it in thought or expression involves a contradiction. Man, as a thinker, stands by his personality apart from the universe in which he lives. He cannot in thought recognize himself as identical with universal matter or universal mind. The reality of what thinks, as distinguished from the material world, is a condition of our knowledge of the material world; for all knowledge involves, at bottom, a discrimination between the thinker and the material fact which he knows. Hence, neither the materialist nor the idealist can formulate his theory in language without an essential contradiction in terms. The beginning of articulate speech, as well as the beginning of thought, necessarily postulates the essential characteristics of mind and its laws, however imperfectly developed that mind may be.

The question whether man shall be classed with the anthropoid apes or separated from the animal kingdom has been much discussed by naturalists. With some noted exceptions this matter has been determined, apparently, by foregone conclusions concerning the origin of man by generation from the lower animals. As this is a matter which affects the naturalist rather than the general inquirer, and is partially involved in what has already been said, we waive further discussion.

The Unity of Man was generally conceded by the early naturalists—notably by Buffon, Blumenbach, Linnæus, and Prichard. Virey, whose work was first published in 1801, seems to have been the first among modern naturalists to call in question the specific unity of man. The discussion which ensued has led to the use of the terms *monogenist* and *polygenist* to characterize those who affirm or deny the unity of the human race. Virey divided man into two species, founding his distinction mainly upon the facial angle of Camper. In 1825, Bory de St. Vincent divided man into fifteen species. In 1826, Desmoulins, who had previously recognized eleven species, increased the number to sixteen. Jacquinot in 1849 recognized three species; Dr. Morton, twenty-two "families;" Luke Burke, sixty-three species. Agassiz assumes eight centres of creation for the human race, although there is some difference of statement in his earlier and later writings. He held the men of these different creations, though different in origin, to be one in their intellectual and moral nature. Nott and Gliddon, in their *Types of Mankind*, adopted generally Agassiz's views with reference to the different centres of creation, but insisted that the men of different origins constitute fundamentally different species, denying the unity of moral and mental nature which had been affirmed by Agassiz. This hypothesis was naturally pressed into the service of the defenders of the institution of slavery, and became the foundation of a diplomatic paper addressed to the British government upon the antislavery agitation by Mr. Calhoun. We are struck, in this enumeration of different classifications (which might be indefinitely extended), with the extreme differences in the conclusions at which these writers have arrived both in respect to the basis of classification and the classification itself. It indicates clearly that the polygenists, as a whole, are more fatally at variance with each other than they are with those who maintain the unity of man. If such contradictory systems of classification were to be put forth concerning any *animal* as well known as man, we should be inclined to suspect that the systems of classification, taken as a whole, were vitiated by some fundamental error. It is easy to see, without contrasting these essentially different systems with each other, that they are mutually inconsistent and destructive. The deductions of the polygenists from their theories vary as widely as the theories themselves. Knox (*Races of Men*) denies the possibility of a change of habitat for man, and affirms that Europeans in America are suffering a sure and constant deterioration; Dr. Caldwell (*Unity of the Human Race*) is equally confident that European races are steadily improving in America. Kombst (in *Johnston's Physical Atlas*) separates man into three species, but affirms that a mixture improves the result; Dr. Nott (*Types of Mankind*) denies the possibility of a permanent union of the different species of man, and appeals for proof to the weakness and inferiority of the mulattoes in the South. From these specimen illustrations of the utter absence of any agreement in fundamental principles on the part of the polygenists, as well as from the fact that their underlying principles of classification are often essentially contradictory, we are driven to the conclusion that they have undertaken an impossible task; and the presumption in favor of the unity of the human species is greatly strengthened by the dissensions and contradictions of its opponents. The range of facts bearing upon the subject of the unity or non-unity of man, and the imperfection of our knowledge, present great difficulties whichever hypothesis we assume. The naturalists who have assumed the unity of man are numerous and their authority weighty. From Linnæus, Buffon, and Blumenbach to the present day there has been an unbroken line of succession of ethnologists who have affirmed the unity of the human race. So far as the argument from language is concerned, writers on comparative philology have been, with few exceptions, unanimous that it points in the direction of unity. The remarkable treatise by Mr. L. H. Morgan, published by the Smithsonian Institution, on *The Systems of Consanguinity and Affinity in the Human Family*, points in the same direction. Our limits forbid any extended citation of the opinions of naturalists upon this point. The views of Darwin and Wallace have been already given. De Quatrefages (*Rapport sur les Progrès de l'Anthropologie*, p. 128) thus sums up an extended and valuable discussion of the point in question: "The conflict between these two doctrines was originally caused by dogmatic and anti-dogmatic controversies which originated in the last century. When these controversies shall have ceased, when the feeling which they excite shall have been allayed, all wise and studious men will, I am entirely confident, accept of monogenism; for it will be necessary at last to recognize the fact that man, a simple animal so far as his body is concerned, is in this quality subject to all the laws which govern anywhere organization and life; and scientific monogenism, with which alone we are here concerned, is, at bottom, only the development of this truth."

A few years since polygenism was popularly supposed to have become the settled creed of men of "advanced" views in science. It was claimed, indeed, as one of the points which science had *settled*. The change within twenty years is noteworthy. Mr. E. B. Tylor says (art. "Anthropology" in *Encyc. Brit.*, 9th ed.): "On the whole, it may be asserted that the doctrine of the unity of mankind now stands on a firmer basis than in any previous ages. It would be premature to judge how far the problem of the origin of races may be capable of an exact solution, but the experience of the last few years countenances Mr. Darwin's prophecy that before long 'the dispute between the monogenists and the polygenists will die a silent and unobserved death' (*Descent of Man*, vol. i. p. 227)." When we recall the extreme confidence with which the doctrine of the non-unity of man was put forth by a large segment of naturalists a few years ago, we are taught the need of caution in the acceptance of scientific hypotheses, and find that fashion and authority prevail in science as well as in literature and philosophy.

Antiquity of Man.—Many attempts have been made to determine the antiquity of man by reference to the Hebrew Scriptures, the monumental inscriptions of Egypt, and the literature of Eastern nations. Jewish and Christian writers have endeavored to settle this question from the Pentateuch, but the continuity of the chronological record embodied in the Pentateuch is by no means certain; and the Masoretic Hebrew text, the LXX. version, and the Samaritan Pentateuch greatly differ in respect to their chronology, as may be seen from a table in Poole's *Genesis of the Earth and Man* (p. 90), which is reproduced in the Bible dictionaries of Dr. Smith and of McClintock and Strong under the article "Chronology." The tendency of the early Church was to conform its chronological system to the indications afforded by the LXX. Archbishop Usher (*Chronologia Sacra*, 1660), following the Hebrew text, fixed upon 4004 B. C. as the date of the creation of Adam. William Hales (*New Analysis of Chronology*, 1809–14), taking the LXX. as his guide, assigned the creation of Adam to 5411 B. C., indicating a reaction in the Christian Church in the direction of a longer chronology. At this period, it should be recollected, the question of the antiquity of man was not sharply discriminated from that of the earth. The drift of Christian opinion with reference to this subject is further illustrated in the preface to the *Oxford Chronological Tables* (1835), which says: "The Scriptures were written for nobler and more exalted purposes than the mere transmission of dates or the gratification of antiquarian curiosity; and hence we must not be surprised if, on topics connected with chronology, we fail to meet with the information we desire, and find ourselves at a loss to ascertain the precise time at which some of the most important transactions took place. This increased uncertainty, however, seems to have aroused the diligence and ingenuity of chronologers, who have compiled system upon system, without adding much to our stock of knowledge respecting the remote ages of antiquity. Thus, for example, there are not less than *three hundred* different dates assigned as the era of the Creation, varying in the extremes no less than 3000 years; and equal uncertainty, though perhaps not extending to an equal number of discordant opinions, prevails respecting other eras, and perplexes the chronological student at every step of his inquiry." The tendency of opinion among reverent students of the Scriptures is still further illustrated in the following passage from Prichard's *Physical History of Mankind* (vol. v., 1847): "By some it will be objected to the conclusions at which I have arrived that there exists, according to my hypothesis, no chronology, properly so termed, of the earliest ages, and that no means are to be found for ascertaining the real age of the world. This I am prepared to admit; and I observe that the ancient Hebrews seem to have been of the same opinion, since the scriptural writers have always avoided the attempt to compute the period in question. . . . In no one instance, as far as I can remember, . . . has any one writer alluded to the age of the world." Without further reference (which the limits of this article will not permit) to critical authorities, we may reasonably question, as the result even of this meagre and imperfect sketch of the opinions of some of the most devout and competent students of the Bible, whether it was the design of the Hebrew Scriptures to reveal either the antiquity of man or the antiquity of the earth. The tendency of opinion in this direction was marked and clear before recent discoveries of fossil remains and stone implements in the Drift formation had specially called the attention of naturalists to the general subject. A note on the chronology of Genesis in the *Speaker's Commentary* (vol. i. p. 61) affords conclusive evidence that the best scholars of the Church of England fully recognize the difficulty of determining the age of man from the Hebrew Scriptures.

Fossil human bones and stone implements had been found during the eighteenth century in such situations as led to the supposition that they were deposited in the localities where found previous to the historical period; but down to the time of Cuvier, who died in 1834, they had not been accepted by scientific men in general as affording satisfactory evidence of the great antiquity of man. From the time of Boué (1823) there was a gradual increase of evidence in this direction, but only so late as 1838 did the discoveries of Boucher de Perthes give to the question such importance as to command the attention of the scientific world. Subsequent to this time discoveries similar to those of De Perthes at Abbéville and St. Acheul have rapidly multiplied. The discovery by Dr. Keller, in 1854, of the remains of lake-dwellings in the Swiss lakes, and the exploration in 1847 of the shell-heaps in Denmark (though these remains are incontestably of a later period than those found by De Perthes), excited the public mind to great activity on this subject. These investigations have led a large majority of scientific men to conclude that this geological evidence points to a much higher antiquity for man than had been commonly assumed. Attempts have been made from this evidence to settle a definite chronology for the human race, but the results obtained in this direction have been as conflicting and unsatisfactory as those arrived at by chronological writers who proceed by other methods.

The nature of primitive man has been much discussed within a few years past under the form of inquiries into the origin of "civilization" and "culture." Some writers like Whately have taken the ground that man has never in any instance emerged from barbarism by his own powers, inferring from this assumption that civilization must have had a supernatural origin. The remains of pre-historic man which have been found over so wide a portion of the earth seem to point to a gradual development of civilization by slow degrees, and from a state of intelligence low indeed, but sufficient to generate successful efforts in the direction of higher conditions of life. These pre-historic remains have led some writers to assume a primitive state utterly savage, even below that of the most barbarous tribes at present known. But various considerations give weight to the hypothesis that primeval men started in the race of improvement from the condition of grown-up children rather than from that of brutal savages. It has been too readily assumed that the remains of pre-historic men, and the implements found with them, are proof that they led a life scarcely above that of beasts. The well-known Engis and Neanderthal skulls, though at first pressed into the service of this notion, do not on careful examination favor it. Prof. Huxley says of the Neanderthal skull that it "is by no means so isolated as it appears to be at first, but forms in reality the extreme of a series leading gradually from it to the highest and best-developed human crania." Of the Engis skull he says, "It is, in fact, a fair average human skull." He also adds the conclusion that the fossil remains of man hitherto found do not indicate a lower condition than the lowest savages of the present day. (*Man's Place in Nature*, pp. 181–183.) The Cro-magnon fossils belonging, says Dr. Dawson (*Nature and the Bible*, pp. 166–167), "to the oldest race of men known in Western Europe," present the skeleton of a man nearly six feet high, with a brain "of greater size than in the average of modern men, and the frontal region as largely developed." Gratiolet sent to the museum in Paris the skull of a modern idiot, which, though a little smaller, reproduced the Neanderthal skull in almost every particular. Quatrefages says that the Neanderthal skull "differs in nothing from the mean type of the existing Germanic races, and in no respect approaches that of the Simians." (*Rapport*, p. 251.) In regard to internal capacity of the skull, the earliest remains of prehistoric men do not essentially differ from barbarous peoples of the present day. Even the Neanderthal skull, which, in the absence of any means of comparison with other skulls of the same period and locality, may have been exceptional or that of an idiot, has been estimated to indicate a brain-cavity equal to 75 cubic inches. The collections of Drs. Davis and Morton give the average internal capacity of the cranium in the chief races as follows: Teutonic family, 94 cubic inches; Esquimaux, 91; negroes, 85; Australians and Tasmanians, 82; showing that the Neanderthal skull (which has been mainly relied on as proving the degradation of primitive man) is in brain-capacity but a few cubic inches less than that of the Bushman of to-day. A large majority of these fossil remains will compare favorably in brain-capacity with the average of living men; while the average size of the brain in the orang-utan is 28 cubic inches, and that of the gorilla 30—scarcely one-third of the average brain-capacity of existing human races. (See Wallace, *Natural Selection*, p. 338.) It may be further said that the table given by Prof. Daniel Wilson (*Pre-historic Annals of Scotland*) shows that the skulls of the pre-historic period measured by him compared with the skulls of the early historic period, which he also measured, differ from each other in brain-capacity less than those of various civilized races at the present day. Nor is the inference to be drawn from the earliest implements used by man at variance with that drawn from the form and capacity of these primitive skulls. We have before us some specimens, taken from the drift in the valley of the Somme, of the earliest and rudest stone implements that have yet been discovered. The manufacture of one of these with only such tools as the drift period could afford indicates an amount and continuity of thought and persistence of will which will compare favorably with that possessed by a considerable segment of the inhabitants of civilized countries. The implements found in the "kitchen-middens" of Denmark and the lake-dwellings of Switzerland, though confessedly of a later period, indicate not only a considerable degree of mechanical ingenuity, but an adaptation to their evident uses, and even a sense of beauty, which indicate that they are the products of beings of considerable intelligence. Quatrefages (*The Prussian Race*, p. 23) says: "Every artist will admire what is correct, firm, and true in some of the designs, graven with mere flints upon plates of mammoth teeth and upon reindeer horns, which have been taken out of the caves of the Madeleine of Langerie-Basse, etc. The ivory handles of poignards found in the caverns of Bruniquel are worthy of our best modern sculptors."

From the long infancy and early helplessness of primitive man he must, from the first, have lived in a social state. Some sort of a family or tribal organization seems to be a condition of the propagation of our species. But a social state, of whatever kind, involves a medium of communication, and for a being with the impulses and capacities of man naturally leads to the development of articulate speech. Certainly, no tribe, however degraded, has ever been found without a spoken language which involved all the essential principles of general grammar, however limited its vocabulary or imperfect its development. These languages, due, in great part, to association and convention, arbitrary, to a considerable extent, in the signs which they employ, varying indefinitely in vocabulary, even when spoken by kindred tribes, the vehicles of thought, and not merely of emotion, are to be sharply discriminated from that natural and instinctive language by which men, and to some extent the brutes, communicate their emotions to each other—the test of which is, for each species, prevailing uniformity and universal intelligibility. All attempts to trace the origin of articulate speech to that natural and instinctive language which we have just characterized signally fail from the incapacity of the theory to account for the vast change of meaning in words originally onomatopoietic, as well as for the many words in every language which are purely arbitrary and conventional. Thought and language are so connected that neither can exist without the other; and the rudest language ever spoken implies the possession, by those speaking it, of a mental constitution which is essentially the same as that of civilized man. This view is not affected by the evidence that language may have passed through successive stages of development and growth from monosyllabic through agglutinative forms to the inflectional system of the Aryan nations. For those languages which, like the Chinese, have been arrested in their course of development in the monosyllabic state, have shown themselves equal to all the requirements of literature and civilization.

The assumption that the movement of man has always been one of progress, and that the lowest forms of savage life at present illustrate everywhere an advance upon man's primitive condition, seems irreconcilable with the facts of history or of our present life. Unfortunately, there are within the ranks of every civilized society large communities of persons who, though surrounded by all the appliances of education, morality, and civilization, are, in their modes of life, habits, and instincts, savages. All know that the pauper and dangerous classes are continually recruited from the ranks of those above them. All know that these classes transmit their habits and character to their descendants, and that were it not for the constant efforts of the better portions of society, they would threaten the very existence of civilization. What is constantly seen among the paupers and criminal classes has, under certain conditions, become true of whole communities and nations. Civilization is in great part the victory of man over the forces of nature. Great changes, like the elevation or subsidence of continents, or the influence of a glacial period, producing great or sudden changes in climate on the surface of the earth, would inevitably overthrow the supremacy over nature which ages of thought and conflict had secured to man. Races and peoples who by the increase of numbers or the exigencies of war have been pushed into inhospitable climates or upon a barren soil suffer always in a few years an arrest of development or a deterioration of their intellectual and physical condition. The gradual sinking of Greenland and the Aleutian Islands are illustrations in point. Half-civilized peoples feel these influences even more severely than those who have better learned the processes by which man defends himself against the antagonistic forces of inorganic nature. The presence or withdrawal of the moral and religious agencies of civilization have wrought results for good or evil, instances of which must occur to every thoughtful reader. (See Marsh's *Man and Nature*, ch. i.; also Guyot's *Earth and Man*, p. 268.) In the absence of positive knowledge concerning the origin of the arts of life and the condition of primitive man, we see no speculative reason for assuming either a golden age or a state of bestial degradation. Nor do we see reason for giving a chronological significance of universal application to implements of stone, bronze, or iron. We may reasonably suppose that in primitive ages, as now, there were oscillations of progress and decadence. We know that the age of stone succeeded the age of copper in America, and that the use of stone, bronze, and iron has been contemporaneous in different countries. The use of these implements indicates rather states of development than periods of time. Implements of stone are in certain localities in use even at the present day.

Our limits forbid us to discuss the complicated questions which are suggested by polyandria and the abnormal conditions of life existing among the hill-tribes of India and elsewhere among degraded races. The testimony of Col. Ross King is that the hill-tribes have degenerated, and are still in process of deterioration. (*Tribes of the Nilgiri Hills*, pp. 47, 51.) The same testimony is given by Marshall. (*A Phrenologist among the Todas*, p. 268.) The considerations which have been advanced lead us to regard the opinion that primitive man started upon his career from a state of grown-up childhood as more reasonable than that which attributes to him a semi-bestial condition. Whatever can be said in favor of the opposite view may be found stated with sufficient fulness and clearness in Sir John Lubbock's *Origin of Civilization*.

If we assume the hypothesis toward which scientific opinion seems now drifting, of the unity of man's origin, man must have dispersed over the earth from a single centre. From the absence in man of natural means of protection against cold, and from other considerations which might be named, it seems most natural to suppose that man had his origin in a tropical or semi-tropical climate. Tracing back the lines of migration so far as it is possible, we find that intertropical Asia appears the most reasonable point of departure for the primitive race. This hypothesis has certainly been most widely received by scientific men, and harmonizes with any indications on this point which are contained in the Hebrew Scriptures, and with the fact that the earliest civilizations originated in that vicinity. The question of the varieties of men, and the determination of their lines of migration, are complicated with each other. It is necessary, however, to settle some proximate system of classification in order to discuss the question of migration at all. As we have already seen, a capital obstacle in the way of those who would classify man into distinct species is the absence of coincidence in the several marks of distinction upon the presence of which such classification must depend. This difficulty, which forbids us to classify man into distinct species, embarrasses us to some extent even when, accepting the unity of man, we attempt merely a classification into varieties. Every basis of classification that has been adopted has a certain value, but when we rigidly apply them they clash with each other, and bring us to confused and contradictory results. The facial angle, which was Camper's basis of classification, conspicuously fails when applied to individuals who are regarded on other distinctive marks as belonging to the same race. Classification upon the basis of the character of the hair is contradicted by the facts of color. The projecting jaw, which is claimed to be a peculiarity of the blacks, is rather a mark of degradation among peoples, either black or white, than of the blacks as a race. Illustrations of this fact are by no means uncommon among segments of the Indo-European race subjected for a considerable time to degrading influences. Color, though apparently among the most constant of marks of difference, varies so much among peoples who, judging from all other considerations, belong to the same race, that it cannot be relied on to classify the people of an entire continent or of different continents. The typical negro is hardly characteristic of the people of the African continent. According to Latham (*Man and his Migrations*, p. 147), "The negroes themselves are referable to an extreme rather than a normal type; and so far are they from being coextensive with the Africans that it is almost exclusively along the valleys of rivers that they are to be found." The Hottentots are yellow, the Caffres brown, and the Tuaricks of the Great Desert vary from the light color of the Arab to nearly black; while some Africans thoroughly black have finely-formed European features. The difference of color among the inhabitants of Hindostan is notorious. The law of consanguinity, and the formulas by which it is expressed, have been lately suggested as a possible basis for the classification of men. Tracing descent by the female line, and a complicated series of formulas indicating different degrees of relationship, have been shown to exist in closely allied forms over a large majority of the Asiatic Turanians and the native American races. Still, a large segment of undoubtedly Turanian peoples W. of the Ural Mountains, including among them the Finns and the Magyars, formulate their relationships after the ordinary European methods. (See L. H. Morgan's *Systems of Consanguinity*, in *Smithsonian Contributions* (vol. xvii.).) The failure of language to constitute a basis for the classification of man which shall be trustworthy and *universal* is obvious to the least instructed observer. The instances in which whole nations have, within the historic period, laid aside the language of their forefathers are numerous. Notwithstanding this fact, however, it may be questioned whether a language which has once been spoken by a large body of people is ever completely eradicated. Names of places and certain elements of the vocabulary always remain, so that minute investigation to a certain extent neutralizes the defect of which we have spoken. The French is substantially a Latin tongue, but the considerable number of Celtic and German words in its vocabulary shows that the French people were not originally a Latin race. The investigations of William von Humboldt regarding the aboriginal inhabitants of the Spanish peninsula are a remarkable illustration of the possibility of finding and interpreting the fossil remains of a speech which for ordinary purposes of life had been superseded. Basque words fastened to the most prominent physical features of Spain and its oldest towns go very far to prove that the Basques were its aboriginal inhabitants. On the whole, language furnishes the solution of a greater number of ethnological problems than any other mark of race-affinity. Prichard's *Eastern Origin of the Celtic Nations* is a remarkable illustration of the immense value of language for establishing affinities which other lines of inquiry could never have revealed. The truth is, all these bases of classification have value, and must enter as factors into any adequate classification of the human race. (For a discussion of the extent to which language has contributed to ethnological science see *Christian Review* for July, 1859.) The following classification of the principal human races—which is mainly that of Latham—is, like all other classifications that have been proposed, measurably provisional and defective. (For detailed accounts of various tribes and races we refer to their titles in the body of this work.)

A. ASIATICS AND NORTHERN EUROPEANS—POLYNESIANS—AMERICANS.

Class I. Mongolians.—Area, Northern, Central, and South-eastern Asia; Northern Europe.

Division 1 (languages monosyllabic).—The Chinese, the Siamese, the Burmese, Thibetans, the peoples of the Indian Archipelago, and various smaller tribes.

Division 2. *Turanians* (languages other than monosyllabic).—Groups: (1) The Mongolians proper, occupying the great central steppes of Asia. (2) The Turks, by which we understand not merely the Turks of the Ottoman empire, but their congeners in Independent and Chinese Tartary, Bokhara, some tribes of the Caucasus, Crimea, and Northern Siberia. (3) The Ugrians, occupying an area which is pretty equally divided by the Ural Mountains. The most prominent representatives of the western Ugrians are the Lapps and Finns and the Magyars of Hungary, the latter having intruded on the country which they occupy in the tenth century. Possibly, the Eskimo and some of the Kamschatkan tribes must be added to this group. (4) The Tungús, occupying an area to the N. and E. of the Mongolians proper. (5) The Peninsular group, including the Coreans, Japanese, Kurile Islanders, Kamskadales, and Koriaks, whose affinity for each other is acknowledged to be doubtful.

Class II. Iranians, who may be grouped as follows: (1) *Persians*—divided into Persians proper, Kurds, Bilúch, Afghans. (2) *Paropamisans*—occupants of the Kohistan of Cabul. (3) *Armenians*—who are scattered beyond the limits of the country which bears their name. (4) *Dioscurians* (or Caucasians, in the limited and more recent sense of the term)—including the Circassians, Georgians, and other cognate tribes.

Class III. Indians (Asiatic).—These may be divided into two families—the northern, or Sanskritic, and the southern, or Tamul—which in many localities are so blended and interwoven with each other as to make any accurate discrimination, whether of race or language, extremely difficult. To the Sanskritic family belong, on the basis of language at least, the peoples speaking the Hindi, the Bengali, the Mahratta, and other less important tribes. The Hindostani is, according to Latham, "a Lingua-Franca rather than a true native form of speech." The Gypsies are, both on linguistic and physical considerations, to be referred to the Sanskritic branch of the Indic race.

Class IV. The Oceanic Stock, which may be divided into—1. *The Amphinesian*—of the Mongol rather than the African type, and with language akin to the Malay. This division may be subdivided into—(1) Protonesians, or occupants of the Indian Archipelago and Chinese Sea, Sumatra, Borneo, Java, Moluccas, Philippines, and, in general, those islands (*νῆσος*) which were first (*πρῶτος*) occupied from the Eastern continent; (2) Micronesians of the Caroline and Marianne Isles; (3) Polynesians of the South Sea Islands in general. from the Sandwich Islands to New Zealand, from the Fijis to Easter Island: (4) Malagasi of Madagascar. 2. *The Kelænonesians*—of the African (*κελαινὸς*) rather than the Mongol type, and with slight affinities in language to the Malay. This division may be subdivided into—(1) The Papuans of New Guinea, Louisiade, New Hebrides, Tanna, Mallicollo, and New Caledonia; (2) Tasmanians; (3) Australians. (See Earle, *Papuans.*)

Class V. The American Stock.—1. *Eskimo and Algonkin Stocks.*—Beginning with the coast of Greenland, we find the Eskimo extending along the Arctic shores to Asia. On the N. E. coast of the Atlantic we meet the Algonkin stock, which extends S. from the Eskimo line to North Carolina on the sea-coast, and in the Mississippi Valley to the mouth of the Ohio River, with outlying tribes as far S. as the Tennessee. It also has a north-western extension, reaching through Canada to the valley of the Red River of the North, the Saskatchewan, and the northern portion of the Rocky Mountains.

2. *The Iroquois Stock* was found mainly in New York, its range extending from the Hudson to the valley of the Genesee, the Susquehannas extending into Pennsylvania, and the Tuscaroras so far S. as North Carolina, whence they migrated northward about 1711.

3. *The Dakota and Sioux Stock* seems to have originally occupied the territory between the head-waters of the Mississippi and Missouri rivers. It extended, at a later time, to the Rocky Mountains, and S. till it included the Black Hills. It reached S. from the Niobrara River to the mouth of the Missouri, and down the Mississippi to the Arkansas.

4. *The Gulf Tribes* occupied the territory S. of the Tennessee to the Gulf of Mexico, and from the Mississippi to the Atlantic.

5. *The Athapascan Stock* extended from Hudson's Bay westward, in the extreme North-west, to the Pacific.

6. *The Shoshone and Snake Tribes* spread S. from the Lewis branch of the Columbia to Utah, including the Utes, the Comanches of Texas, and some scattered tribes in Lower California.

The mound-builders of the Western States, who were replaced, before the discovery of America, by less civilized tribes, would seem to have been connected with the semi-civilized tribes of New Mexico. The semi-civilized populations embraced Mexico, Yucatan, and Central America, and may be traced northward to Cape Honduras and the Mosquito Shore. The similar civilization in South America was confined to Peru and the elevated table-land of New Granada. (Gallatin, *Am. Eth. Soc. Trans.*, vol. i. p. 1.) Analysis of the uncivilized tribes of South America must be omitted. (See Latham, *Varieties of Man*, p. 459.) The languages of the tribes extending over the immense area from the Arctic to Cape Horn, though dissimilar in their vocabularies, are so uniform in their structure and grammatical forms that they are considered to belong to one great stock. (Gallatin, *Ibid.*, p. 10.) The Otomi, whose habitat is the N. E. portion of Michoacan in Mexico, speak a language supposed by some to be exceptional from its monosyllabic character. But there is good reason to connect it with the American languages in general, rather than with any Eastern monosyllabic tongue. (*Ibid.*, p. 403.) The partial civilization of the Peruvians and Mexicans is thought by some to segregate them in origin from the other American tribes. There is reason to believe that the exceptional character of this civilization has been very much overrated. It was in all probability indigenous, and the organization of Mexican society appears to have been a natural development of a system widely prevalent among the less civilized or barbarous American tribes. The Indian tribes have suffered great displacement since they have been known to civilized man, and are now in constant change. The migrations of these tribes, actual and probable, are worked out in the article on Migrations of the American Aborigines, by Hon. Lewis H. Morgan, LL.D.

B. CENTRAL AND SOUTHERN EUROPEANS.

The principal races of this region are to be referred, on both linguistic and historic grounds, to one family, the *Indo-European*, so called because it had its possible origin, certainly its early abode, on the banks of the Indus, whence it has overspread the principal portion of Europe. To this family belong the Sanskritic division of the Indic group and the Iranian group, which have already been mentioned in their appropriate locality. The European division of the Indo-European family includes—

I. The Celtic, which may be divided into (1) the Cymric; (2) the Gaelic.

II. The Italic, including—(1) the ancient races of the Italian peninsula; (2) the Latin race and its lineal descendants.

III. The Hellenic, including the various tribes of ancient Greece and Southern Italy, with their descendants, and possibly the Albanian or Skipetar, though in regard to this last point there is considerable doubt.

IV. The Lithuanic, occupying a narrow belt extending from the Gulf of Finland to the Vistula, and represented by the peoples of Livonia, Courland, and Old Prussia. (See Quatrefages, *The Prussian Race.*)

V. The Teutonic, which may be subdivided into—(1) the Low German peoples, including the Frisic, Dutch, and English; (2) the High German, or German in the modern sense of the term; (3) the Scandinavian, including the Icelandic, Danish, Norwegian, and Swedish.

VI. The Sclavonic, of which the Russians and the Poles are the prominent representatives.

We have already recognized the fact that the Lapps and Finns and the Magyars of Hungary are of "Ugrian," the Turks of "Mongolian" stock, and that the connection of the Skipetar or Albanians with the Indo-European family is doubtful. The Basques—whose habitat is in the S. of France and N. of Spain, in the vicinity of the Western Pyrenees—must also, on the ground of language and other considerations, be regarded as standing apart from the Indo-European family.

C. AFRICANS AND SOUTH-WESTERN ASIATICS.

This class may be divided into the following groups:

1. *The Semitic*, including, in Asia, the Syrians, Assyrians, Babylonians, Phœnicians, Ammonites, Moabites, Ishmaelites, Edomites, Samaritans, and Jews, with their colonies; in Africa, the Abyssinians of Tigré, the Abyssinians speaking the Amharic language, and the Gafat Abyssinians, and (as sub-Semitic) the Berber and the Coptic tribes.

2. *The Nilotic* tribes, which may be grouped as (1 and 2) the Nubians and Bishari, approximating to the Copts; (3) the Agows, resembling the Abyssinians; (4) the Gallas, having both Semitic and Kafre characteristics.

3. *The Kafres*, extending from the parts N. of the equator, on both sides of the continent, to the Hottentot frontier, and, in the hottest and moistest portions of their habitat, nearly akin to the negro type.

4. *The Negro*, subdivided into numerous petty tribes (which vary in color and physiognomy from the typical

black according to locality), occupying the centre of the continent S. of the equator.

5. *The Hottentot*, who, according to Latham, "has a better claim to be regarded a separate species of the genus *Homo* than any other section of our kind," occupies the southern portion of the African continent.

The Migrations of Man.—We can give but little space to the general subject of the migrations of man. Those which are actually taking place at the present time are as rapid and extensive as any which have occurred in the past. From these we may infer the possibility of those which are indicated by linguistic and archæological considerations. The movement of the Indo-European family, which spread from the Ganges to Iceland, though pre-historic, is now unquestioned. The Turks have come from the heart of Asia within a few centuries, occupying and controlling the whole region around the Levant. The Hungarians from the N. of the Caspian are settled in the Carpathian valleys, retaining the language which connects them with the Vougouls and Ostiaks. Soon after the Christian era the Germanic peoples proper spread from their narrow habitat S. of the Baltic to Poland on the E. and to Scotland in the W. The allied Scandinavians pushed the Lapps and Finns to the extreme N., occupied Iceland, the islands N. of Scotland, and contributed an important element to the population of Great Britain. The Slavonians, receding before the encroachments of the German area, have spread eastward over the greater part of European Russia, before occupied by tribes of Tartars. The Slavonic movement eastward in Siberia and Central Asia is a constant topic of newspaper comment. The migration of Spanish, French, Africans, and especially English and Germans, to the American continent surpasses enormously in number that of the barbarians who absorbed the Roman empire of the West. The Arabian change of habitat under the impulse of Mohammed and his successors is familiar to all. Though the power of this impulse as affecting Europe and Asia seems nearly spent, it is still vital as an encroaching, and to some extent as a civilizing, force in the interior of Africa. The immense range and permanence of these changes of habitat prove that men of all races are capable of acclimatization in localities the most distant and different from those of their origin. It shows that man's intelligence enables him to win a livelihood in the most inauspicious situations—that, unlike the animals, he is able to set at defiance the most formidable and active forces of heat, cold, and insalubrity, and to subject to his supreme control all the kingdoms of nature.

The literature of this subject is vast, and it is perhaps better to refer (in addition to those works specially noted in the text) to a few books which contain, in their references, the bibliography of the subject, than to use space in the enumeration of titles. Prichard's *Researches into the Physical History of Mankind* (1841–47, 5 vols.) is very full, giving sources of information down to the date of its publication. The *Rapport sur les Progrès de l'Anthropologie*, by De Quatrefages (1 vol., Paris, 1867), contains a detailed and elaborate bibliography of works bearing on the various divisions of the science of man. Waitz's *Anthropologie der Naturvölker* (5 vols., 1860–70) is also extremely full in references. These, with the well-known anthropological journals and volumes of transactions of anthropological and ethnographical societies of England, France, Germany, and the U. S., will be found more useful to the investigator than any collection of title-pages without critical estimates of the works named. M. B. ANDERSON.

Man, Isle of, an island of Great Britain, in the Irish Sea, comprises an area of 145,325 acres, half of which is cultivated, and has a population of 53,738. It is traversed from N. to S. by mountain-ranges whose highest peak, Sneafell, rises 2024 feet above the level of the sea. Black marble, copper, zinc, and iron occur; lead is abundant. Agriculture and cattle-breeding are pursued to some extent, the climate being very favorable; the soil, however, is only mediocre. The fisheries are rich. The inhabitants are of Celtic race, and still speak a language of their own, the Manx language, although the English language is generally understood. The government is vested in a governor appointed by the Crown, and the court of Tynwald, with which the legislative and judicial authority rests. Principal town, Castletown.

Manaar', Gulf of, a wide inlet of the Indian Ocean between Ceylon and the southern extremity of Hindostan, and separated from Palk's Strait by the islands of Ramisseram and Manaar, and a low reef called Adam's Bridge.

Manacor', town of Spain, on the island of Majorca, 3 miles E. of Palma, is a summer resort of the nobility of the island, and a handsome and thriving town, with considerable trade in wine, oil, fruits, and corn. Pop. 14,894.

Mana'gua, the capital of Nicaragua, stands on the southern shore of the lake of the same name, in lat. 12° 7′ N., lon. 86° 12′ W., surrounded with rich coffee plantations. The town owes its rank as a capital partly to its central position, partly to the rivalries of the cities of Grenada and Leon. Pop. about 12,000.

Managua, Lake of, a body of water in Nicaragua, 40 miles long, 16 miles wide, and from 2 to 40 fathoms deep, which has played a conspicuous part in the various projects of interoceanic communication. It is situated 157 feet above the Pacific, and its northern shore, where the volcano of Momotombo projects boldly into its waters, is separated from the ocean only by the plain of Leon, 15 miles broad and elevated about 50 feet above the level of its waters. At its southern extremity it is connected with Lake Nicaragua by the river Tipitapa or Estero de Panaloya, which carries a considerable body of water during the rainy season, but which is nearly empty during the dry. The difference of level between the two lakes is about 28 feet at average stages of water, and it has been proposed to build a canal between the two lakes by deepening the Tipitapa and constructing a series of locks to the superior lake.

Man'akin, a name given to the rather numerous species of birds of the family Ampelidæ, sub-family Piprinæ, and genera *Phœnicercus*, *Pipra*, *Rupicola*, *Metopia*, and *Calyptura* (South American), and the Old-World species *Calyptomena viridis* (green manakin), from Java and Sumatra. The male manakins are beautifully colored. All the birds of this species feed indiscriminately on animal and vegetable substances and are very active in their movements.

Green Manakin.

Man and his Migrations. See MAN.

Manas'sas, city and tp. of Prince William co., Va. (see map of Virginia, ref. 4–H, for location of county), on the Washington City Virginia Midland and Great Southern R. R., at the junction of Manassas Gap R. R., 35 miles from Washington, D. C. The city is incorporated, and governed by a mayor and council. Pop. in 1870, of city, about 680; of tp. 1645; in 1880, of city 361; of tp. 1949.

Manassas Junction, Battle of. See BULL RUN, BATTLE OF.

Manas'seh, the eldest son of Joseph; was adopted by Jacob on his deathbed, and became the head of a tribe of Israel, which numbered 32,200 warriors on the exodus from Egypt and 52,700 on the entrance into Canaan. It received land on both sides of the Jordan—on the western side, between the tribes of Issachar on the N. and Ephraim on the S.; on the eastern side, N. of Gad. In the eastern part lay the towns of Gadara, Gamala, Jabesh-Gilead, Gerasa, and others.

Manasseh, the fourteenth king of Judah, a son of Hezekiah; reigned from 696 to 641 B. C.; became an open idolater; was taken prisoner by the king of Assyria, and detained for several years at Babylon, but repented and was restored to his kingdom. The apocryphal composition called *The Prayer of Manasseh* is received as canonical by the Greek Church.

Manatee′ [Haytian], a genus of herbivorous marine animals, called "sea-cows." They are usually associated with the order Cetacea, the external features being closely allied thereto; the internal structure, however, places them near the Pachydermata. At present they are included within the family Manatidæ, which numbers also the Indian dugong (*Halicore dugong*) and Steller's rhytina (*Rhytina Stelleri*), the latter now extinct. Three species of *Manatus* are known—the Mexican sea-cow (*Manatus latirostris*), found in Florida, on the Mexican shores, and in the West Indies; the lamantin (*M. Senegalensis*) of the western coast of Africa; and the *Manatus australis* of the tropical portions of South America. The adult manatee is a clumsy oval form, about nine feet in length, though individuals are sometimes found much exceeding this. It has a tough hide, resembling that of the pachyderms, sparsely beset with short, stiff hairs. The flippers are furnished with flat nails. The posterior extremity is flattened and expanded horizontally like that of the whale, and constitutes a very large proportion of the whole body. It has thirty-two molar teeth, eight on either side, above and below. The canines and incisors are absent, except in extremely young individuals. All members of the family are vegetable eaters, and are often spoken of as herbivorous Cetacea. The intestinal canal is of extraordinary length, measuring in the *Rhytina* nearly twenty times the entire length of the animal. Their favorite food is the coarse fuci and the herbage that grow along the shoal waters at the mouths of rivers. The manatee is able by aid of its flippers, which are provided with stout nails, to climb on shore and browse on the rushes and other plants growing near the water. A specimen of the *Manatus latirostris* was kept alive at the Central Park Zoological Gardens, N. Y., during one summer, but the cold of the later season proved too severe for it. This individual measured nearly seven feet in length, and weighed 450 pounds. Its circumference was four feet and nine inches. It manifested at times a certain species of playfulness, and readily responded to the call of its keeper. At such times there was quite perceptible a peculiar sound, resembling the squeak of a mouse. It uniformly ate its food under water; rushes and fuci were always drawn down from the surface, and masticated under water; leaves of the canna proved an acceptable diet. It usually remained immersed five or six minutes. The immense size and strength of these creatures is exhibited in a late account, by Mr. Charles Lanman, of a fight between the Mexican sea-cow and a jaguar. The latter animal was beaten so furiously by the tail of the manatee that it was soon disabled, and finally was crushed underneath the huge form until its back was broken. The length of this manatee was eighteen feet. J. B. HOLDER.

Manayunk′, a part of the 21st ward of Philadelphia, Pa., on the E. bank of the Schuylkill River and on the Reading R. R., is connected with the heart of the city by steam and horse cars, by steamboat, and by an excellent highway. It has water and gas works, excellent postal and telegraphic facilities, and a large number of stores of every variety, in addition to a good market-house. The Schuylkill Navigation Company's canal begins at the lower part of the town, and extends nearly 2 miles up the river near its bank, affording fine facilities for manufacturing purposes. The town is celebrated for its cotton, woollen, and paper mills. Within its limits are about 30 manufacturing establishments, with a capital of $6,000,000, whose annual product amounts to $10,000,000. Pop. about 10,000.

Mancha, La, an old province of Spain, comprising the modern province of Ciudad Real and portions of Toledo, Albacete, and Cuenca. It occupies the bare and monotonous elevated plateau of Central Spain, which is bounded S. by the Sierra Morena and N. by the Alcarria. It is sparsely peopled, and this circumstance, in connection with scarcity of water and the total absence of trees, gives the whole region the dismal aspect of a desert. Nevertheless, whenever a little irrigation is attempted—and there is no difficulty in reaching water by digging—great crops of wheat, rye, barley, wine, oil, flax, etc. are raised. The mules reared in the province are considered the best in Spain, and the mineral wealth is considerable, quicksilver being produced at Almaden, saltpetre at Herencia and Alcazar de San Juan. The principal towns are Almodovar del Campo, Ciudad Real, and Valdepenas. The province, of which, during the Middle Ages, the eastern portion was known as La Mancha de Aragon and the western simply as La Mancha, is the scene of *Don Quixote*.

Manche, department of France, bordering on the English Channel. Area, 2263 square miles. Pop. 526,377. The ground is mostly low, and in many places even marshy, though a range of hills traverses the department from N. to S., being connected with the hills of Maine and Brittany on the S., and at various places forming quite picturesque landscapes. The soil is fertile, and grain, flax, hemp, and apples are produced; 44,000,000 gallons of cider are made annually. Large cattle and very strong horses are reared; also many sheep, but of an inferior kind. Of the entire area, more than one-half is arable; 198,000 acres are meadow, 52,000 woods, and 82,000 heaths. The rearing of horses and livestock is a particular industry of the department. In 1881 it possessed 92,839 horses (besides several thousand asses and mules), 270,000 horned cattle, 277,000 sheep, about 100,000 pigs, and 40,000 beehives. The coast is often inhospitable and dangerous. Between it and the Channel Islands the tide flows with tremendous force; the great Bay of Mont St. Michel, comprising an area of 60,000 acres, was covered with forest until swallowed up by the tide of the year 709. Cap. St. Lô.

Man′chester [Sax. *Mamchestre*; Lat. *Mancunium*], a city of England, Lancashire, on the Irwell, consists of Manchester proper, on the western bank of the river, and Salford, on the eastern, connected by eight bridges, and virtually constituting one town, though having separate municipal governments. It is the greatest cotton-manufacturing centre in the world. Its textile fabrics, the so-called "Manchester cottons," were mentioned in the fourteenth century. In the seventeenth the place was spoken of as one of the thriftiest towns of England. In 1780 it imported 6,700,000 pounds of raw cotton, and the value of the exports of its cotton manufactures amounted to £355,060. But the importation of raw cotton rose in 1800 to 56,000,000 pounds, and in 1860 to 1,115,890,608 pounds, and the value of its exports increased from £1,101,457 in 1781 to £56,000,000 in 1856. Though the American war at one time threatened to interfere seriously, the difficulty was only temporary; and the cotton industry of Manchester is still on the increase, employing about 44,000 hands and 22,000 steam-powers in 1400 factories. It must not be supposed, however, that cotton manufacture, though the principal branch of industry, is the only one carried on on a great scale in Manchester. On the contrary, the enormous wealth of coal which the surrounding region possesses has called into life and made prosperous almost every kind of manufacturing industry. Large quantities of woollens and silks are manufactured, though for some years the latter industry has been on the decline. Machinery and tools, from philosophical instruments to steam-engines, and all those miscellaneous and multifarious articles designated as "smallwares," give occupation to many hands. The chemical factories are also of vast dimensions. The spirit of this busy hive is shown by the many industrial inventions and improvements by Leigh, Hughes, Arkwright, Hargreaves, Watt, and Stephenson, which either originated or were first adopted here. One of the finest canal works in the world, the Bridgewater Canal, and the first railway ever in active operation, were built between Manchester and Liverpool. The ideas of free trade originated here, and here was established the first free-lending library in England. The city has over 200 places of worship, and a great number of charitable, benevolent, and educational institutions, though the latter are said to be insufficient for the teeming population. The principal educational institutions are the Victoria University; the Mechanics' Institute, founded in 1825 and enlarged in 1856, for the purpose of instructing the working classes in the principles of the arts and other useful knowledge; the Royal School of Medicine and Surgery, founded in 1824; the Literary and Philosophical Society, founded in 1781, etc. The Victoria University is simply a development of the Owens College, which was founded in 1846 by John Owens, who left £100,000 for an institution in which all the regular university branches of learning should be taught. By private subscription the funds of the institution were raised in 1867 to £400,000, and in 1880 its charter as a university was granted. But in spite of many recent improvements the city is still one of the unhealthiest in England. The drainage of the ground has been greatly improved; new and wider streets have been opened; parks have been formed—Queen's Park, Phillips Park, and Alexandra Park in 1870; good water has been procured, led into the city through an aqueduct 20 miles long. Nevertheless, the annual death-rate is 3.2 per cent. In architectural respects the city is not very remarkable, though some of its public buildings, such as the town-hall, the Royal Exchange, the assize court, etc., and also many of its warehouses, factories, and residences, are splendid structures. The old town-hall, built in 1832, was rather a stupid thing—an imitation of the Erechtheum of Athens—but it is now used for the town library, to which purpose its style corresponds better. The new town-hall—

which is probably the largest and most important municipal building in Europe—was completed in 1877, and is built in a loose Gothic style quite appropriate. It covers an area of 8000 square yards and contains two hundred and fifty rooms. The great hall is 100 feet long and 50 feet broad. The principal tower is 260 feet high and affords an extensive view of the southern part of Lancashire and Cheshire. The cathedral, 216 feet long and 120 feet wide, in Gothic style, was built in 1422, but has undergone many changes. The population of Manchester was 240,367 in 1841, 338,722 in 1861, 351,189 in 1871, 341,414 in 1881; and of Salford, 113,023 in 1841, 102,449 in 1861, 124,801 in 1871, 176,235 in 1881. The marked decrease in the population of Manchester and the corresponding increase in that of Salford simply mean that various city improvements and increase of rent have reduced the number of inhabited houses in the centre of Manchester. That part of the city is now the seat of its commercial and distributing activity, while the factories and storehouses have been removed to the outskirts.

Of the oldest history of Manchester nothing is known with certainty. There was a Roman station in the vicinity, and Roman remains of various descriptions, and dating from the period between Vespasian and Constantine the Great, have been found. From the Roman period down to the beginning of the tenth century the history of the city is wholly legendary, but in 923 it was devastated by the Danes, and Edward sent a portion of his Mercian troops to repair and garrison it. In the twelfth century its woollen manufactures began to develop. In 1301 it received its charter of municipal liberties and privileges. From the beginning of the seventeenth century it has gradually but steadily grown into what it now is—a manufacturing centre of the very first rank. (See *Manchester Ship-Canal*, in Ship-Canals.)

Manchester, R. R. junction, Hartford co., Conn. (see map of Connecticut, ref. 4–D, for location of county), 8 miles E. of Hartford. The extensive manufacturing establishment of the Messrs. Cheney Bros., which alone gives employment to 1000 operatives, is located here. The works occupy about 8 acres. Manchester is also famous for the large number of its paper-mills, of which there are 12 or 15 in a flourishing condition. The extensive mills of the Union Manufacturing Co. are here. There are in addition several stockinet, cotton, woollen, needle, and other factories. Pop. of tp. in 1870, 4223; in 1880, 6462.

Manchester, on R. R., Delaware co., Ia. (see map of Iowa, ref. 4–J, for location of county), 47 miles W. of Dubuque, on the W. branch of the Maquoketa River, has a high school and several large mills and shops. Principal business, farming. Pop. in 1880, 2275; in 1885, 2338.

Manchester, cap. of Clay co., Ky. (see map of Kentucky, ref. 4–I, for location of county), 85 miles S. E. of Lexington, in a region abounding in coal, iron, and salt. Pop. in 1880, 97.

Manchester, R. R. junction, Washtenaw co.. Mich. (see map of Michigan, ref. 8–J, for location of county), 55 miles W. of Detroit. It has ample water-supply, saw and planing mills, foundry and machine-shops, a large brewery. and also possesses medicinal springs. Pop. in 1880, 1156.

Manchester, city and important R. R. centre, one of the caps. of Hillsborough co., N. H. (see map of New Hampshire, ref. 10–E, for location of county), on both sides of the Merrimack River, lat. 42° 53′ N., lon. 71° 31′ 9″ W., 16 m. S. from Concord, was the first city incorporated in the State, is one of the largest and richest, produces nearly one-fifth of its manufactured goods, and is one of the principal cities in the U. S. in the value of cotton and woollen manufactures. It was settled in 1722 by the descendants of the Scotch-Irish Presbyterians, and was incorporated in 1751 as the town of Derryfield. Its name was changed in 1810 to Manchester, and it was made a city in 1846. It owes its extraordinary growth since 1838 to the Amoskeag Manufacturing Co., which controls the water-power of the Merrimack. It has a Roman Catholic convent and orphan asylum. The city is compressed into a square mile upon the eastern side of the Merrimack, into which, just opposite, the Piscataquog River empties. It contains the State reform school, county jail, and county court-house. It has a system of waterworks, completed in 1874 at a cost of $600,000, with a reservoir of 16,000,000 gallons capacity, fed from Lake Massabesick, which is 4 miles from the city hall, and contains 2300 acres. It has a free library of 18,000 volumes, established in 1854, 5 public parks in the heart of the city, and 2 cemeteries. It has paid police and fire departments, 4 steam fire-engines, and a fire-alarm telegraph. The census of 1880 shows 121 manufactories; capital, $15,149,153: average number of hands employed, 10,838; wages paid during the year, $3,370,404; value of products, $14,136,305. The Amoskeag Falls, with a fall of 54 feet 10 inches, the highest on the Merrimack River, supply the water by two canals of a joint length of 2½ miles for four large corporations—the Amoskeag Manufacturing Co., Stark Mills, Manchester Mills, and Langdon Mills, which have, in the aggregate, 300,000 spindles and 7600 looms, a capital of $6,750,000, and a pay-roll of $265,000 a month, and make about 140 miles of cloth a day, including sheetings, drillings, delaines, seamless bags, etc. The Amoskeag Co.'s machine-shop makes 50 steam fire-engines a year, and the Manchester Locomotive Works, with a capital of $150,000, are able to turn out 14 locomotives a month. Other manufactories make 160,000 dozen pairs of stockings a year, 4 tons of paper a day, and a large amount of edge tools, files, machinery, carriages, leather, boots and shoes, woodwork, and ale. Pop. in 1870, 23,536; in 1880, 32,630.

Manchester, Adams co., O. (see map of Ohio, ref. 8–D, for location of county), on the N. bank of the Ohio River, 75 miles E. of Cincinnati, has a furniture manufactory, 4 large mills, and is the shipping-point for the agricultural products of the surrounding country. Pop. of v. in 1870, 942; in 1880, 1455.

Manchester, cap. of Coffee co., Tenn. (see map of Tennessee, ref. 7–F, for location of county), 70 miles from Nashville, on a branch of the Memphis and Charleston R. R., and on the Bark Camp fork of Duck River, has a college. Pop. in 1870, 500; in 1880, 438.

Manchester, on R. R., one of the caps. of Bennington co., Vt. (see map of Vermont, ref. 9–B, for location of county), 30 miles S. of Rutland and 60 N. of Troy, N. Y., is a famous summer resort, has about 3 miles of marble sidewalk, beautiful drives and mountain scenery, Burr and Barton Seminary, and a classical school for both sexes. Pop. of tp. in 1870, 1897; in 1880, 1928.

Manchineel′ [Sp. *mancinilla*, a "little apple," so called from the appearance of the fruit], the *Hippomane mancinella*, a very poisonous evergreen tree of the West Indies, belonging to the order Euphorbiaceæ. Its white *latex* or juice burns the skin upon which it falls. To taste its fragrant fruit would be dangerous were it not that the mouth is at once blistered by it. It is affirmed that men have died from sleeping in its shade, but it is believed that the bark of the *Bignonia leucoxylon* (which often grows near by) is an antidote to the poison. The beautiful wood is of excellent quality, but is poisonous even when dry. The bastard manchineel of the West Indies is the *Cameraria latifolia* of the order Apocynaceæ. It is also poisonous.

Manchooria. See Mantchooria.

Mancini is the name of an Italian family which during the minority of Louis XIV. played a very prominent part in the history of the French court. The father, Michele Lorenzo Mancini, married in 1634 a sister of Cardinal Mazarin: she bore him five daughters, and to provide for this "battalion of nieces" by means of good marriages was for several years the principal lever of the policy of the uncle. I. Laure (1635–57) married the duke of Mercœur, and was mother of the duke of Vendôme. II. Olympe (1639–1708) married the prince of Carignan, and was mother of Prince Eugene. III. Marie (1640–1715) married Prince Colonna, but left him and died in obscurity. She was very far from being handsome—tall, meagre, yellowish, with a very large mouth and not very expressive eyes—but she was intellectual, she sang Italian songs in a most charming manner, and the young Louis XIV. became so enamored with her that he proposed to marry her, which, however, was prevented by her uncle. IV. Hortense (1646–99) married the marquis of La Meilleraye, who assumed the title of duke of Mazarin. V. Marie-Anne (1649–1714) married the duke of Bouillon. They were all at one time or another the mistresses of Louis XIV. Most of them were divorced by their husbands, and some of them were suspected of having been poisoners.

Manci′ni (Pasquale Stanislas), b. at Naples about 1820; at an early age became prominent as a publicist; took a lively part in the Neapolitan movements of 1848, after which he retired to Turin with his wife (the gifted poetess, Laura Beatrice Oliva Mancini, who d. in 1869), and there practised with great success as an advocate. In 1851 he was elected professor of international law in the University of Turin, where his lectures were enthusiastically applauded. In 1855, Cavour invited Mancini to take part in the Consiglio del Contenzioso Diplomatico. As an opposition member of Parliament the speeches of Mancini were listened to with lively interest. In 1862 he was for a short time minister of public instruction while Rattazzi was president of the council. He afterward lived in Rome, being at the same time a deputy in Parliament, a professor in the university, and an active advocate. In the peace conference at Ghent in 1873, Mancini, as representative from Italy, was chosen president of the congress. He published at Naples in 1873 his *Prelezioni di Diritto Internazionale,* and also an admirable essay on Macchiavelli. Minister of foreign affairs 1881–83.

Man'co Capac', the founder of the Inca dynasty of Peru, represented by the traditions of the Peruvians as a man of fair complexion from a distant land, who with his sister and wife, Mama Oello, appeared on an island in the Lake of Titicaca several centuries before the Spanish conquest, professing to be children of the sun, becoming the instructors of the Peruvians in religion and civilization, and the builders of the city of Cuzco. (See Peru.) A reputed descendant, called Manco Capac II., brother of Atahuallpa, was placed on the throne of Peru as nominal sovereign by Pizarro in 1534, escaped from tutelage the following year, assembled his people and besieged Cuzco unsuccessfully (1536), and carried on a desultory warfare until killed by soldiers of Almagro's faction in 1544.

Manda'mus, in law. The writ of mandamus is a command issued—in England by the court of king's bench, in this country by any superior court upon which the jurisdiction has been conferred—directed to an inferior tribunal, an officer, or a corporation, and requiring them to do some particular thing therein specified which belongs to their office or duty. In all ordinary cases where the primary rights of the citizen have been violated the remedies to which he is entitled can be obtained by actions. But it sometimes happens that persons clothed with official or quasi-official authority, and thus having the power, as a part of their public functions, to perform certain acts in which a private citizen is interested, become charged with a duty towards such citizen, who in turn acquires a right against them to demand that the acts in question should be performed. If the official persons neglect or refuse to fulfil the obligation which thus rests upon them, it may be that the injured party can obtain no adequate remedy by means of an ordinary action, and for this case the English and American law furnishes the high and most effective remedy of mandamus, by which the very thing that ought to be done is ordered to be done, and the relief is therefore specific, complete, and absolute. The rules of procedure require that the prosecution shall be in the name of the State or the people as the plaintiff, with the private complainant as the relator—that is, the promoter of the proceeding—but this connection of the State is merely nominal: the judicial process is as completely under the control of the injured person who seeks redress by its means as though it were a common suit at law or in equity. From the foregoing description it may be seen that the three following requisites must exist in order that a mandamus may be granted: (1) A right that some act should be done by an official or quasi-official person pertaining to his special functions and duty; (2) a corresponding legal obligation resting upon such person to do the act in question; and (3) the absence of any other adequate legal remedy for the non-performance of the obligation. When all of these essentials exist the writ of mandamus is the proper mode of obtaining relief, and its application is thus exceedingly extensive. It is a means by which the higher judiciary, representing the majesty of the State, can exercise a controlling influence not only over the inferior tribunals, but over ministerial, administrative, and executive officers; by it the hierarchy of officials may be taught that they are subject to the law, and abuse of power, neglect of duty, and arbitrary conduct in its discharge may be effectually prevented. One universal principle regulates its use: it is never employed to interfere with or to control the exercise of a discretion, but only to compel the performance of a fixed and certain legal duty. When directed, therefore, to an inferior tribunal, or to persons whose functions are judicial, it only commands them to adjudicate upon the matter described and to render some decision; when directed to ministerial officers, it commands them to do some specific act, but the act must be one which they are legally obliged to do as commanded, and in respect to which they are not clothed with a discretion. Mandamus may also be used against a corporation, on account of its quasi public nature, to compel it or its officers to perform acts required by law; as, for example, to admit or restore a member legally entitled. John Norton Pomeroy.

Man'dan, cap. of Morton co., Dak. (see map of Dakota, ref. 4–C, for location of county), on Northern Pacific R. R., 5 miles W. of Bismarck. Pop. in 1880, 239; in 1885, 2263.

Man'dans, a tribe of Indians of the Dakota family, on the upper Missouri River, near Fort Berthold, Dakota Territory. When first brought into communication with the whites near the close of the eighteenth century they inhabited nine villages, but when Lewis and Clark ascended the Missouri in 1803 they had been driven by the Sioux up the river to the Arickaree country, and occupied but two villages, one on each side of the river, near the spot where the explorers built Fort Mandan. They were more friendly to the whites and of a lighter color than the surrounding tribes. This circumstance has been frequently insisted upon, especially by George Catlin, the artist, who lived a considerable time with the Mandans, in connection with the Welsh legend of Prince Madoc, and the Mandans have been gravely pronounced descendants of the Welsh colony. Affinities to Welsh have been stated to exist in their language, but all efforts to substantiate this conjecture have proved illusory. The Mandans were nearly swept away by the smallpox in 1837, being reduced from 2500 to 145 individuals, and they have since suffered from frequent hostilities with the Sioux, but increased to nearly 500 souls in 1875. In 1884 they numbered 311 in Dakota. They made treaties with the U. S. in 1825 and 1866, and since 1870 have been officially confederated with the Arickarees and Minnetaries, to whom a large common reservation has been assigned on the Yellowstone River, on the borders of Montana and Dakota. The Mandans live chiefly by agriculture, are peaceable and friendly to the whites, but have never taken any considerable steps toward civilization.

Manda'ra, or **Wandala,** kingdom of Central Africa, S. of Bornoo, of which it has been a dependency since 1863, consists of a large, well-watered, very fertile, beautiful, and well-cultivated valley, encircled by the high and picturesque Mendepy Mountains. The inhabitants are Mohammedan negroes, who are industrious in the manufacture of cotton fabrics and articles of iron, and who possess a celebrated breed of horses. They are more intelligent and better shaped than the surrounding negro tribes, but they are generally accused of cowardice, and owe their independence to the surrounding mountains rather than to their courage. The capital is Doloo, with 30,000 inhabitants. The former capital, Mora, was entirely destroyed in the war with Bornoo in 1863.

Mandarin Duck (*Anas galericulata*), one of the domesticated species of duck, brought from Japan and China. It is of singularly brilliant plumage, has a fine green crest, and a fan-shaped tuft of feathers on the back. It is asserted that these ducks, unlike the common domestic duck, are never polygamous, and that they never mate but once. They are remarkable for conjugal fidelity.

Man'date [Lat. *mandatum,* a "commission"], a species of bailment in which the bailee undertakes to perform some labor or service with or about the property delivered to him, without recompense; as if, for example, he agrees to carry goods from one place to another (not being a common carrier), or to make some article out of them for the benefit of the bailor, acting in either case gratuitously. As this kind of bailment is exclusively for the benefit of the bailor, the bailee is only bound to use slight diligence in caring for the property entrusted to him. (See Bailment.) Such care and vigilance are to be exercised as are usually shown by men of common sense and ordinary prudence in the management of their own property. This will, of course, vary in degree with the circumstances of each particular case. Greater care is requisite if the property is peculiarly exposed to danger, or is liable to be easily injured, or is of great value, than under other circumstances. If the service to be performed be one requiring professional or mechanical skill, and the occupation or experience of the bailee be such as to imply the possession of such skill, he will be held responsible for its exercise in executing the work undertaken. He will, however, in general, only be required to exercise the ordinary degree of skill which is usually exhibited by those who are engaged in the same occupation, and not the highest degree of skill of which such persons may be deemed capable. There may, however, be special cases where a more severe rule will be applied, as where he is known to have extraordinary abilities, and is employed for that reason. The same rules will be applicable if the mandatary be known to possess the skill necessary, though he is engaged in no occupation by which it might be acquired, or if he positively professes competence for the service to be performed, and his incapacity is not known to the bailor. If, however, the bailee be known to the owner of the property to be incompetent for the work, or there is no reason to presume the possession of sufficient skill, an unskilful execution of the task undertaken will not render the former liable. He will only be bound in that case to exercise such skill as he actually possesses. If goods entrusted to a mandatary be lost, destroyed, or injured by reason of theft, robbery, inevitable accident, or the commission of acts of violence which could not be guarded against, or from any other similar cause, and the loss or damage could not have been prevented by the exercise of a reasonable degree of foresight or the use of ordinary precautions, he will incur no liability for the injury. It is sometimes the case that the parties to such a bailment determine their mutual duties and responsibilities by special agreement, which would then, if in accordance with the policy of the law, supersede or modify the usual legal rules by which a mandatary's liability is determined. It would seem to be contrary to public policy to allow the mandatary to stipulate that he should not be responsible for the consequences of his own negligence. A mandatary is in all cases obliged to follow strictly the instructions given by the bailor. It is not allowable for him to use the property for any purpose of his own, but only to effectuate the object of the bailment. During the continuance of the bailment he has a special or qualified property in the goods entrusted to him, which will entitle him to bring an action against any one by whom they are wrongfully injured or converted, and to recover damages for the loss sustained. The bailor, by virtue of his absolute title to the goods, has also a right of action in such a case. A recovery by either bailor or bailee, however, will bar the other's right of action. If the mandatary, losing sight of the object of the trust, appropriate the property to his own use, he may be sued by the owner in an action of trover for the value of the goods, or in replevin for the recovery of the goods themselves. The bailor may resume possession of the property at any time, even though the object of the bailment is not fully completed. This right is qualified by the condition that he is not to cause serious and unnecessary detriment to the bailee, being without fault. But the natural expiration of the bailment occurs when the purposes of the trust have been fully accomplished or the time has ended within which the service was to be performed. It is then the bailee's duty to deliver the property to the owner without its being otherwise altered, deteriorated, or improved than would be the result of the proper performance of the work undertaken and of the natural wear and tear to which the goods had been necessarily subjected.

The consideration upon which a contract of mandate is based is the trust and confidence on the part of the owner induced by the bailee's acceptance of the goods and by his undertaking to fulfil the purposes of the bailment. A mere executory promise to accept such a bailment and discharge its resulting duties is void for want of a consideration. But if the fulfilment of the trust be entered upon, the owner is deprived of his present possession of the goods, and of the immediate power of using them, and is forced to depend upon the promises of the bailee for assurance that they will be kept safe and that the object of the bailment will be carried out; this is regarded in law as a sufficient detriment to the bailor to constitute an adequate consideration. (See Contract.) It is therefore generally true in regard to gratuitous promises that no action will lie for nonfeasance or an entire failure to perform the duty undertaken, although a party suffers damage thereby; but only for misfeasance or an improper performance of the service imposed. But mandataries may also in many instances be sued in an action of tort as well as in an action of contract. Thus, an action of tort might be maintained for an injury to the property occasioned by their gross negligence. (See Tort.) (See the works of Story and Edwards on *Bailments;* Parsons on *Contracts;* Chitty on *Contracts.*)

George Chase. Revised by T. W. Dwight.

Mandelay, or **Pattawapura,** the present capital of the kingdom of Burmah, is situated 3 miles from the Irrawaddi River, a little N. of Amarapura, the former capital. It was founded in 1856, and is laid out in three parallelograms, one within the other, and separated from each other by walls, ditches, towers, palisades, and other kinds of fortifications. The innermost parallelogram is occupied by the king's palace, with the spiral tower rising above his throne, and its gardens; the second by the military and the government officials; the third by the merchants and mechanics. Pop. estimated at 65,000.

Man'derson (Charles F.), b. in Philadelphia, where he received an excellent education, removed in 1856 to Canton, O., and studied law; was admitted to practice and elected city solicitor. He entered the Union army in 1861 as captain in the 19th Ohio regiment, and served through the war with great bravery in Mississippi, Alabama, Tennessee, and Kentucky, taking part in all the principal engagements and coming out a brigadier-general. At the close of the war he resumed the practice of law at Canton, O.; removed to Omaha, Neb., in 1869, and devoted himself to his profession. He was elected to the U. S. Senate Jan. 31, 1883.

Mandeville (Bernard), b. at Dordrecht (Dort), Holland, about 1670; studied medicine, and was admitted to practice at Rotterdam in 1685, after which he settled in London as a physician. Published *Esop Dressed, or a Collection of Fables in Familiar Verse* (1704), and after several other poems of little note brought out *The Grumbling-Hive, or Knaves turned Honest* (1714), and in 1723 an enlarged edition, under the title *The Fable of the Bees, or Private Vices Public Benefits,* which was censured by Berkeley and others. A second part of the *Fable* appeared in 1728, and both parts in 1732. He also published *A Letter to Dion* (1732), etc. He was patronized by Lord Macclesfield, and d. at London Jan. 21, 1733.

Mandeville (Henry), D. D., b. at Kinderhook, N. Y., Mar. 6, 1804; graduated at Union College 1826, at New Brunswick Theological Seminary 1829; was a clergyman of the Reformed Dutch Church at Shawangunk, Geneva, and Utica; was professor of moral philosophy and belles-lettres at Hamilton College 1841–49, and did much to establish the fame of that institution for oratory. He published a successful series of readers and a manual of elocution and oratory (1845). He became pastor of a Presbyterian church at Mobile, Ala., where he d. of yellow fever in 1858.

Mandeville, or **Maundeville** (Sir John), b. at St. Alban's, England, about 1300; acquired all the scholastic learning, as well as the knowledge of medicine and natural science, attainable at that time, and set out for the East in 1322, with a view to satisfy himself by extensive travel concerning the truth of the marvellous Oriental stories then current. Arriving in Egypt, he was favored by the sultan, whom he accompanied in some campaigns. Returning to England, he wrote, thirty-four years after they had been undertaken, an account of his travels—first in Latin, afterwards in Norman-French, and lastly in English—dedicating the work to Edward III. He d. at Liege, Belgium, Nov. 17, 1372. The English version of Mandeville passes for the first extended work in English prose, and has a great value as a monument of the language, independent of the question of the veracity of the traveller. The earliest English edition was printed at Westminster by Wynkin de Worde in 1499. The best modern edition is that of J. O. Halliwell (1839).

Mandin'go, territory of Western Africa, extending between lat. 10° and 14° N., and between lon. 6 and 10° W., consists of a high table-land, and contains the sources of the Senegal and the Niger. Its inhabitants, the Mandingoes, form one of the finest negro tribes, remarkable as well for the strength and harmony of their physical features as for their intellectual powers and aptitude for civilized life. They have a passion for music and dancing, and a talent for trade. They possess a rich language, written with Arabic characters, and as they are very fond of travelling, they have spread widely. They are Mohammedans, and very zealous propagandists of Islam. Their number has been estimated at between 6,000,000 and 8,000,000. They have formed no great empire, but live in small, independent states, of which the principal are Manding, Bambook, Bondoo, Dentilia, and Yarra. Polygamy is very frequent among them, but each wife has a house of her own, or rather hut.

Man'dolin [Gr. πανδοῦρα], an instrument of music somewhat resembling the guitar and the lute. Its body is an open, shell-shaped box made of strips of bent wood. It has four or five strings, which are struck by the plectrum. The neck has a finger-board. This instrument is chiefly Italian. Its sounds are peculiar, but sweet and loud.

Man'drake [Gr. μανδραγόρας], the *Atropa mandragora* (*Mandragora officinarum*), a solanaceous perennial herb of the warm parts of the Eastern continent. It is a narcotic poison, and was used by the ancients for its soporific and anæsthetic effects. It was anciently believed to have many magical virtues: it could cure barrenness; its forked root was likened to a man, and believed to possess a soul; it was believed to shriek so loudly when dug up that the person digging it died. Consequently, the earth was carefully removed from it by one whose ears were stopped with wax, and a dog was attached by cords to the root to drag it out. The name has been applied in the U. S. to *Podophyllum peltatum,* the May-apple, of the barberry family.

Man'drill [said by some to be a name of African origin, but by others to be a combination of *man* and *drill,* a species of baboon—*i. e.* the "manlike drill;" *drill* is an Old English word, not yet quite obsolete], the *Cynocephalus mormon,* the largest of the baboons, a native of Northern Africa, and one of the most formidable of the monkey tribe. It often attacks man in its native forests. It is a hideous brute, and excels in intelligence and strength, as well as in ferocity.

Mandu'ria [anc. *Mandyrium* or *Mandonium*], a town of Southern Italy, in a fertile part of the province of Lecce. It was originally a Greek settlement, and S. of the town are ancient sepulchres in which Greek vases of much interest have been found. Pliny mentions an intermittent spring which still exists here, and there is another of great antiquity issuing from an excavation in a rock. Pop. 8733.

Manee'sa, or **Manis'sa** [anc. *Magnesia*], town of Asiatic Turkey, in Asia Minor, on the Hermos. It is a large city, containing more and finer public buildings, mosques, minarets, public baths, and bazaars, than Smyrna, and carrying on an important trade in cotton, grain, and tobacco. This last article is raised in the immediate vicinity of the city, and is considered the best of its kind in Asia Minor. The streets of Maneesa are generally protected against the sun by overspreading mats or vines. Pop. estimated at 40,000.

Ma'nes [Lat. pl., probably at first signifying the "good ones"], among the ancient Romans, the name for the spirits of deceased persons. The household Lares came to be regarded as identical with the ancestral Manes, and hence received worship as *dii Manes*, or divine spirits.

Man'etho of Heliopolis, Egyptian high priest and keeper of the sacred archives in the third century B. C. under the first two Ptolemies, b. at Sebennytus in Lower Egypt. He wrote in Greek, with the aid of the temple records and other documents, his Egyptian history, of which nothing remains but fragments. Josephus, *Contr. Apion.*, i. 3, 9. See Cory, *Fragments*, 2d ed., 1832; Scaliger, Eusebius (Syncellus and Julius Africanus), and his *De Emendatione temporum*, 1629; Fabricii, *Bibliotheca Græca*, ed. Harles, iv. 128; Fruin, Leyden, 1847, and Müller's *Fragment. historicorum Græcorum*, Paris, 1848.) These fragments, in addition to an account of the Hyksos, furnish the complete lists of thirty dynasties, running over more than 3500 years. By means of this, in conjunction with recent discoveries which attest their correctness, the Egyptian chronology has been restored. He wrote a work on the antiquity and religion of the Egyptians. Original fragments on papyrus were found by Seyffarth at Turin, which were edited by Lepsius in his *Auswahl* (1842). (See also Lepsius, *Chronologie*, 1850, and his work on Manetho's determination of the compass of Egyptian history, 1857; Boeckh, *Manethos und die Hundstern-periode*, 1845; Unger, *Chronologie des Manethos*, 1867.) A poem on the influence of the stars is attributed to him, which the critics now refer to the fifth century A. D. It has been edited by Gronovius, 1698, by Koechly (Didot), 1851, and, with a German translation, by Axt and Rigler, 1832. The fragments of Manetho are now conceded to have great value. Besides the writers mentioned, see Freret, Marsham, Usher, Bunsen (*Egypt's Place*), Poole, Rask (1830), Champollion, Wilkinson, Hincks, Hengstenberg. C. P. KRAUTH.

Man'fred, b. in Sicily about 1233, a son of Frederick II. of the house of Hohenstaufen, received, on the death of his father in 1250, the principality of Tarent, and acted as regent in Italy during the absence of his half-brother, Conrad IV. He subdued with great valor the insurrections in Capua, Naples, and other cities, but his services were ill-rewarded by Conrad. In 1254, Conrad died, and Manfred was for the second time appointed regent in Italy during the minority of Conradin, and, on a rumor of the death of Conradin in Germany, he was proclaimed king of the Two Sicilies, and crowned at Palermo, Aug. 11, 1258. The rumor proved false, but he now refused to abdicate; and when the pope, Urban IV., put him under ban, he invaded the Papal States and conquered all Tuscany after the victory at Montaperto, Sept. 4, 1260. His government, thus consolidated, was vigorous, splendid, and beneficial to the country. He founded Manfredonia, built the harbor of Salerno, and established schools in all the large cities. At his magnificent court poets and scientists gathered together, and he himself was the most brilliant in the whole circle, a true Hohenstaufen. Meanwhile, the pope, Urban IV., and after him Clement IV., put up for sale in Europe the crown of Naples and Sicily, and Charles of Anjou, a brother of Louis IX. of France, was found to be the highest bidder. With a French army he landed in Italy, was crowned in Rome Jan. 6, 1266, and defeated Manfred, by treachery rather than by valor, in the battle of Benevento, Feb. 26, 1266. Manfred himself fell in the battle, and, being under the papal ban, was buried without ceremonies under a heap of stones, afterwards called the "rock of roses." His wife and sons were imprisoned—the former for eighteen, the latter for thirty-one years.

Manfredo'nia, a maritime town of Southern Italy, in the province of Foggia, on the Gulf of Manfredonia. The commerce of the port is very considerable, and several European nations have consuls here. It is also an important fishing station. The town itself is pleasantly situated at the foot of Monte Gargano, about 23 miles N. E. of Foggia. The site was chosen by Manfred in 1261, who induced the inhabitants of the large but fever-stricken Siponto to settle here. The Turks destroyed this town in 1620, and it has never recovered its former prosperity. Pop. in 1881, 9401.

Mangalore', town of British India, in the presidency of Madras, on the Malabar coast, in lat. 12° 52′ N. It is poorly built, but stands in a fertile plain, surrounded with palm-groves and plantations of rice and sugar, and has a large trade in sandal-wood and rice. Pop. 29,667.

Manganese', Chemistry of. [The derivation of this name is curious. The mineral in which it was first discovered, *pyrolusite*, the deutoxide of manganese, had in some way obtained the fanciful name "black magnesia," or, as Latinized, "*magnesia nigra*;" whence, it is asserted, *manganese*.] The earlier chemists considered the manganese ores as containing some modification of iron, but Pott in 1740, and others subsequently, Kaim, Winterl, Scheele, and Bergmann, proved that they contained a metal chemically distinct from iron; and Gahn, the master of Berzelius, first obtained the metal manganese at a date not left on record. It was in examining the action of muriatic acid on pyrolusite, in the course of his investigation of this very question, that Scheele made the grand discovery of *chlorine* in 1774.

Metallic Manganese.—Though known for nearly a century, this metal has not yet come into use, either in a pure form or in alloys, though it was long since found to form some alloys having promising properties. The difficulty of procuring it from its ore is so great that it is at present only a curiosity of the laboratory, held by dealers in laboratory-supplies at a cost of over $100, gold, per pound—not far below the cost of platinum. It is described as being, when obtained by smelting the ore with carbon at the highest attainable heat of a blast furnace, a soft, brittle metal, grayish-white, and with the aspect of cast iron, feebly magnetic, and having a density, according to Bergmann, of 6.861 to 7.1, to John of 8.013, and to Bachmann of 8.03. These variable figures argue either variable purity or the existence of two or more allotropes, most probably the latter, because the variations are too great to be due to any supposable impurity. It oxidizes so readily in the air that it must be preserved, like sodium, in liquid hydrocarbons, according to John and Bachmann. Brunner in 1857 obtained manganese in another way—by reducing its chloride with sodium; and *he* describes it as *not magnetic*, of density 7.138 to 7.206, approaching to the figures of Bergmann, hard enough to *cut glass like a diamond*, taking a fine polish, and *not tarnishing in the air*, though it decomposes water slowly. Wöhler found that Brunner's manganese contained silicon, the truth being that, as in the case of iron, the presence of silicon (others since state, of carbon also) modifies the properties of manganese profoundly (as the present writer believes, by producing allotropic modifications). These matters should be reinvestigated more thoroughly. Deville obtained manganese in a form in which it had a reddish color like bismuth, and decomposed water readily in the *cold*.

Oxides of Manganese.—There are six oxides of this metal known: manganous oxide, MnO; manganoso-manganic oxide, Mn_3O_4, or MnO, Mn_2O_3; manganic oxide, Mn_2O_3; manganic deutoxide or peroxide, MnO_2; manganic acid, MnO_3; permanganic acid, Mn_2O_7. Manganous oxide is the base of the ordinary salts of manganese, the sulphate, carbonate, acetate, etc. Manganoso-manganic oxide, corresponding in composition to the magnetic oxide of iron, is the mineral species *hausmannite*. Manganic oxide, the sesquioxide, occurs as the mineral *braunite*. The deutoxide is the mineral *pyrolusite*, occurring in powdered form in commerce as *black oxide of manganese*. This is the most valuable manganese mineral; used in making chlorine. When mixed with muriatic acid, the following simple reaction occurs: $MnO_2 + 4HCl = MnCl_2 + 2H_2O + Cl_2$. Manganic acid, MnO_3, has not yet been isolated, being known only in its salts, which are themselves decomposed by contact with water, yielding solutions of permanganates. The manganates are green in color. By fusing together any oxide of manganese in the air with an alkali, a green manganate is formed, which was formerly known as *chameleon mineral*, from the alterations of color from green to purple which its solution in water undergoes through the change from a manganate to a permanganate. Permanganic acid is known, isolated, in liquid, and even in solid crystalline, forms. It is described as a thick, greenish-black, metallic-looking liquid, evaporating when warmed as violet vapors, but exploding when heated quickly. It sets fire to paper, and explodes with alcohol on contact. Its most important compound is the *permanganate of potash*, familiar now in commerce in beautiful crystals, which are largely used as a disinfecting agent. It is also one of the most valuable tests used by the chemist in the laboratory. Manganese has been stated by Percy and others to form alloys with copper similar to, and capable of being substituted for, *German silver*, which, if correct, would enable it to take the place, to some extent, of the expensive metal *nickel*, and thus make the latter cheaper. Manganese compounds have valuable uses in dyeing, also in medicine. Manganese has been found to be a normal constituent of the ashes of plants, and in very minute quantity is believed to be always present in human blood and in animal tissues generally. With the exceedingly delicate test known as "Crum's test" it is found to be almost, if not quite, as universally diffused throughout nature as iron, to which latter it is closely linked by a great many chemical analogies and affiliations. (See article IRON.) HENRY WURTZ.

Mange [Fr. *demanger*, to "eat"], a disease of dogs, horses, cattle, swine, and sheep, distinguished by the presence of *acari* or mites upon the skin, and also marked by scurfiness, itching, heat, and pimples upon the skin. Sulphur ointments, carbolic-acid washes, corrosive sublimate in weak solution, and decoction of tobacco or of the green leaves of *Veratrum viride*, are all useful applications. The afflicted animal should be kept alone, for the disease is contagious. When the mites have been destroyed by the use of any of the above applications the animal will need liberal feeding, and perhaps some mild tonic, like iron. A little copperas dissolved in his drink will probably be sufficient.

Man'gle [Dutch, *mangel*], a machine for smoothing cotton and linen goods, such as tablecloths, sheets, etc., after washing. The old style of mangle is a box filled with stones, and resting upon two wooden cylinders, which roll backward and forward upon the smooth table upon which the linen is spread. The box is drawn back and forth by simple machinery. No heat is usually employed, but there are several improved forms of the mangle in the market. For the finer kinds of work no mangle, it is believed, can ever take the place of the sad-iron.

Man'gles (JAMES), b. in England about 1785; became a commander in the British navy, and with Capt. C. L. Irby made a tour in the Levant 1816–20, of which the narrative, printed for private circulation in 1823, was published in 1844 under the title *Travels in Egypt, Nubia, Syria, and the Holy Land.* He wrote a few geographical treatises, among which are *Geography, Descriptive, Delineative, and in Detail; and Hydrography in Detail, etc.* (1849), and *Guide to the Navigation of the Thames Mouth* (1853). D. Nov. 18, 1867.

Man'go [Malayan, *mangga*], the fruit of *Mangifera Indica*, an East Indian tree of the order Anacardiaceæ, now naturalized in most warm climates. The tree is widespreading and affords a dense and very grateful shade. There are many varieties of the fruit, many of which are very fine for desserts, having an agreeable blending of sweetness and acidity. The fruits of other species of this genus are eaten, but none of the others are valuable. The tree is generally raised from seeds, but the finer varieties are propagated by layering and inarching.

Mangold-Wurzel [Ger. for "beet-root"], a name adopted by farmers and others into English to designate the larger and coarser varieties of the beet (*Beta vulgaris*), now extensively grown as food for domestic animals. Mangolds are too coarse and rank for human food, and even for cattle they are harsh and irritant to the bowels in the early part of the winter; but towards spring they may be fed to all kinds of stock with great advantage, though too liberal feeding is believed to have a diuretic effect. Mangolds need a generous soil, clean culture, and liberal manuring. As much as 80 tons to the acre have been grown in favorable circumstances.

Man'gosteen [Malayan, *mangusta*], the fruit of *Garcinia mangostana*, a small tree of the order Guttiferæ, a native of the Spice Islands, now grown in many tropical regions, and cultivated in the Eastern Archipelago. The tree becomes about 20 feet high and has some resemblance to the fir, though its leaves are large, oval, and glistening. From the Moluccas it has been introduced into Ceylon and several points of Southern Asia, and even into the Antilles, though not without difficulty. The fruit externally resembles an orange, but is usually brownish-red rather than yellow. The outer rind is very thick, rich in tannin, and very astringent and inedible, but it is sometimes used medicinally in dysenteries. The edible portion is a white pulp around the seeds, large and five in number, in the centre. This juicy pulp is described as "having the whiteness and solubility of snow, and a refreshing, delicate, delicious flavor, . . partaking of the compound taste of the pineapple and peach, with many other equally good but utterly inexpressible flavors." This excellent fruit, being perfectly wholesome, may be eaten freely without harm, and is likewise very refreshing in fevers. The tree is highly ornamental.

Man'grove [probably corrupted from Malay *mangle*, and *grove*], a popular name for the shrubs and trees of the order Rhizophoraceæ, natives of the muddy coasts, tidal estuaries, and salt-marshes of hot countries, where they form dense thickets, which exclude the sun's rays from the soil and become most fruitful centres of malarial influence. There are some five genera and twenty species, of which *Rhizophora mangle* and *candelaria* are the typical mangroves. The mangrove is found in many tropical regions, and is abundant on the coasts and keys of Florida. The fruit is eatable, the bark useful in tanning. Most of the mangroves are remarkable as invaders of the domain of the sea, which they slowly convert into dry land. Their stems put forth long aërial roots which extend down into the water; the seeds germinate in the fruit, and send down a long and heavy root, which on falling sinks into the mud: and thus the mangrove swamp slowly gains upon the shallow seas, spreading like a banyan grove. The roots and stems give lodgment and shelter to innumerable bivalves, crabs, and other aquatic animals of different descriptions, while the branches swarm with aquatic birds; and thus the "mangrove forests"—in some respects a true plague spot in a country—often teem with life. The wood of some species is hard, heavy, and useful in the arts, particularly in boatbuilding. Mangrove-wood is often brought to seaports as part of a ship's dunnage. It is sold as firewood, for which some species are excellent. The bark is also imported for tanners' use, and is useful for some kinds of work. In some countries there are other trees which share the habits and the habitat of the mangrove, as the *Laguncularia racemosa* (order Combretaceæ) of the West Indies, Florida, etc. The white mangroves (*Avicennia*) of Australasia, India, South America, etc. are of the order Myoporaceæ, and have the habit of true mangroves. The bark of some species (as *A. tomentosa*) is excellent for tanning. The resin, the seeds, and the roots of this species are used as food by the poor in many countries. The *Conocarpus racemosa*, a mangrove of Brazil (order Combretaceæ) yields bark for tanning. Zanzibar exports to Arabia great numbers of mangrove poles, called "Zanzibar rafters," in trade. The business affords a handsome profit.

Mangum (WILLIE PERSON), b. in Orange co., N. C., in 1792; graduated at the University of North Carolina in 1815; became a successful lawyer and Whig politician, and was in 1819 and 1826 chosen a judge of the superior court; was in Congress 1823–26; U. S. Senator 1831–37, and again in 1841–53. In 1837 eleven electoral votes were cast for him for the office of President of the U. S. He was president of the Senate during the Tyler administration. D. in Orange co., N. C., Sept. 14, 1861.

Manhat'tan Island. See NEW YORK, CITY OF.

Manhattan, R. R. centre, cap. of Riley co., Kan. (see map of Kansas, ref. 4–H, for location of county), is situated at the junction of the Kansas division of the Union Pacific and the Atchison Topeka and Santa Fé R. Rs., and of Big Blue and Kansas rivers, and contains the Kansas State Agricultural College, a public library, boot and shoe, cigar, wagon, and carriage factories. Pop. in 1870, 1173; in 1880, 2105.

Manheim, Lancaster co., Pa. (see map of Pennsylvania, ref. 6–H, for location of county), on the Reading and Columbia and Lancaster R. Rs., 10 miles N. N. W. of Lancaster, has large steam flouring-mills, an extensive steam saw and planing mill, foundry, machine-shop, carriage-factories, and cigar-manufactories. The borough has a fine park, and is surrounded by an agricultural district of great fertility. Pop. in 1870, 1122; in 1880, 1666.

Mania. See INSANITY.

Man'ichæism, a religious system which arose toward the end of the third century in the Persian empire, compounded mainly of Persian Dualism, Booddhism, and Syrian Gnosticism, and using certain Christian ideas as a gloss for a heathen theosophy. In respect to the founder of the sect, the Latin and Greek Fathers differ from the Persian accounts. The former—all derived from a corrupt Latin translation of reports of a discussion of Bishop Archelaus of Cæsarea with Manes or Manichæus—trace the system to one Scythianus, a Saracen merchant of the time of the apostles, whose pupil, Terebinthus—called by himself Buddas—wrote by his direction four books, of which Eubricus, a liberated slave, obtained possession after his death and founded on their doctrine a new religion. According to Persian accounts—later and much more credible—one Mani (sprung from an illustrious family of the Magi, of high gifts and extensive culture in art and science, a painter and a mathematician, having professed Christianity and been ordained presbyter in the Church, yet retaining his Parsee ideas), amid the attempts at the accession of the Sassanidæ to the throne of Persia to restore the old national religion, conceived the idea of forming a universal religion, blending Christianity with Parsism. Accordingly, under the reign of Shaphur I. (Sapor) he came forward as a reformer and the founder of a new sect, claiming to be the Paraclete promised by Christ. Excommunicated by the Christians and persecuted by the Magi, he fled, and travelled through India and Central Asia as far as China, gathering, as he went, additional materials for his religious system. For twelve months he lived in a cave in Toorkistan, where he was fed by ravens, and wrote his book, the *Ertenki Mani*—the gospel of his sect, full of gorgeous imagery and pictorial illustration, symbolizing his theosophy. Returning to Persia, he was protected by the new king, Hormuz; but afterwards by his successor, Behram, being compelled to discuss his system with the Magi, and being declared vanquished, he was flayed alive (277 A. D.). After his death his sect, spreading in the Roman empire, was persecuted by Diocletian because of its Persian origin, and afterwards by the Christian emperors as heretical and antichristian; which very fact subsequently tended to secure for it protection in Persia.

Ancient Persian Dualism furnished the fundamental idea of this system. In it good and evil were opposed from eternity, and were represented by light and darkness. The good god, Ormuzd, and his twelve sons, constituting the kingdom of light, were in eternal warfare with Satan and his demons, the kingdom of darkness. Inroads had been made by the latter upon the former, and in order to guard the border-land Ormuzd places over it an Æon (the mother of life), who gives birth to the ideal man; who, assisted by the five pure elements, enters on the contest, but is taken captive. Another Æon (the living Spirit) is now sent to his aid—not, however, in time to prevent the kingdom of darkness from swallowing up part of his luminous essence (the soul of the world). The remaining part of the ideal man—the Jesus Impatibilis—is now transported to the sun. Out of the mixture of the luminous essence, thus absorbed, with the kingdom of darkness, the living Spirit now creates this present visible world, in order that from a process of purification now entered on the particles of light may now regain strength and freedom. From this mixture every man has, besides a soul of light, an evil soul; the former of which is to gain the victory by drawing to itself the particles of light scattered through nature, and especially in the vegetable world. While this purification is being accomplished under the superintendency of the ideal man residing in the sun, and of the living Spirit, the evil demons, on the other hand, are attempting by false religions, as Judaism and heathenism, to bind souls to the kingdom of night. At last the ideal man in the sun—the Christ—descends in a seeming bodily form, and aims by his doctrine to liberate the imprisoned souls of light. He is seemingly killed by demons, but it is only the phantom of his body that is crucified. But his doctrine is misapprehended and misrepresented by his apostles, to restore which to its purity Mani, the promised Paraclete, is sent. He was thus the head of the Church, with apostles, bishops, presbyters, deacons, and evangelists under him. His community or Church was divided into the catechumens or *auditores*, and the elect or perfect; the latter to be supported by the former, while they, the elect, were to practise the most rigorous asceticism and to abstain from marriage and from sins of the mouth, the hand, and the body. Baptism and the Lord's Supper—the former with oil, the latter without wine—were part of the secret ceremonial of the perfect. They had no altars or images. The sun was revered by them merely as representative of the ideal man, or the principle of light. Fasts, prayers, and readings from Mani constituted their worship. Sunday was a festival devoted to the sun. But their great festival was the anniversary of the martyrdom of Mani. The Old Testament they rejected absolutely, and of the New they retained only what had been revised and redacted by the Paraclete, Mani.

The system of Mani seems to have been formed on the apparent opposition of good and evil in the material universe and in the soul of man. This opposition he teaches to be the expression of two antagonistic principles, existing independently from eternity, and professes to represent a scheme by which the material universe and the soul of man may be freed from this conflict, may be purged of the evil, and wholly possessed and perfectly blessed by the good. As a system, it is to the utmost extent fanciful. Its attraction for curious and speculative minds lies in its professed solution of the dark and (to many minds) desperate enigma of the origin of evil—an exposition of the blending and conflict of good and evil in the universe, with the ultimate liberation and triumph of the former. The sect, though pursued with hostility in various forms by Magians, Christians, and subsequently by Mohammedans, continued to subsist by a secret tradition down to the Middle Ages, when it reappeared in connection with several heretical sects.

In various forms and combinations, and under various names, its main elements were soon after the death of its founder widely diffused through the Roman empire. Africa was its chief seat in the West, and its chief apostle there was Faustus of Mileve, who wrote apologies for it and against Christianity. Through his influence Augustine was for a time captivated with its promises of occult and profounder wisdom, but afterwards, disappointed and disgusted with its emptiness, he wrote largely and with great earnestness against it. From Valentinian I. (364–375) the Roman emperors issued frequent and severe edicts against it. In Africa it was also persecuted by the Vandals, and whole shiploads of its adherents (477) were transported by them to the continent of Europe. At the time of Leo the Great (A. D. 440–461) numbers of them were found at Rome. The sect was distinguished by rigorous formal asceticism, but was accused of Antinomian principles, and of the indulgence of secret lusts. The elements and principles of the Manichæan system were diffused through Spain through the Priscillianists, a dualistic sect, which, appearing 380, spread extensively, but was finally suppressed 583. But, despite the rigorous measures taken against them in various countries, the elements of their system appear during the Middle Ages in various mystic and Gnostic schools, such as the Paulicians and the Catherini, by whom its doctrines were widely diffused through the S. of France and Germany, where successively they established their chief seats. Indeed, the mystery of the origin of evil and the seeming dualism of human nature have ever tended to drive minds in the direction of their speculations, though entirely independent and ignorant of their system. T. M. POST.

Manididæ. See APPENDIX.

Manigault (GABRIEL), b. in South Carolina in 1704 of Huguenot parentage; became a wealthy merchant, and at the outbreak of the war of independence loaned the State $220,000. When Gen. Prevost attacked Charleston in May, 1779, Manigault, at the age of seventy-five, was among the volunteers in the lines, accompanied by a grandson fifteen years old. D. at Charleston in 1781.

Mani'la, or **Manil'la,** city of Luzon, capital of the Philippines, and the residence of the Spanish viceroy or governor, is situated at the mouth of the Pasig. It consists of the city proper with about 12,000 inhabitants, and a number of suburbs with a population of 250,000. The city proper is situated between the river and the sea, and is surrounded by walls and defended by a citadel. It is laid out with straight and broad streets, and with many public squares sparkling with fountains and displaying the whole gorgeousness of a tropical vegetation in their gardens. It contains a fine cathedral, the magnificent palaces of the governor and the archbishop, the colleges, barracks, and other public buildings, and has a most beautiful promenade along the ramparts, which in the evenings, when crowded with people, presents a most animated aspect. Of the suburbs, Binondo, situated on the northern bank of the river, is the largest and most important. It is the seat of traffic and commerce, and here Spaniards, Englishmen, Americans, Chinese, Hindoos, Malays, and mestizoes meet to buy and sell; hundreds of races, costumes, and languages mix together in endless confusion. Manila has been one of the principal centres of commerce in the East Indies almost since its foundation in 1571 by Legaspi. It has an excellent harbor, and all the products of the Philippines are brought hither—rice, sugar, coffee, cotton, hemp, and tobacco. The last two articles are the principal ones. Manila cheroots and cigars are world-famous; the manufacture, which is a government monopoly, employs more than 20,000 hands. Of the Manila hemp many delicate and beautiful fabrics, much appreciated in commerce, are made. Three times it has been almost entirely destroyed by earthquake; on one occasion, in 1863, all its churches fell and thousands of people were killed.

Manila Hemp, or **Abaca,** the fibre of *Musa troglodytarum* (order Musaceæ), a plant resembling the plantain and the banana. It is cultivated principally in the Philippine Islands, and the fibre is obtained from the leaf-stalk of the plant. It is largely imported for the manufacture of cordage and canvas, which is of the very best quality, exceeding hemp in durability, but not in flexibility. Old Manila is used for paper-stock, and makes a wrapping-paper of excellent quality and great strength.

Manil'ius (MARCUS), a Latin poet, of whom a didactic poem in five books, *Astronomica*, has been preserved, but of whose life and age nothing is known, though it is probable that he flourished under Augustus. The first manuscript was discovered by Poggio, and printed at Nuremberg in 1473. Scaliger in 1579, Bentley in 1739, and Jacob in 1836, have given editions based on several manuscripts. There is an English translation by Creech (1697) and a French by Pingré (1786). The work has no poetical or literary merit, but it is written with great learning; and it seems singular that it should have fallen so completely into oblivion as to be overlooked by all ancient writers, even by Formicus, who wrote his work on astronomy in the time of Constantine the Great. Indeed, the book by Formicus presents so many points of resemblance to that by Manilius that the former must have been based either upon the latter or upon a third work, from which also the latter was derived.

Manin′ (Daniele), b. in Venice May 13, 1804; studied at Padua, and early became one of the most distinguished advocates in Venice. His influence, together with that of Tommaseo, was most important in preparing the revolution in Venetian Lombardy. Being imprisoned with his friend, he was subjected to a political trial, but on Mar. 17, 1848, the people forced the dungeons, liberated the two illustrious prisoners, bore them in triumph through the city, and then placed them at the head of the provisory government. Manin moderated the violence of the revolution, restrained it from excesses, sustained the honor and defended the independence of Venice to the utmost. On his banishment he withdrew to France, where he supported himself by teaching Italian, and at the same time was a most active apostle for the freedom of Italy. No Italian abroad ever rendered more important service to his country than Daniele Manin. The sympathy and esteem he won for himself converted some of the most distinguished French writers to the cause of Italian independence. To Daniele Manin should be especially attributed the efficiency of the Societa Nazionale Italiana, which, by the advice of the illustrious Venetian refugee, La Farina founded at Turin. D. in Paris Sept. 22, 1857. His remains were solemnly conveyed by his son to Venice, where in May, 1875, a fine monument was erected to his memory. (See Henri Martin, *D. Manin*, Paris, 1859; Edmund Flagg, *Venice*, New York, 1852; and his biography by Errera, Venice, 1872.)

Ma′nioc, Cassa′va, Ju′ca, or **Mandio′ca,** names of the *Jatropha Manihot* or *Manihot utilissima*, and of the *Manihot Aipi*, half shrubby euphorbiaceous plants of South America, perhaps natives of Africa also. They are extensively cultivated as sources of food. From the farinaceous root is prepared tapioca, Brazilian arrowroot, the Brazilian *farinha*, and other forms of amylaceous or starchy food. The first-mentioned species is poisonous, but its dangerous qualities are dispelled by heat; the other species is considered harmless. The plants are propagated by cuttings, and produce a large amount of food. (See Tapioca.)

Manipur, a native state of India, bounded E. by Cachar and W. by Independent Burmah, but with undefined frontiers S. and N. Area, about 7600 square miles.

Manis. See Pangolin.

Manistee, city, cap. of Manistee co., Mich. (see map of Michigan, ref. 5–H, for location of county), on R. R. and on both sides of the Manistee River, and between Lake Manistee and Lake Michigan. The river between the lakes is 1½ miles in length, and navigable for small vessels drawing 10 to 12 feet of water. It has numerous steam saw-mills and several shingle-mills, also planing-mills, foundries, and machine-shops. It ships annually 200,000,000 feet of lumber, an immense quantity of shingles, lath, pickets, wood, bark, etc. It is also located in the great peach and fruit belt of Michigan. Pop. in 1870, 3343; in 1880, 6930.

Manistee River rises in Antrim co., Mich., and flows in a generally S. W. course to Lake Michigan.

Manistique, on Lake Michigan, cap. of Schoolcraft co., Mich. (see map of Michigan, ref. 2–G, for location of county). Pop. of tp. in 1880, 693.

Manito′ba, province of the Dominion of Canada, British North America, bounded on the N. by the parallel of 50° 30′ N. lat., on the E. by the meridian 90° W. lon., on the S. by Minnesota and Dakota, U. S. A.—the line being the 49th degree of N. lat.—and on the W. by the meridian of 101° W. lon. Area, 123,200 square miles.

Surface, Climate, Geology.—The whole area of the province is included in the valley of the Red River of the North, and is a fertile plain, the part near the river being a remarkably dead level. W. of the river the streams flow in deep troughs or *coulées*. Tall grass covers a great part of the country. From what is known of the geology of this region, it would appear that it is a Cretaceous surface, generally resembling that of N. E. Dakota. The soil is very productive of wheat and most other crops; but from its lower level it is claimed that the winter climate, though severe, is milder than that of the same river-valley in its more southern portions. Thus, the bank of the Red River at St. Vincent, Minn., is 792 feet above the sea (*U. S. Geol. Survey*, F. V. Hayden, 1872). Farther up, at Breckenridge, the elevation is 953 feet (*ibid.*), while at Fort Garry, Manitoba, it is but 640 feet (*Profile Map Can. Pacific Railway*). Lake Winnipeg, according to Mr. Hind, is but 628 feet above the sea-level. There is at least sufficient timber in the province for all immediate wants. Buffalo and other game abound. The waters teem with valuable fish. Notwithstanding the very favorable statements with regard to the mildness of the climate of Manitoba, the published climatological statistics of the Canadian government appear to show that it is one of the coldest inhabited parts of British America in winter, though the rather short summer is very warm. The rain and snow fall is very light in winter, hence the Canadian Pacific Railway, which will pass through the province, will here meet with but small obstruction to its trains from snow. The climate is remarkably healthful. The Red River, though very serviceable in navigation, has been known to inundate the surrounding country. Formerly, the inhabitants suffered much from severe winters and from the visitations of grasshoppers. The eastern portion of the territory has more wood and water than the western, and is not such a dead level. It has some marshy land. Cattle, horses, and sheep are reared, and flour and furs exported.

Agricultural Products.—According to census of 1881, Manitoba produced 1,029,378 bushels of spring wheat, 4295 bushels of winter wheat, 253,604 bushels of barley, 1,270,268 bushels of oats, 1203 bushels of rye, 8991 bushels of peas and beans, 320 bushels of buckwheat, 2516 bushels of corn, 556,193 bushels of potatoes, 149,025 bushels of turnips, 49,096 bushels of other roots, 185,279 tons of hay, and 303 bushels of grass and clover seed.

The government consists of a lieutenant-governor, an executive council of five, and a legislative assembly of thirty-one members. The province sends three senators to the Dominion Parliament.

Religion, Education, etc.—In 1881, 12,246 of the people were Roman Catholics, that religion having been long since established here by missionaries to the Indians. St. Boniface is the seat of a Roman Catholic archbishop. At Winnipeg is the see-house of the lord bishop of Rupert's Land (Anglican). The board of education consists of equal numbers of Protestant and Catholic members. Separate schools are established, and are maintained partly by fees and assessments and partly by a provincial grant. St. John's College (Anglican) and St. Boniface College (Roman Catholic) were incorporated in 1872. The pop. in 1881 consisted of 14,297 Church of England adherents, 14,292 Presbyterians, 9470 Methodists, 9449 Baptists, etc.

History.—This province is the northern part of the region purchased in 1810 from the Hudson's Bay Company by Thomas Douglas (1744–1820), earl of Selkirk, who planted here the famous "Red River Settlement," called also "Pembina," and afterwards "Assiniboia." The first settlers were Gaelic-speaking Highland Scotch. Many Canadians of English, Scotch, and French descent, and many half-breed Indians, joined the colony in 1815, and subsequently, when the U. S. boundary-line was run through, it was found that a good part of the colony was S. of that line. Pembina, Dak., and St. Vincent, Minn., are parts of this old colony. The attacks of the North-west Co., the severity of the winters, and visitations of grasshoppers interfered sadly for many years with the prosperity of the people. The government devolving at last upon the Hudson Bay Co., it transferred the burden of local government to the "council of Assiniboia," which endured till 1871, when on Mar. 15 the elective legislature of the new province was first convened. At the beginning of the negotiations for the transfer of authority to the Dominion (1869 and 1870) there was a strong feeling against the movement, especially among the French Canadians and half-breeds. Under one Louis Riel they imprisoned many of their opponents, organized an armed resistance, and seized the public treasury. In July, 1870, a military expedition from Canada appeared and compelled the insurgents to submit.

Population.—The population in 1881 was 65,954; in 1883, about 125,000. In 1857 it was but 6522. The capital is at Winnipeg. Charles W. Greene.

Man′itou [Indian]. Among the North American Indians of Algonkin stock, any object of religious reverence or dread is called *manitou*, whether it be a divinity, an evil spirit, a fetich, or an amulet. *Gitche Manitou* ("the Great Spirit") is the Supreme Being.

Manitou, on R. R., El Paso co., Col. (see map of Colorado, ref. 4–E, for location of county), near the city of Colorado Springs, is famous for its soda and iron springs, has several hotels, and is a noted resort of health-seekers. Pop. in 1880, 422.

Manitowoc, city and R. R. centre, cap. of Manitowoc co., Wis. (see map of Wisconsin, ref. 5–F, for location of county), on Lake Michigan, at the confluence of Manitowoc River, 75 miles N. of Milwaukee, with which it is connected by R. R., has graded schools, several manufactories, tanneries and shipyards, a good harbor, and a considerable lake trade. Pop. in 1870, 5168; in 1880, 6367.

Mankato, city, on R. R., cap. of Jewell co., Kan. (see map of Kansas, ref. 4–F, for location of county). Pop. in 1880, 506.

Manka'to, city and R. R. centre, cap. of Blue Earth co., Minn. (see map of Minnesota, ref. 11–D, for location of county), on the Minnesota River, at the mouth of the Blue Earth River. It is 86 miles from St. Paul, 184 from Sioux City, and 140 from Winona. It has a State normal school, a public library, a board of trade, large linseed oil-works, a woollen manufactory, foundries and machine-shops, a furniture manufactory, a fine driving park, also breweries and flouring-mills. It is the centre of a large agricultural district. Pop. in 1880, 5550; in 1885, 7845.

Mankind. See MAN, by PRES. M. B. ANDERSON, LL.D.

Man'ley (H. DE HAVEN), b. in Pennsylvania Dec. 21, 1839; graduated at the Naval Academy in 1860; became a master in 1861, a lieutenant in 1862, a lieutenant-commander in 1866, a commander in 1874; served on board the Congress in her action with the Merrimack, Mar. 9, 1862, and commanded the boats of the Canadaigua in the joint army and navy attack upon Morris Island, July 8, 1863, which resulted in the capture of a large part of the island. Commended for gallantry. Retired on account of physical disability June 1, 1884. FOXHALL A. PARKER.

Manley (JOHN), b. at Torbay, England, in 1733; was a mariner in early life; settled at Marblehead, Mass., and became master of a merchantman; was commissioned captain by Washington Oct. 24, 1775; sailed in the schooner Lee and captured in Boston harbor three vessels, one of which was an ordnance brig of great value; commissioned captain by Congress Aug. 22, 1776, he took command of the Hancock (32 guns), with which he captured the British man-of-war Fox, but in which he was himself captured by the Rainbow, July 8, 1777. After several years' confinement he was exchanged, tried for the loss of his vessel, honorably acquitted, and placed in command of the Hague frigate 1782, with which he cruised in the West Indies, and when driven on a sandbank at Guadaloupe by a British 74, defended himself three days against the cannonade of four ships of the line, and finally escaped. This exploit closed the naval annals of the Revolution, in which Capt. Manley, next to Paul Jones, was the principal hero. He was again tried for his conduct at Boston, and censured on some of the details. D. in Boston Feb. 12, 1793.

Manly (BASIL), b. near Pittsborough, Chatham co., N. C., Jan. 28, 1798; became a member of a Baptist church when sixteen years old, and soon began to preach, though not regularly licensed until 1818; entered the junior class in South Carolina College the following year; graduated 1821; was for three years pastor of a church in Edgefield district, then for eleven years (1826–37) pastor of the only Baptist church in Charleston; was influential in the establishment of Furman University at Greenville, S. C.; became in 1837 president of the University of Alabama, which post he filled until 1855, when he resumed his pastoral labors at Charleston, S. C.; acted subsequently as a travelling missionary in Alabama; was for a time pastor of a church at Montgomery, Ala., and d. at Greenville, S. C., Dec. 21, 1868. Dr. Manly was the chief organizer of the Southern Baptist convention 1845, and of the theological seminary at Greenville 1858, and was author of a *Treatise on Moral Science,* for many years a textbook in Southern colleges.

Mann (A. DUDLEY), b. in Virginia in 1805; was commissioner to negotiate commercial treaties with Hanover, Oldenburg, and Mecklenburg 1845, to all the minor German states 1847; special commissioner to the insurgent government of Hungary 1849; minister to Switzerland 1850; private secretary to Pres. Pierce 1853, but resigned the same year; devoted himself thenceforth to the development of the material resources of the Southern States, and was appointed 1861 upon a special mission to procure the recognition of the Confederate States by European governments, being afterwards associated for the same purpose with Messrs. Mason and Slidell.

Mann (ALFRED TURNER), D. D., b. in Augusta, Ga., Nov. 1, 1815; studied at the State University at Athens, and at Randolph-Macon College in Virginia, where he graduated in 1836, and in the same year entered the ministry of the M. E. Church, South, and became an eloquent pulpit orator. A. H. STEPHENS.

Mann (HORACE), LL.D., b. at Franklin, Mass., May 4, 1796; graduated at Brown University in 1819; studied law at Litchfield, Conn.; was admitted to the bar in 1823, and settled at Dedham, Mass., but in 1833 removed to Boston. He was often in the State legislature, where he was an effective laborer for educational and other reforms. As a lawyer he had a remarkable power over juries, for all who had dealings with him were convinced of the complete honesty and earnestness of the man. He was (1837–48) the secretary of the Massachusetts board of education; a member of Congress 1848–53, Free-Soil candidate for governor of Massachusetts 1852, and president of Antioch College, Yellow Springs, O., 1852–59. D. at Yellow Springs Aug. 2, 1859. Mr. Mann was born in comparative poverty, and his youth, like his whole life, was a season of ceaseless toil. While presiding over the Massachusetts board of education he accomplished a great and much-needed reform in the face of opposition, public distrust, and a succession of obstacles the narration of which seems almost incredible. At Yellow Springs his labors and anxieties were redoubled, and unquestionably his life was greatly shortened thereby. His twelve annual reports to the Massachusetts legislature (1837–49) are of high value. He published also *Lectures on Education* (1848), *Letters and Speeches on Slavery* (1851), *Lectures on Intemperance* (1852), and supervised (1835) the publication of the *Revised Statutes of Massachusetts.* (See *Life,* by Mrs. Mann, 1865.)

Man'na [Heb. *mân*], the concrete juice of the *Fraxinus Ornus,* a small tree native in the countries on the Mediterranean coast. At present the manna of commerce is obtained exclusively from Sicily. It is in the form of cream-colored, brittle, spongy flakes of an agreeable sweet taste. It contains a large percentage of a peculiar sugar called *mannite.* Manna is a gentle laxative, and is occasionally used as such in medicine, especially in case of children, from its pleasant taste. It is an ingredient of the old "black draught." EDWARD CURTIS.

The manna [Arab. *mon*] of the Sinaitic peninsula is found, during the month of June only, on the twigs and branches of the shrub *turfa,* whose botanical name is said by Porter to be *Tamarix gallica.* Small pots of it are kept for sale at the convent of Mount Sinai. The present annual yield of the peninsula is five or six hundred pounds only; and there could never have been enough to feed two or three millions of people, so that the manna of Ex. xvi. 14 and Josh. v. 12 must have been miraculous. R. D. HITCHCOCK.

Manna Grass, or **Floating Fescue,** the *Glyceria fluitans,* a kind of grass growing in wet places in the temperate regions of nearly every quarter of the world. It is prized as affording abundant hay of very fair quality; and in Poland and parts of Germany the seed is collected and used as a grain. It is called Polish manna, and is nutritious and palatable.

Manners (JOHN JAMES ROBERT), D. C. L., P. C., by courtesy LORD JOHN MANNERS, b. at Belvoir Castle Dec. 13, 1818, son of the fifth duke of Rutland; educated at Eton and Trinity College, Cambridge; was an early member of the Camden Society, and took a deep interest in church-restorations. He was in Parliament 1841–47 for Newark, 1850–57 for Colchester, and 1857–74 for North Leicestershire. In 1852 he became first commissioner of public works, and again in 1858 and 1866 in Lord Derby's administration. When the Conservatives again came into power, in 1874, he was appointed postmaster-general, and he held that position until the Conservatives went out of office, in 1880. He has published some poems, etc.

Mann'heim, or **Manheim,** town of Germany, in the grand duchy of Baden, at the influx of the Neckar in the Rhine. It is well built and very regularly laid out, containing a ducal palace, which is one of the largest buildings of the kind in Germany, and several fine churches. Its manufactures are not important, but its trade, carried on partly by rail, partly by boats on the Neckar and the Rhine, has of late become very brisk. Pop. 53,465.

Man'ning, on R. R., cap. of Clarendon co., S. C. (see map of South Carolina, ref. 6–F, for location of county). Pop. of tp. in 1870, 1278; in 1880, 1440.

Manning (DANIEL). See APPENDIX.

Manning (HENRY EDWARD), CARDINAL, b. at Totteridge, Hertfordshire, England, July 15, 1808; studied theology at the University of Oxford, and was appointed rector of Lavington and Graffham in Sussex in 1834, and archdeacon of Chichester in 1840; but the Gorham case occasioned him to give up in 1851 his preferments in the Anglican Church and join the Roman Catholic. After residing for several years in Rome, he was ordained a priest in 1857, and appointed rector of St. Helen and St. Mary's, Bayswater, and on the death of Cardinal Wiseman in 1865 he was nominated archbishop of Westminster. He was created a cardinal Mar. 15, 1875. He founded the Roman Catholic university of Kensington Oct. 15, 1874, and took a very active part in the Council of the Vatican, defending the dogma of the infallibility of the pope. The most prominent of his writings are *The Temporal Mission of the Holy Ghost* (1865), *The Temporal Power of the Pope* (1866), *England and Christendom* (1867), *Petri Privilegium* (1871), *Cæsarism and Ultramontanism* (1874), *The Internal Mission of the Holy Ghost* (1875), *Sin and its Consequences* (1876), *The Catholic Church and Modern Society* (1880), etc. Cardinal Manning replied to Mr. Gladstone's *Expostulation*, in *The Vatican Decrees in their Bearing on Civil Allegiance* (1875).

Manning (Jacob Merrill), D. D., b. at Greenwood, N. Y., Dec. 31, 1824; graduated at Amherst College in 1850, and at Andover Seminary in 1853; was settled over the Mystic church (Congregational) in Medford, Mass., 1854–57, when he became associate pastor with Dr. Blagden of the Old South church in Boston, and in 1866 also lecturer at Andover on the relations of Christianity to popular infidelity. Besides sermons, addresses, and articles in the *Bibliotheca Sacra*, he published an *Oration before the City Government of Boston, July 4, 1865, Half Truths and the Truth* (1873), *Helps to a Life of Prayer* (1875). D. in Portland, Me., Nov. 29, 1882. R. D. Hitchcock.

Manning (James), D. D., b. at Elizabethtown, N. J., Oct. 22, 1738; graduated at Princeton in 1762; was the first president of Rhode Island College (now Brown University) 1765–90; and was 1770–91 pastor of the First Baptist church, Providence, R. I. He was sent to Congress in 1786, and was a zealous Federalist. He was one of the first pulpit-orators of his time. D. at Providence, R. I., July 29, 1791. (See his *Life*, by R. A. Guild (1864).)

Mannite. See Manna.

Manoel (Francisco), b. at Lisbon, Portugal, in 1734; was considered the best modern lyric poet of his nation. His productions consist chiefly of odes, sonnets, and epistles, and were published under the *nom de plume* of "Filinto Elysio." Among his poems is an ode to Washington. The liberality of the principles avowed in his writings led to an accusation of heresy, and he escaped the dungeons of the Inquisition only by flight to France in 1784. D. at Paris in 1819. He made Portuguese translations of La Fontaine's *Fables*, of Chateaubriand's *Martyrs*, and of Wieland's *Oberon*.

Manom'eter [Gr. μανός, "rare," and μέτρον, "measure"], an instrument for determining the degree of density of the air. One simple form is a bent tube, of which the shorter leg is sealed at the end. The bend is filled with mercury. The pressure of the mercury on the enclosed air equals the sum of the atmospheric pressure, and the weight of that part of the mercurial column which rises in the longer leg above the level in the shorter leg. Many other manometers have been invented, some of which are employed as steam-gauges.

Manre'sa, town of Spain, in the province of Barcelona, on the Cardouet, in a rich and fertile plain, manufactures cloth, ribbons, white lead, paper, chocolate, and brandy. Pop. 16,526.

Mans, Le, town of France, the capital of the department of Sarthe, on the Sarthe, forms a centre of the railways between Paris, Tours, Angers, Rennes, and Cherbourg, and is one of the most important commercial and manufacturing places of Western France. The city is old-fashioned, Norman in its character, but has a very beautiful Gothic cathedral, commenced in 1216 and finished in 1434; several other interesting buildings, such as the town-house, the theatre, the corn-market, etc., and numerous scientific and benevolent institutions, as, for instance, a lyceum, a theological seminary, a library, a museum of natural history, an art-gallery, several hospitals, etc. It is the seat of a bishop and of the government of the department. Its trade is chiefly in cattle, poultry, and other agricultural products; among its manufactures are those of carpets, linen, and lace, the most important; also its bleaching-fields and tanneries are extensive. In ancient times its name was *Vindinum*, and it was the capital of the Cenomani; at the time of Charlemagne it was one of the most important cities of France. But the invasion of the Normans in the ninth century, and later on the long contest between the count of Anjou and the duke of Normandy, destroyed its prosperity. A battle took place here Dec. 12, 1793, between the royalists and the republicans, in which the latter were victorious under Marceau; and another on Jan. 12, 1871, between the Germans under Prince Friedrich Carl and the French under Gen. Chanzy. Pop. 55,347.

Mansard', or **Mansart** (François), b. at Paris, France, in 1598; became early distinguished as an architect; built several churches and numerous châteaux, but of most of his buildings only prints are extant. He is the initiator of the curved roof named after him. D. at Paris in 1666.—His nephew, Jules Hardouin Mansard, b. at Paris in 1645, d. at Marly in 1708, was a son of the painter Hardouin, but assumed his uncle's name when he entered the profession of an architect. He built the châteaux of Marly and Lunéville, the palaces of Versailles and Grand Trianon, and the dome of the Hôtel des Invalides, and laid out the Place de Vendôme and Place des Victoires.

Man'sel (Henry Longueville), D. D., b. at Cosgrove, Northamptonshire, Oct. 6, 1820; was educated at Merchant Taylors' School and at St. John's College, Oxford, where he became a fellow in 1842; was ordained priest of the Anglican Church 1845; became reader in moral and metaphysical philosophy at Magdalen College, Oxford; delivered in 1858 the Bampton lecture on *The Limits of Religious Thought;* became Waynflete professor of philosophy 1859; regius professor of church history and canon of Christchurch 1867; dean of St. Paul's 1868. D. in London July 30, 1871. Besides the Bampton lecture aforesaid, his chief works are *Prolegomena Logica* (1851), *Metaphysics* (*Encyc. Brit.*, 1857), *The Philosophy of the Conditioned* (1866). He was one of the editors of Hamilton's *Lectures*. Dean Mansel was an elegant writer, and in philosophy was a follower of Hamilton. A posthumous work, *The Gnostic Heresies of the First and Second Centuries*, preceded by a memoir, was published in 1874.

Mans'field, town of England, in the county of Nottingham. It has some manufactures of hosiery and lace, and a large trade in corn, malt, and cattle. Pop. 13,651.

Mansfield, cap. of De Soto parish, La. (see map of Louisiana, ref. 7–B, for location of parish). Pop. in 1870, 813; in 1880, 770.

Mansfield, R. R. junction and tp. of Bristol co., Mass. (see map of Massachusetts, ref. 5–I, for location of county), 24 miles S. of Boston, has cutlery-shops, several gold, shell, and horn jewelry factories, strawworks, about 40 basket firms, 2 foundries, spindleworks, etc. Pop. in 1870, of tp., 2432; in 1880 of tp., 2765, including 1680 in Mansfield centre; pop. of tp. in 1885, 2939.

Mansfield, city and R. R. centre, cap. of Richland co., O. (see map of Ohio, ref. 3–F, for location of county), has a fine court-house, agricultural implement manufactories, woollen-mill, and paper-mill. It is situated in the midst of a flourishing agricultural community, has a large wholesale mercantile trade, aggregating a business of $3,000,000 annually, Holly waterworks, a public library, opera-house, and public hall. Pop. in 1870, 8029; in 1880, 9859.

Mansfield, post-b. of Tioga co., Pa. (see map of Pennsylvania, ref. 2–F, for location of county), 31 miles from Corning, N. Y., on R. R. and the Tioga River, has a State normal school, a school for soldiers' orphans, an iron furnace, a bedstead-factory, a planing-mill, etc. Pop. in 1870, 616; in 1880, 1611.

Mansfield (Edward D.), LL.D., b. at New Haven, Conn., Aug. 17, 1801; graduated at the U. S. Military Academy in 1819, but declined appointment in the army, and graduated from the College of New Jersey 1822; studied law at the Litchfield Law School, and was admitted to the bar in Connecticut, but immediately removed to Ohio, where in 1836 he was elected professor of constitutional law in Cincinnati College. Leaving the profession of the law for that of public writer, he was editor of the Cincinnati *Chronicle* 1836–49, of the *Atlas* 1849–52, of Cincinnati *Gazette* 1857, and of the *Railroad Record* 1854–72; and for several years contributed to the New York *Times* over the signature of "Veteran Observer;" commissioner of statistics for the State of Ohio 1857–67. Author of *Utility of Mathematics, Political Grammar, Treatise on Constitutional Law, Legal Rights of Women, Life of Gen. Scott, History of the Mexican War, American Education*, etc. Degree of A. M. conferred by College of New Jersey, and LL.D. by Marietta College, O.; member of the Société Française Statistique Universelle. D. Oct. 27, 1880.

Mansfield (Jared), b. at New Haven, Conn., in 1759; graduated at Yale College in 1777. Becoming distinguished as a teacher and scholar, his *Essays, Mathematical and Physical*, attracted the notice of the government, which led to his appointment in 1802 to a captaincy in the engineer corps of the army, and assignment to duty at the Military Academy as acting professor of mathematics; in 1803 he was appointed surveyor-general of the North-west Territory, and removed to Ohio, where he was the first (being appointed for that purpose) to run the meridian lines on which is based the admirable system of the public surveys, and to do which he imported astronomical instruments from London, and practically established the first observatory in the U. S. in his own house near Cincinnati. Returning to New Haven in 1812, having meanwhile been promoted to be lieutenant-colonel in his corps, he was in October of that year appointed professor of natural and experimental philosophy at West Point—the first to fill this chair. After sixteen years of service in this capacity, he resigned in 1828, and returned to New Haven, where he d. Feb. 1, 1830.

Mansfield (Joseph K. F.), b. at New Haven, Conn., Dec. 22, 1803; graduated at West Point, and appointed a second lieutenant of engineers 1822. Prior to 1846, Mansfield was engaged entirely on engineering duty on the Atlantic and Gulf coasts, in the construction of fortifications, improvement of rivers and harbors, and as member of the board of engineers; in the war with Mexico, as chief engineer of Gen. Taylor's army, he was distinguished in the defence of Fort Brown (brevet major); at the battle of Monterey, where he was severely wounded (brevet lieutenant-colonel); and at Buena Vista (brevet colonel). Returning to duty with his corps (in which he had attained a captaincy in 1838) at the close of the war, he was for five years a member of the board of engineers for fortifications on the Atlantic and Pacific coasts, when he was appointed (1853) inspector-general of the army, with the rank of colonel, which position he held at the outbreak of the civil war. In Apr., 1861, he was placed in command of the department of Washington, and at once commenced the work of fortifying the capital, receiving the appointment of brigadier-general of volunteers the following month. Retained on this duty until October, he was in that month transferred to Camp Hamilton, Va., and in November to the command of Newport News, participating in the capture of Norfolk, May 10, 1862; transferred in command of Suffolk June–Sept., 1862; promoted to be major-general of volunteers in July; assigned to the command of a division in the Army of the Potomac Sept. 10, at the head of which, a week later, while encouraging his troops at the battle of Antietam, he received wounds from the effects of which he d. the next day, Sept. 18, 1862.

Mansfield (William **Murray**), Earl of, b. at Scone, Perthshire, Scotland, Mar. 2, 1705, was the third son of Viscount Stormont, a Scottish nobleman of Jacobite opinions; educated at Westminster School, at Christchurch, Oxford, and at Lincoln's Inn, he travelled in France and Italy in company with the young duke of Portland; was called to the bar Nov. 23, 1730, and, settling at London, soon acquired almost a monopoly of a lucrative practice consisting of appeals from the Scottish court of sessions to the House of Lords. At the same time he cultivated the society of men of letters, especially of Pope, who often sang his praises, and being endowed with a fine presence, engaging manners, great oratorical powers, untiring industry, and keen judicial insight, he rose rapidly in his profession; was soon in the receipt of an annual income of £3000; married in 1738 a daughter of the earl of Nottingham; was elected to Parliament in Nov., 1742, on the downfall of Walpole, and in the same month received the appointment of solicitor-general from the ministry of Lord Wilmington. The Jacobite rebellion of 1745, favored as it was by many of his relatives, exposed Murray to an accusation of disloyalty, which was presented to the cabinet and afterward to the House of Peers, but without result, his only reply being the energy, conjoined with moderation and impartiality, with which he conducted the prosecutions against Lord Lovat and other noblemen who were convicted of treason. In 1747, and again in 1754, Murray was re-elected to Parliament, was in May of the latter year appointed attorney-general, and on Nov. 8, 1756, chief-justice of the king's bench, with the title of Baron Mansfield and a seat in the cabinet. In 1757, while filling temporarily the post of chancellor of the exchequer, he effected the coalition between Pitt, Fox, and Newcastle, which resulted in the formation of the ministry of the former. For more than thirty years Lord Mansfield presided over the chief British tribunal, gaining golden opinions for his promptness, decision, equity, and integrity, but gradually losing popular favor by his decided leaning toward Toryism and the "principle of authority." In the American troubles consequent upon the repeal of the Stamp Act he gave his opinion that the colonists must submit to the authority of Parliament before their grievances could be considered. In the trial of Woodfall, the publisher of Junius's letters, he held that the jury was competent only to pronounce upon the fact of publication and the "sense of the paper," not upon any question of law; and this view he steadfastly maintained. He was created earl of Mansfield in 1776; had his house in Bloomsbury Square sacked in 1780 during the Gordon riots, for which loss he refused all compensation; retired from the bench June 4, 1788, and d. at Highgate Mar. 20, 1793. Having left no issue, the barony expired with him; the earldom, with most of his large fortune, descended to his nephew, David Murray, Viscount Stormont. (See his *Life*, by Roscoe (1838), Lord Campbell's *Lives of the Chief-Justices*, and Foss's *Judges of England*.)

Mansfield, Mount, in Cambridge, Lamoille co., Vt., is 4389 feet in height. The mountain itself presents a grand appearance, and the view from the summit is one of the finest in New England, the mountains about Montreal, 70 miles away, being easily seen in clear weather. It is the highest of the Green Mountains.

Manslaughter, in law. By the common law, manslaughter was the unlawful and felonious killing of another without any malice express or implied; that is, without the intent to kill, either proved by direct evidence or inferred from the facts of the homicide, which raises the crime to murder. It was separated by the text-writers into two classes, the involuntary and the voluntary. Involuntary manslaughter was where one doing an unlawful act, not a felony, accidentally kills another, or where one through culpable neglect of a duty resting upon him causes the death of another; voluntary manslaughter was when upon a sudden quarrel two persons fight and one kills the other, or when one greatly provokes another by personal violence, and that other immediately kills him. In both of these instances of voluntary manslaughter the element which characterized it was the heat of passion under which the act was done, and the want of time for the anger to cool and for reason to resume its sway over the man. In most if not all the States of this country the crime is entirely defined and regulated by statute, and the common law does not prevail. These statutes, however, in general closely conform to the common-law principle, but add thereto a number of special cases found to be necessary by the exigencies of modern society, and reduce to manslaughter some modes of killing which at the common law would have been murder. While the common law knew no grades or degrees of the offence, the statutes of the various States separate it into several degrees, according to the amount of culpability. Since they differ exceedingly in their details, it is impossible to give even an abstract of their provisions. The highest degree generally embraces cases of accidental killing while the slayer is engaged in the commission of some crime which at the common law would have rendered the homicide a murder; and often some other particular offences which were not specially provided for at the common law, such as killing in the act of procuring an abortion, and the like. The degrees then succeeding generally include all cases of unintentional killing while in a heat of passion, while the remaining grades cover all the particular instances of homicide through negligence and wherever not entirely excusable or justifiable. The punishment is imprisonment in the State prison for different periods of time, varying with the degree of the crime. John Norton Pomeroy.

Manson, Ia. See Appendix.

Man'stein, von, Prussian general of infantry, made a celebrated name for himself first in the war of 1866 against Austria, but more especially in the war of 1870–71 against France. In the latter he commanded 9th army corps, army of Prince Friedrich Carl; took part in the battle of Vionville (Aug. 16, 1870), and played an important part in battle of Gravelotte (Aug. 18, 1870). D. May 11, 1877.

Mant (Richard), D. D., b. at Southampton, England, Feb. 12, 1776; educated at Winchester School and at Trinity College, Oxford; became fellow of Oriel College 1798; was incumbent of several parishes in and near London; became bishop of Killaloe 1820, of Down and Connor 1823, and of Dromore (in addition) 1842. D. at Ballymoney, Ireland, Nov. 2, 1848. He is chiefly known as one of the authors of an *Annotated Bible* (3 vols., 1814), known as D'Oyly and Mant's, which had an immense circulation in England, and was republished in New York, with additions by Bishop Hobart (2 vols., 1818–20). His *Bampton Lectures* for 1811 passed through several editions. His greatest work, *History of the Church of Ireland from the Reformation to the Revolution* (2 vols., 1840), passed to a second edition the year following. He is also the author of *Ancient Hymns, from the Roman Breviary, with Original Hymns* (1837). Revised by R. D. Hitchcock.

Mantchoo'ria, a region of North-eastern Asia, forming the northernmost part of the Chinese empire, extends between lat. 40° and 53° 30′ N. and lon. 118° and 135° E., bounded S. by Corea and the Yellow Sea, W. by Mongolia, and N. and E. by Asiatic Russia, from which it is separated by the rivers Amoor and Usuri. The country, which is very imperfectly known, extended formerly to lat. 58° N. and lon. 142° E., but that part of it which lies N. of the Amoor and E. of the Usuri was ceded in 1858 by China to Russia. Its present area is estimated at 370,000 square miles, its population at about 3,000,000. It consists of large plateaus, bordered S. by the Shan-Alin Mountains and W. by parts of the Khingan Mountains, which rise to a height of 15,000 feet, and traversed by several broad valleys, of which that of the Soongari River, an affluent of the Amoor, is the most remarkable. The plateaus are mostly covered with dense forests, the habitation of many wild animals which yield excellent furs. The rivers teem with fish, salmon and sturgeon. The valleys are well cultivated; barley, wheat, millet, ginseng, tobacco, and rhubarb are raised, and large herds of cattle, horses, and sheep are reared. The country is divided into three provinces—Liaotung, or Shinking, capital Mukden; Girin, and Saghalin-ulu. The inhabitants, the Mantchoos, belong to the Tungusian family of the Mongolian race. They have the same peculiar formation of the eyelids as the Chinese, whom they resemble very closely also in other respects. But they have a lighter complexion, are more strongly built, and endowed with more energy and intelligence. In the beginning of the seventeenth century they invaded China, and in 1643 conquered Peking and placed their chief on the Chinese throne. They now form the dominant race, and are spread over the whole empire as officers and soldiers.

Mantegn'a (Andrea), b. at Padua in 1431 in humble circumstances; adopted, on account of his brilliant talents, as a son by his teacher in painting, Squarcione; attracted attention by his pictures when only seventeen years old, and was invited to Mantua in 1468 by Ludovico Gonzaga, for whom he painted the famous nine cartoons of *Cæsar's Triumph*, which later were bought by Charles I., and are now placed in Hampton Court. From 1485 to 1490 he resided in Rome, invited by Innocent VIII., and one of his most celebrated pictures of this period is *Madonna della Vittoria*, in the Louvre. He also gained a great reputation as an engraver. D. at Mantua on Sept. 13, 1506.

Man'tell (Gideon Algernon), F. R. S., LL.D., b. at Lewes, England, in 1790; became a surgeon in his native town, and acquired celebrity by his geological researches into the Wealden formation of Sussex, in which, besides many other fossil genera, he discovered the gigantic iguanodon, the hylæosaurus, the pelorosaurus, and the regnosaurus; became a member of the Royal Society 1825; received the Wollaston medal of the Geological Society 1835, and the royal medal of the Royal Society in 1849; settled at London in 1839 as a physician, and had great success as a lecturer on geology. He published *Fossils of the South Downs* (4to, 1822, 42 plates), *The Wonders of Geology* (1833), *The Geology of the South-east of England* (1833), *A Day's Ramble in and around the Ancient Town of Lewes* (1838), *The Medals of Creation, or First Lessons in Geology* (1844), and a *Pictorial Atlas of Fossil Remains* (1850), besides several minor works. The whole number of his books and papers on geology amounted to 67. Dr. Mantell sold his geological collections to the British Museum in 1839, and bequeathed to Yale College his geological drawings. His works are highly readable, and maintain their value as a record of conscientious and minute research. D. in London Nov. 10, 1852.

Manteo, cap. of Dare co., N. C. (see map of North Carolina, ref. 3–D, for location of county), on Roanoke Island, on the S. shore of Shallowbag Bay. Pop. not in census.

Mantes-sur-Seine, town of France, in the department of Seine-et-Oise, on the Seine, manufactures leather, sailcloth, and saltpetre. Pop. in 1881, 6056.

Man'teuffel, von (Edwin Hans Carl), Baron, b. at Magdeburg Feb. 24, 1809; entered the regiment of guard-dragoons in 1826, and became aide-de-camp to the king in 1848. He often held very important positions, especially of a diplomatic character, exercised a decisive influence on the reorganization of the Prussian army, and was made a lieutenant-general in 1861. He was very active in the negotiations between Austria and Prussia which ended with the convention of Gastein, and was in 1865 appointed governor of Sleswick. In 1866 he commanded the army of the Main. In the Franco-German war he drove Bourbaki across the Swiss frontier. In 1873 he was made a field-marshal, and in 1880 he was appointed governor of Alsace-Lorraine. D. June 17, 1885.

Manteuffel, von (Otto Theodor), Baron, b. at Brandenburg Feb. 3, 1805, was educated at Schulpforta; studied jurisprudence at Halle, and obtained a position in the Prussian administration in 1829. In 1848 he was made minister of the interior, in 1851 premier and minister of foreign affairs, and he was the upholder of the Prussian reaction. In 1858 he retired. D. Nov. 26, 1882.

Man'ti, city, cap. of San Pete co., Ut. (see map of Utah, ref. 3–G, for location of county), 22 miles S. E. of Nephi. Pop. in 1870, 1239; in 1880, 1748.

Mantine'a, one of the oldest and most active cities of Arcadia, Peloponnesus, situated on the Ophis, near the frontier of Argolis. It became very famous as the place in which in 362 the battle was fought between the Thebans and Spartans; the Spartans were defeated, but Epaminondas fell.

Man'tis [Gr. μάντις, a "diviner"], a remarkable genus of large orthopterous insects, raptorial in their habits, and kindred to the Phasmidæ, or walking sticks, from which *Mantis* and some four other genera have been separated and made a family, the Mantidæ. They are popularly called walking leaves, race-horses, soothsayers, or prophets. When watching for their prey these creatures assume a sort of kneeling posture, doubling the great spiny fore legs under the thorax. Hence they were once believed to be engaged in prayer. The Hottentots worship them. There are numerous species. *M. argentina* of South America devours small birds. *M. Carolina* is found in the U. S., where insects of the curious mimetic genus *Mantispa*, though neuropterous, have the appearance and habits of the true Mantidæ.

Mantis'sa [Lat., "an addition"], the decimal part of a logarithm. (See Logarithm.) W. G. Peck.

Man'torville, on R. R., cap. of Dodge co., Minn. (see map of Minnesota, ref. 11–F, for location of county), on the Zumbro River, has a brewery and an excellent stone-quarry, from which many fine buildings of the town have been erected. Principal business, farming. In 1870 the villages of Kasson and Mantorville were included in Mantorville tp. Pop. in 1870, of v. 622; of tp. 1969; in 1880, of v. 477; in 1885 of v., 387.

Man'tua (*Mantova*), city of Northern Italy, in the province of Milan, the strongest fortress of the celebrated "Quadrilateral," and even of Italy. It is in lat. 45° 07′ 45″ N., lon. 28° 27′ 33″ E., 8 miles N. of the Po, and 90 feet above the level of the Adriatic. This town is built on two islands formed by the Mincio, which here spreading out creates a lake that encircles the city. The channel or canal between the two islands dividing the city is called the *Rio*. Mantua, though its fortress and citadel are of immense strength, has a still more certain defence in the stagnant water that surrounds it, and that proves far more deadly to besieging armies than to those within the walls. The streets and squares are broad and regular, and the public and private buildings have a grand mediæval aspect, and are very rich in works of art. The town has five gates and a dockyard, called Porta Catena, from whence there is a navigable communication with the Po. This port, closed by a chain at night, presents by day an animated commercial scene. The cathedral of Mantua was designed by Giulio Romano, and contains fine frescoes. The church of St. Andrea is magnificent, that of Santa Barbara very elegant, and both are adorned with pictures by first-rate artists. St. Martino and St. Egidio are churches of the sixth century. The old ducal palace is very sumptuous, with frescoes by Mantegna, Giulio Romano, etc. Mantua was one of the political and religious centres of the Etruscans. Cæsar bestowed upon it the privilege of Roman citizenship. It was the birthplace of Virgil (70 b. c.). In 568 it was not yet surrounded by water. In the eleventh century it belonged to the celebrated countess Matilda, and after her death passed to the emperor of Germany. In 1328 the duchy was governed by Luigi Gonzaga, the first of an illustrious house that retained its power for 379 years. In 1708 it again fell to Austria, but was well governed only by Joseph II. Wurmser, the Austrian general, surrendered it to Bonaparte on Feb. 3, 1797, after which it became a part of the Cisalpine republic. In 1874, having changed masters several times meanwhile, it submitted again to Austria, who treated it with cruel severity until the treaty of Vienna (Oct. 1, 1866) made it a part of the kingdom of Italy. Pop. in 1881, 28,048.

Man'ual. In music, the finger-board of an organ—that played by the hand, as distinguished from the pedal, which is played by the feet.

Man'uel I., Comnenus, Byzantine emperor, b. about 1120; succeeded his father, John II., or Calo-Joannes, in 1143, and d. Sept. 24, 1180. His reign was a succession of campaigns against the barbarous tribes in Dacia, Geisa of Hungary, Roger of Sicily, Egypt, Raymond of Antioch, and the Turks. He was a valorous soldier, with an ambitious desire of reviving the old Roman empire in all its splendor; but his considerable military successes were barely sufficient to keep his tottering throne standing. He suffered a great defeat from the Turks in the battle of Myriocephalus in Pisidia (1176), but the following year he defeated the Turks in Lydia, and obtained an honorable peace, after which he seems not only to have given up his ambitious plans, but even to have lost his energy.

Manuel II., Palæologus, Byzantine emperor, b. in 1348; succeeded his father, John V., in 1391, and d. July 21, 1425. The Byzantine empire consisted at that time of the city of Constantinople and the adjacent districts; and so miserable had this throne, once so gorgeous, become, that on a tour to the Western countries for the purpose of forming alliances against the Turks, John V. was detained in Venice for debt. Many Turks had settled in Constantinople, where they had three mosques and free exercise of religion, besides other advantages. Bajazet pushed his demands still further, and John V. sent Manuel to his court as security for the fulfilment of the demands. On the death of his father Manuel fled to Constantinople in order to secure the throne for himself, and Bajazet, provoked by this breach of faith, followed him with a great army. Aided by Sigismund, king of Hungary, Manuel met him at Nicopolis, but was completely defeated in 1396, and Bajazet laid siege to Constantinople. The last hour of the Byzantine empire seemed now to have come, when the progress of Timur and the terrible rout of the Turks at Angora (1401) still left it standing for some time.

Manufac'tures. By a curious etymological irony the word *manufacture* (that which is made by the hand) has come to signify chiefly that which is made by the agency of machinery, "so that the most perfect manufacture is that which dispenses entirely with manual labor." The object of all manufactures, whether in the primary or secondary sense of the word, is the modification of natural objects, and their adaptation to satisfy human wants. Dr. Ure divides manufactures into the two great classes of chemical and mechanical; but, practically, nearly every industry requires an application of some of the principles of both. The most important feature of modern manufactures is its employment of automatic agents. In place of depending upon the skill of the workman, subject to a thousand influences capable of producing variation, manufactures depend upon machinery, whose action is invariable under known conditions. The hand-loom weaver throwing his shuttle through the loom would do so not with a constant regularity, but with variations arising from changing conditions of health, skill, and industry. The thing of iron that has taken his place acts uninfluenced in this way. Operations which to be performed even coarsely by hand would need the highest skill and the closest attention, can be performed in machinery with greater certainty and greater despatch under the supervision of a child. Intimately connected with modern manufactures is the factory system, on which to a large extent their success is dependent. The hand-loom weaver in his own house, obliged to work long hours for a bare pittance, is a type of the old system; the weavers congregated in a large mill containing many looms, all animated by the same motive-power, working for regular and comparatively moderate hours, is the type of the new system. Considered from the industrial point of view, the advantages of machinery and manufactures may be stated, in Babbage's words, "to arise from the addition which they make to human power; the economy they produce of human time; the conversion of substances apparently common and worthless into valuable products." Under the first head must be included not only the use of the simpler machines, but also the *additional* forces derived from wind, water, and steam. The complex nature of most of the industrial operations of the present day will show what serious inconveniences would arise from the deprivation of labor-saving instruments. The economy of time is another important advantage of machine over manual industry. Not only can the machine work at quicker velocity than the man, but the period of natural operations can be abridged, as in tanning, bleaching, and many other processes. Tasks too great for human strength and operations too delicate for human touch can be accomplished by machinery. The great regularity of the operations of machinery involves much less waste, and thus increases the use to which the raw material can be applied. Absolute accuracy can almost be guaranteed. These words when placed in the printing-press will in a marvellously short time be multiplied by many thousand copies, each of them identical to the minutest point—a feat utterly beyond manual skill, with years to work in. The power of copying—that is, of faithful reproduction to a practically unlimited extent—is one of the most important of the advantages of manufactures, and is developed in a thousand diverse manners.

In manufactures there is a constant endeavor to lessen the cost of production. This gives rise to a succession of inventions, benefiting first their ingenious authors, but in a still greater measure the consumer of the article. It is by the action of this principle that luxuries formerly found only in the houses of the wealthy now add to the comfort and pleasure of the humblest homes. Division of labor is one of the cardinal principles of manufactures, the advantage being a great increase in the quantity of work, owing, "first, to the increase of dexterity in every particular workman; secondly, to the saving of time, which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labor, and enable one man to do the work of many." (*Adam Smith.*) The causes which have led to the establishment of manufactories—to the factory system—are indicated in the preceding remarks. In no other way would it be possible to combine the conditions necessary for production on the large scale now required. Local advantages sometimes cause an aggregation of manufactures of one class in particular districts, yet there are many examples of the migrations of industries, which when examined often convey valuable lessons. Sometimes municipal *un*wisdom, sometimes mob-fury, has impoverished a district in this way. The large scale upon which modern manufactories are conducted usually implies that the owner of one is a person with considerable capital at command. The supposed antagonistic interests of the master and men have led to great suffering and to great loss. The system of partnership of labor by which the worker receives a percentage of profit in addition to wages has been tried with varying degrees of success. At present it can only be regarded as being in the tentative stage, though some modification of it will probably form an increasingly important feature in the future of industry. Taxation and local regulations have sometimes exercised an important influence upon the success of specific manufactures.

The sanitary influence of manufactures has been greatly debated. In the early stages of the factory system in England the absence of regulation and the cupidity or thoughtlessness of the employers led to the infliction of great suffering. Children were kept at work for many hours at a time. Physical deformity, mutilation, and even death, were the result. Pauper children were placed in factories under an "apprenticeship" system differing little from slavery. The passing of the Ten Hours' act greatly changed the aspect of affairs. Shorter hours, better ventilation, improved construction have ameliorated the condition of the workers in manufactories. (See FACTORY.)

Historically, the manufacturing system dates its importance from the last century. Previous to Arkwright's time manufactures were everywhere feeble and fluctuating in their development. The handicrafts of the ancient world were small indeed when placed in comparison with the manufactures of to-day. The development of steam-power and the systematic application of machinery have changed almost the entire social fabric, and added in no small degree to the comfort of mankind. Not the least beneficial result is that bond of union with which it surrounds the nations. Babbage on *The Economy of Machinery and Manufactures* and Dr. Ure's *Philosophy of Manufactures*—the first for its philosophic originality, and the second for its abundant details—are useful works to consult. W. E. A. AXON.

Manumissio. See APPENDIX.

Manure. See FERTILIZERS.

Man'uscript [sing. MS., plu. MSS.; Lat. *manuscriptum*, "written by hand"] signifies abstractly anything written. Through use and association the term is generally understood as meaning a book of paper or parchment, yet, strictly speaking, especially of the earliest works, it is difficult to draw the line exactly, since lapidary inscriptions are executed by hand, and there was a gradual transition from these to plates of lead or bronze, on which whole works—*e. g.* the *Eugubian Tablets*—were inscribed, and so to cakes of clay afterwards burned, wooden tablets, tablets covered with wax, sheets of horn, bark (whence *liber*, a "book"), leather, and palm-leaves, which latter are still extensively used in the East. The Egyptian MSS. were chiefly written on papyrus, made from a water-plant which has now, like the lotus, disappeared from Egypt, but which is abundant on the upper Nile. Parchment is said to have been invented at Pergamos (159 B. C.), whence its name (Lat. *pergamena*), on account of an Egyptian embargo on papyrus. Modern discoveries have proved that it was made centuries before this date. It came into general use for MSS. about the eighth century. The preparation of MSS. was a great art among the Greeks and Romans; with the latter so many were sometimes employed in a *scriptorium*, or writing establishment, that hundreds of copies of a book could be produced in a single day. When the great cheapness of labor in Rome is taken into consideration, and the rapidity with which professional copyists produce MS., it will be found that books were in ancient times not as expensive as we are taught to believe. Elaborately ornamented works were of course dear, and these are almost the only ones which have been thought worth preserving. Even the Gothic text, resembling type in its accurate uniformity, was produced more rapidly than is generally supposed. It is not unusual for auctioneers and others to speak of some missal as having cost some monk a life's labor, when two or three months amply sufficed the illuminator and writer to perfect it. The many uses to which both parchment and paper can be applied, and the perishable nature of the papyrus, fully account for the fact that so few early Greek or Latin volumes exist. To the custom of illuminating MSS. (see Illuminated Manuscripts) we doubtless owe the preservation of many books which were kept for the sake of their ornament by persons who had no understanding of the text. At the present day there are many collectors who own valuable MSS. which they will not suffer to be copied or published for fear of diminishing their value. The great libraries of Europe—as, for example, that of the British Museum—are to a certain extent *scriptoria* at the present day. Any person desirous of having a neat MS. copy of any other MS. or book in it can do so, the librarian or superintendents being always able and willing to supply the names of professional copyists. The usual rate for copying from clear type is 3*d.* per folio or seventy words. Copying from MS. is dearer; that of the Elizabethan era is about 6*d.* per folio. The *scriptorium* of the Middle Ages had its guardian angel. If the monks in their prayers or psalms passed over anything, the lost syllables were gathered up by a little demon named Titivitilarius or Titivillus, who carried a bagful into hell every morning. But, on the other hand, every word faithfully transcribed was recorded by the angel of the *scriptorium*, and for it one sin was pardoned to the writer. It is possible that the "devil" of the modern printing-office is a descendant of Titivillus. Early MSS. are of great value, since by them alone the truth of a text is often determined. The science of reading different MSS. and of judging of them is called diplomatics; that of writing in all its phases, palæography. Among the principal works on MSS. are Herman Hugo, *De prima Scribendi origine* (Treves, 1738); Ebert, *Handschriftenkunde* (Leipzig, 1825–27); Astle, *Origin and Progress of Writing* (London, 1784); G. Pauthier, *De l'origine et de la formation des différents systèmes d'écriture; Essais d'appréciation*, etc., *sur l'écriture* (Paris, 1837); Léon de Rosny, *Recherches historiques et philologiques sur l'écriture des différents peuples anciens et modernes* (Paris, 1857–58); Montfaucon, *Bibliotheca Bibliothecarum Manuscriptorum Nova* (Paris, 1739). A very full index of works on writing is given in the *Dictionnaire Universelle* of Larousse, under the title "Écriture." Charles G. Leland.

Manu'tius (Aldus), b. at Bassiano, Italy, about 1449; established about 1490 a printing-press at Venice, from which issued a series of editions of Greek and Latin authors which acquired a great reputation, and are still highly prized for their correctness. (See Aldine Editions.) Manutius was himself a good scholar, and he was helped in his editorial labors by a number of other scholars, who assembled with him and formed the so-called Aldine Academy. He introduced the character called Italic, said to have been cast in imitation of Petrarch's handwriting, and used on account of its smaller bulk instead of the frequent printers' abbreviations which at that time made reading very difficult. He compiled a Greek-Latin lexicon (1497). At the death of his grandson, Aldus the Younger, in 1597, the establishment was broken up. D. at Venice Feb. 3, 1515.

Many, cap. of Sabine parish, La. (see map of Louisiana, ref. 8–B, for location of parish), 25 miles S. W. of Natchitoches. Pop. in 1880, 143.

Manzana'res, town of Spain, province of Ciudad Real, stands in a beautiful and fertile district rich in grain, wine, fruit, olives, and vegetables, and manufactures woollen fabrics. Pop. 8857.

Manzanill'o, town of Cuba, situated on the south-eastern coast of the island, has a good harbor. Pop. 5643.

Manzo'ni (Alessandro), Count, b. at Milan May 8, 1785. His mother, Giulia Beccaria, was the daughter of the celebrated Marchese Cesare, author of *Dei Delitti e della Pene.* Manzoni's early studies were prosecuted at Merate and at Lugano, and he graduated at Pavia. At the age of twenty he went to Paris, where his mother was residing with Carlo Imbonati. Imbonati dying in 1806, Manzoni wrote his famous verses on the death of his mother's friend, which were the keynote of his future career. At this time Manzoni made the acquaintance of Fauriel, to whom he became warmly attached. In 1807 he published his little poem *Urania.* Hitherto atheistic in his opinions, he became converted between 1807 and 1808 to the Catholic faith, of which he was afterwards an eloquent defender—first by his *Inni Sacri*, published soon after his marriage with Luigia Enrichetta Blondel, the daughter of a Genoese banker, and afterwards in his *Apologia della Morale Cattolica*, which he defended against the accusations of the illustrious Protestant historian Carlo Sismondi. Returning to Milan after his marriage, Manzoni commenced his tragedy, *Il Conte di Carmagnola*, which he completed at Paris in 1819, and dedicated to Fauriel. Goethe spoke of this tragedy with the highest praise, and was among the first to hail with supreme honor the name of Manzoni in the Stuttgart review entitled *Ueber Kunst und Alterthum.* On the death of Napoleon in 1821, Manzoni composed his immortal ode, *Il Cinque Maggio*, which Goethe immediately translated into German. The following year Manzoni published his tragedy, *Adelchi.* The distinguishing characteristic of the tragedies of Manzoni is a return to the most natural forms of dramatic representation, to the most simple and truthful dialogue. In 1825 he published what Walter Scott called the "most beautiful of romances," *I Promessi Sposi.* This was followed by a little historical romance, *Storia della Colonna Infame.* After this Manzoni devoted himself entirely to the study of Italian, in order to show the unity of the Italian language in its typical form, which, according to him, is the Florentine dialect. Manzoni was not only named senator by the Italian government, but an annual pension of 12,000 francs was settled upon him for his extraordinary civil and literary services. D. at Milan May 22, 1873.

Ma'oris, the name given by themselves to the inhabitants of New Zealand. It is supposed to be derived from *Maoui*, "the Creator or God," a term common to many tribes of the Polynesian group. The natives of this vastly extended archipelago are derived in all probability from the Malay stock, "whose tribes not only cover the islands in the southern Asian seas, but are extended to the lower part of Africa, since the Malagasy, or inhabitants of Madagascar, also belong to the Malays, as Wilhelm von Humboldt has observed." According to others, *Maori* signifies "born of the soil or native," a term applied by many races to themselves in all parts of the world. The Maoris have, however, a tradition that their ancestors came about 500 years ago in seven canoes from a distant island called Hawaiki, in all probability Hawaii. There seems to be some reason to believe that the real aborigines of New Zealand were a small dark race akin to the Papuans, and that traces of this occasionally occur in the darker-skinned Maoris. Owing, in all probability, to favorable physical influences, the natives of New Zealand have developed into the first family of the Polynesians, being as remarkable for their bodily vigor as for intellect. Until subdued and civilized they were a cruel race. Though endowed with great energy and intelligence, they were extremely greedy, rapacious, and unscrupulous. The two great national customs which have not yet disappeared are *muru* and *tapu* or taboo. By the former any man who had by accident or otherwise—but in most cases inadvertently—transgressed certain customs rendered himself liable to a heavy fine, or in some cases to be plundered by everybody. Owing to this, no property was secure; an object of value, such as a coat, would pass in a few days through many hands; and it became disgraceful not to be plundered, because the being subject to *muru* gave a man a right to rob others. *Tapu*, or "prohibition," was infinite in its refinements. Under it nothing belonging to chiefs or *rangatira* (gentlemen) could be touched. Superstition aided this; a powerful man who had eaten unknowingly the remains of a chief's dinner died in a few hours of terror. *Rangatira* were *tapu* from carrying anything on their backs, but they evaded it by bearing it in their arms and nursing it like a child. No man could take light from a chief's fire. *Mana*, luck, virtue, force, or inherent power, was an element of vast influence among the Maoris. A weapon which had slain many men, a virgin fortress, the prestige of a great chief, a pig which foretold changes in the weather by squealing, were all *mana.* Suicide was practised for many causes. When husbands or wives died the survivors in many cases hung themselves; widows did so almost invariably; and debtors often settled their accounts in this manner. Cannibalism, which is now extinct among the Maoris, was a few years ago their ruling passion. The younger generation are beginning to leave off tattooing their faces, which is not remarkable, since they have chapels, school-houses, and a newspaper in Maori and English. Polygamy was universal, and infanticide prevailed generally until of late years. They excel in carving, of which their war-canoes, carrying 100 men, are specimens. They entertained formerly a superstitious dread of an *Atua* or supreme being, and cultivate many superstitions akin to worship relative to the stars, sun, moon, and minor divinities. Many writers vindicate the character of the Maoris, and express admiration of them. They believe that the stars are the left eyes of deceased chiefs; that the higher class among themselves are immortal, but when the *Cookees* or vulgar perish they die for ever. Capt. Cook describes the female Maoris as very plain, but Mr. Savage and Capt. Cruise declare that they are well formed, with very attractive faces and sweet voices. The Maoris subsisted formerly principally on fern-roots, eels, and other fish, *kumara* or sweet potatoes, and *kiore*, a rat. These latter are so much smaller than the European rat that a chief expressed a wish for some from England to improve the breed. No people in the world are so fond of tobacco, and it is said that owing to its abuse the Maoris are rapidly deteriorating. The three principal tribes are the Ngatihaouas, Waikatos, and Ngatimaniapatos. The Maoris have greatly decreased in numbers since the settlement of Europeans. There are now about 44,000. (For details see *Maori Mementoes*, by Sir George Grey, late governor of New Zealand (Auckland, 1855); *Polynesian Mythology*, by Sir George Grey (London, 1855); *Mythology of the New Zealanders*, in Maori (London, 1854); *On the Native Songs of New Zealand*, by J. A. Davies (appendix to the foregoing); *The New Zealand Government and the Maori War of 1663–64* (London, 1864); *Important Information relative to New Zealand* (Sydney, 1839); *A Summer's Excursion in New Zealand* (London, 1854); *Ko nga Whakapepeha, etc., or Proverbial and Popular Sayings of the Ancestors of the New Zealand Race*, by Sir George Grey (London, 1857); *The New Zealanders* (London, 1830); *Voyages de M. l'Abbé de Rochon aux Indes Orientales* (Paris, 1783); Marsden's *Visit to New Zealand* (1820); Nicholas, *Voyage to New Zealand*.) CHARLES G. LELAND.

Map [Lat. *mappa*, "cloth"]. The word *map* is applied in its most usual sense to a representation of the whole or of some portion of the earth's surface, properly termed a *terrestrial* map; it is also used to designate charts of the positions of the stars or constellations of the celestial vault, considered as a surrounding sphere, or more special delineations of the earth's satellite or neighboring planets, as their external appearances are revealed by the telescope. The first man who attempted to draw a map of the world is reputed to have been Anaximander of Miletus, a scholar of the Greek school of philosophy who lived from B. C. 611 to 547. Eratosthenes, born at Cyrene in B. C. 276, is the first of whom it is recorded that he tried to measure the magnitude of the earth, and that he collected into a scientific treatise the scattered information respecting places and countries. The astronomer Hipparchus of Bithynia, born in the beginning of the second century B. C., also treated of geography. But it was not till the second century of the Christian era that Claudius Ptolemy of Alexandria in Egypt, who must be considered the great father of mapping, constructed his series of twenty-six maps, together with a general map of the then known world, basing these upon a catalogue of the astronomical latitudes and longitudes of places. Roman geography of the third century was represented by the still famous and interesting document known as the Peutingerian table, executed, it is believed, in about 230 A. D., which exhibits the military roads of the empire, and indeed the itineraries of the whole world known to the Romans, from Britain to Farther India. In mediæval times the scientific mapping of Ptolemy seems to have been forgotten, and to have given place in Europe to sentimental representations of the earth, in which the holy city of Jerusalem is taken as the central point of the world, all the lands of the globe being made to circle round it, and the ocean to encompass the whole on the outer margins. Perhaps the best example of this age of maps is that known as the Hereford map of the world, drawn on vellum about the end of the thirteenth or beginning of the fourteenth century, by Richard de Haldingham, who then held a prebendal stall in the cathedral at Hereford. The spirit of true geography appears at this time to have taken up its abode in more eastern countries, for during the Middle Ages the Arabians rendered most important services to this science, and the old Arab treatises on geography and travels by Abulfeda, Edrisi, Leo Africanus, Ibn Batuta, and others are still interesting and valuable. Italian maps of the fourteenth and fifteenth centuries, however, betoken a return to scientific mapping.

An epoch was marked in the history of maps when the geographer Gerard Mercator introduced in 1556 the cylindrical projection of the sphere which bears his name, and which since that time has formed the basis of every chart used for the purposes of navigation. Between this time and the conclusion of the following century vast strides were made in geography, and the volumes of maps which were then published by private individuals far excel in costly elaboration any such works of the present day; as examples of these may be taken the nine folios of the great atlas of Joannes Blaeu, published at Amsterdam about 1650; that of De Wit, also prepared in Amsterdam about thirty years later; or the atlas of Sanson, geographer to the French king, published in three huge folio volumes at Paris between 1690–93. Among the most important geographical works of the beginning of the eighteenth century is the survey of China given out in the name of Père du Halde, the work of a number of Jesuit missionaries, who gained admittance first into China about the end of the fifteenth century; this great work was completed in 1718, and still forms the basis of all maps of the Chinese empire. It should be mentioned, however, that native Chinese maps of high value existed previously to this Jesuit survey, and that both in this empire and in Japan geography and mapping had made great progress, quite independently of the advances in the science of the Mediterranean and European countries. Coming down to more modern times, we find in the latter part of the eighteenth century the beginnings of those mathematically accurate surveys and delineations of the surfaces of civilized countries which are now making such steady progress, and fast narrowing the regions of hypothetical or altogether unknown geography.

In considering briefly the different kinds of maps and their construction, we shall divide these into the two chief classes of *topographical* or special, and *geographical* or general maps. This distinction is simply one of the scale which may have been chosen, and of the amount of detail given in the representation. It has been laid down by Col. Jackson* that topographical maps range in scale from a one hundred-thousandth reduction of nature (or 0.63 inch to one mile) to a one ten-thousandth (or 6 inches to a mile); between these and the geographical maps this author introduces a semi-topographical class, but it appears simpler to consider all maps of smaller scale than one two-hundred and fifty-thousandth (or .25 inch to a mile) as general, all of a larger scale as topographical maps, until the limit of one ten-thousandth is reached, above which scale all representations, necessarily of small portions of land, are properly considered as *plans*, not maps.

The greater part of the existing *topographical* maps are the result of surveys undertaken by the governments of the more advanced countries of the globe, in which careful and elaborate mechanical measurements of the surface of the ground are made. The preliminary step in the survey is the exact measurement of a base-line in some level plain, from the extremities of which base-angles are observed to surrounding objects chosen as trigonometrical stations. The distances of these stations from the ends of the base-line are then calculated and laid down on paper, forming so many new base-lines from whence other trigonometrical stations are determined, until the entire area of the country to be surveyed is covered with a network of triangles. The bases measured in making the surveys of Great Britain and Ireland vary from 5 to 8 miles in length. Within the principal triangulation minor triangles, termed *secondary* and *tertiary*, are observed, and afterwards the interior of each is filled up by measurements with theodolite and chain. By this process the length and breadth of each part of the land are determined, and its features in respect of these two co-ordinates are accurately known; but a third element, that of elevation or depth, is also requisite to complete the true representation. In ascertaining this third element of height, the level of the sea is assumed as a datum line, and in more exact surveys horizontal sections, termed *contour-lines*, are traced by means of the spirit-level at certain equal intervals of elevation above the assumed datum, thereby giving a mathematically exact representation of the form and height of the ground at each change of level. In the British surveys contour-lines have been run generally at constant vertical intervals of 25 feet. In order to determine the true position on the globe of the tract surveyed, the astronomical position of some of the chief stations of the principal triangulation must be obtained with the most rigid accuracy, their latitudes being observed independently, their longitudes by differences of time between each other and between a certain known or assumed meridian.

The class of *general* maps, embracing as it does the whole of the geographical representations of the world, or of portions of its surface which are smaller in scale than the limit of topographical maps, is an exceedingly wide one. The most natural, and the only representation of the whole world in which the relative proportions of its various parts can be accurately preserved, is that of an artificial globe, on the surface of which the features of land and sea are mapped; and without the aid of such a globe no true ideas of the planet on which we live can be impressed on the mind. Since, however, the use of such an instrument is limited both by the necessarily small scale upon which it can be readily constructed, and by the obvious inconveniences of transport, it becomes imperative to have recourse to the more convenient though less true representations on a flat surface. Just as it is impossible to lay a sheet of paper on the surface of a globe without folding in some parts, so no map on a plane surface can represent any considerable portion of the globe without distortion. In the case of general maps, then, more than in that of topographical maps, which are more restricted in the areas they depict, some plan by which these errors of representation shall be reduced to a minimum must be employed. Various methods, termed *projections*, have from time to time been devised for this end, each having its application to some special purpose, some being designed for the truer representation of smaller areas, others for larger or for the whole globe. The two chief classes of projection are those which are truly *perspective* views of the globe, various points of view being chosen, and those in which a process of *development* is employed which shall preserve the geometrical relations of the parts of the surface to those of the real figure. In the former class the projections known as the stereographic and orthographic are those which are most frequently used in depicting the hemispheres of the world. In the one the point of projection is conceived to be placed on the surface of the globe, and to be vertically over the plane of projection; in the other the eye is assumed to be at an infinite distance from the globe, so that all visual rays to it may be regarded as parallel. The latter class embraces the developments known as the conic projection of Ptolemy and its modifications, one of which, the polyconic projection, is much employed in maps of the U. S., and the cylindrical projection of Mercator, with many others. The student of this subject is referred to the exhaustive French work on projections noted beneath, or to the more simple, practical English book.*

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* Essay on "Chartography" in the *Manual of Geographical Science* (London, 1852).

When a country has been topographically surveyed, the production of a general geographical map of that region is a simple matter of reduction of the larger to the smaller scale, and should be a perfect delineation of the main features of the land. The number of purposes of illustration to which maps may be applied, besides and along with that chief one of indicating the geographical features of the land, are exceedingly various; indeed, there is no science or culture which cannot be illustrated in some of its branches by means of maps. Most of the countries which have instituted topographical surveys have also employed a staff of geologists to examine thoroughly the structure of the country, and to lay down its geology and mineralogy upon the sheets of the topographical map in progress; in the case of the geological survey of the U. S. this plan has been to some extent reversed, and the geological surveyors have themselves been the first to survey topographically the parts of the less known Western regions which they have also geologically examined. The number of more general geological maps of all countries of greater or less value is endless. In meteorology maps are largely employed to represent the various phenomena, such as barometric pressure, temperature, or rainfall, over the globe or in special localities. General maps are also admirably adapted for displaying graphically the results of any great statistical inquiry: good examples of this class of maps are given in the *Statistical Atlas of the U. S., illustrating the Results of the Census of 1870*. Celestial maps are to the astronomer what the general chart of the world is in the eye of the geographer, a record of work accomplished and knowledge already gained. Both are still in a progressive stage, not perfected; and just as the geography of new countries is constantly being more accurately defined, so new stars are from time to time discovered by the improving telescope, and the positions and motions of those already known are more certainly determined and catalogued. In studying the celestial vault, as in seeking a true idea of the earth, the artificial globe is the truest guide; for the same reasons, however, as maps on a plane surface are used in terrestrial geography, they have also been adopted for convenience' sake in depicting the relative position of the stars as seen from the earth.†

KEITH JOHNSTON.

Mapes (JAMES J.), LL.D., b. in New York May 29, 1806; became a merchant and sugar-refiner, and was for a time professor of chemistry and natural philosophy in the National Academy of Design. He invented useful processes in industrial chemistry, and after heavy pecuniary losses became a successful agriculturist in Newark, N. J. He became a manufacturer of fertilizers, editor of the *Working Farmer*, and published many addresses and papers on chemistry and agriculture. He published also *The American Repository of Arts*, etc. (1840, 4 vols.), *The Practical Farmer*, and other works. D. at Newark, N. J., Jan. 10, 1866.

Mapes, or **Map** (WALTER), b. in England, probably in Herefordshire, about the middle of the twelfth century; studied at Paris; became a noted theologian; a favorite of Henry II., by whom he was sent on missions to the French and papal courts; was canon of St. Paul and of Salisbury, precentor of Lincoln, incumbent of Westbury, Gloucestershire, and archdeacon of Oxford (1196). D. about 1210. He wrote many Norman-French and Latin poems on festive and romantic topics, as also in prose in both languages, but the authenticity of the poems now attributed to him has been seriously questioned of late years. The *Latin Poems commonly attributed to Walter Mapes* were edited by Thomas Wright for the Camden Society in 1841, and the prose work, *De Nugis Curialium*, in 1850.

Ma'ple [Ang.-Sax. *mapeltréo*], a name given to trees of the genus *Acer* and order Sapindaceæ, natives of North America, Asia, and Europe. Many of them are noble shade and timber trees. The American species are the following: (1) The sugar-maple (*A. saccharinum*), called also hard or rock maple, and its variety, *nigrum*, the black maple. In Canada and the Northern States great quantities of sugar of good quality are made by boiling the sap of this tree. It is one of our handsomest park and forest trees, and is prized as firewood and timber. It is used extensively in making furniture, especially the peculiar forms of the wood called birdseye and curled maple. (2) The white maple or silver maple (*A. dasycarpum*), a fine shade tree; its soft and white wood is not prized as fuel or timber, but is used for making shoemakers' lasts. This is the earliest of all our trees to bloom. (3) The red or swamp maple, which shares with the preceding the name of soft maple, the red blossoms of which appear considerably later, but before the leaves. The wood is not unlike that of the silver maple. (4) The striped maple (*A. Pennsylvanicum*), sometimes called moosewood, and (5) the mountain maple (*A. spicatum*) are small trees or tall shrubs of little importance, although the former is planted for ornament. Their flowers appear later than the leaves. These are the Atlantic U. S. species. In the Rocky Mountains occurs (6) *A. glabrum*, a handsome small tree, and a variety of it, generally very distinct, which was called *A. tripartitum*, the leaves being divided into three pieces or leaflets. Finally, Oregon and California have two species: (7) the vine maple (*A. circinatum*), a small tree or large shrub which obtained its popular name either from a sarmentose habit which it affects in its native swamps or on low banks of streams, or from the rounded and many-lobed leaves, which may be likened to those of the grapevine; (8) the large-leaved maple (*A. macrophyllum*), a very handsome tree, but never very large; its timber hard and close-grained, and greatly valued in Oregon, this and an ash being the principal hardwood trees of the region. Of European species, the species commonly planted in the U. S. for shade and ornament are the Norway maple (*A. platanoides*), a round-headed tree, with bright green leaves, most like those of sugar-maple, and the sycamore maple (*A. Pseudo-platanus*), in England called simply sycamore, known by its large leaves, long and reddish stalks, and the lobes acute and pointed, both hardy trees of rapid growth and good timber. The wood of the latter is much used in Europe for carving. (See also BOX ELDER.) REVISED BY ASA GRAY.

Mapleton, Ia. See APPENDIX.

Maquet (AUGUSTE), b. at Paris Sept. 13, 1813; was educated in the college of Charlemagne, where in 1831 he was appointed professor. In 1845 the *Maison Alexandre Dumas et compagnie*, by Eugène de Mirecourt, made quite a sensation, revealing to the public that Maquet possessed a large share in the authorship of Alexandre Dumas, especially in his most popular novels, *Les Trois Mousquetaires, Vingt Ans après, Vicomte de Bragelonne, Monte Cristo*, etc., and their dramatizations. The most popular of the novels Maquet wrote alone are *La Belle Gabrielle, La Rose Blanche*, and the drama *Le Hussard de Berchcs*.

Maquoketa, city and R. R. junction, cap. of Jackson co., Ia. (see map of Iowa, ref. 4–L, for location of county). Pop. in 1870, 1756; in 1880, 2467; in 1885, 3028.

Marabou' Stork, the *Leptoptilus marabou* of Western Africa, one of the ugliest of the stork family, held sacred from its usefulness in devouring large quantities of filth. From this bird, and from the almost equally repulsive adjutant-bird of India, the very beautiful and costly marabou feathers are obtained. These feathers grow beneath the wings. The name is probably given on account of the sacred character of the bird (Arab. *marabouth*, a "saint").

Marabouts' [Arab.], a sort of half-priestly caste in the N. and W. of Africa, among Mohammedan peoples. They are descendants of the Almoravide sovereigns of Spain and Morocco. They profess to exercise miraculous powers, and are regarded with great veneration by the vulgar. They live on alms, but they are very liberally supported. They preside in all popular assemblies, and have a decisive voice in all intertribal questions and other matters of importance. When they die, their tombs are kept sacred. Chapels are erected in their honor, and gifts and prayers are offered. Their true domain is Northern Africa, and in Algeria the French have more than once been made to feel their power. The late Abd-el-Kader belonged to their number. The title comes from the Arab. *marabouth*, a "saint."

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* *Traité des Projections des cartes géographiques*, par A. Germain (Paris). *Principles of Mathematical Geography, comprehending a Theoretical and Practical Explanation of the Construction of Maps*, by William Hughes, F. R. G. S. (London).

† The most recently constructed star-maps are those by Mr. R. A. Proctor (London).

Maracay'bo, city of Venezuela, capital of the state of Zulia, is situated in lat. 10° 40′ N., lon. 71° 40′ W., on a channel which connects the lake with the gulf of the same name, has a good harbor, though admitting only vessels drawing less than ten feet, on account of the shifting bar at the mouth of the lake. It is defended by three forts and contains good facilities for shipbuilding, which is carried on to some extent. Cacao, cotton, fustic, coffee, and cattle are exported. Bricks and tiles, leather and excellent saddlery, cocoanut oil, sugar, rum, chocolate, etc. are manufactured in the city. In 1880 the total value of the exports amounted to $4,188,617; and were the bar removed or brought under control, the city would probably become a commercial centre of considerable importance. Its educational institutions are quite good. Pop. estimated at 30,000.

Maracaybo, Lake of, is 100 miles long and 70 miles broad, and communicates through a channel 20 miles long and 5 miles broad with the Gulf of Maracaybo, an inlet of the Caribbean Sea, on the northern shore of Venezuela. The Lake of Maracaybo is very deep, but the shifting bar at its mouth prevents large vessels from entering. During the reign of the northern winds, in May and April, its waters become brackish. The entrance to it is fortified; it was the last spot of the country held by the Spaniards, and was given up Nov. 9, 1823.

Ma'ragha, town of Persia, in the province of Azerbijan, on the Safi, whose waters are conducted through canals over a large territory and employed for irrigation. The raisins of this vicinity are considered the best in Persia. The manufactures of glass are considerable. Close by are the famous Maragha marble-pits, where the marble is cut in slabs so thin that it is nearly transparent and can be used as windows in the public baths, etc. The finest objects of art are wrought from it. Pop. 15,000.

Marais' des Cygnes ("swans' marsh") **River** rises in Waubunsee co., Kan., flows in a tortuous E. S. E. course 125 miles to the Missouri line, near Fort Scott, and takes the name of OSAGE RIVER (which see). It receives numerous streams and drains a fertile region.

Marajo', an island of Brazil, formed by the Amazon, the Pará, and the Atlantic Ocean, and belonging to the province of Pará. Although low, it is not altogether alluvial; in some places appear rocks. The southern part is covered with primitive forests, the northern with pastures, feeding immense herds of cattle and horses. Pop. 20,000, a mixture of Indians and white men.

Maranhão', or **Maranham,** province of Brazil, bounded W. by the Pará, N. by the Atlantic, E. by the Parnahyba. Area, 141,939 square miles. Pop. estimated at 500,000. Although its soil cannot compare with that of Pará and Amazona in fertility, yet it is one of the richest provinces of Brazil, producing immense crops of sugar, cotton, and rice, and yielding much fine timber, ornamental and dyewoods. It differs from those two provinces with respect to its climate, by having a dry and a wet season; during the dry season, from June to November, the trees lose their leaves, the grass withers, all vegetation dies, and men and animals often suffer severely from lack of water; during the wet season the appearance of the country is most luxuriant. The ground is generally low; only in the south-western parts appear some ranges of hills, which, however, are rich in useful minerals. The inhabitants consist of a mixture of Indians, negroes, and white men, with the exception of a few pure Indian tribes.

Maranhão, or **Maranham,** town of Brazil, the capital of the province of Maranhão, is situated on the north-western coast of the island of the same name, and at the mouth of the Maranhão River, in lat. 2° 31′ S. and lon. 44° 18′ W. It is a handsome city, with many fine and substantial buildings. The streets are generally so steep, the city being situated on two hills, that carriages cannot be used, but they are broad, straight, well paved, and lined with handsome two-storied houses surrounded with gardens. It has a good harbor, though its entrance is somewhat difficult, and a large and important trade. Pop. 31,604.

Mara'no di Napoli, town of Southern Italy, in the province of Naples, 8 miles N. of the city of Naples. Abundant and interesting vestiges of its very ancient origin still remain. Pop. 7143.

Maranta'ceæ [from *Maranta*, one of the genera], a natural order of endogenous herbs, mostly tropical, and closely allied to the gingerworts, which, however, have an aromatic principle, while Marantaceæ have a pure starchy deposit. A few Marantaceæ have some acridity. Arrow-root and *tous-les-mois* are the most important products of the order. The Southern U. S. have two species of *Thalia* and one of *Canna*.

Maraschino. See LIQUEUR.

Maras'mus, consumption of the bowels, abdominal phthisis, is a wasting disease of the entire body dependent upon scrofulous or tubercular degeneration of the mesenteric glands. It is chiefly a disease of children, especially the bottle-fed, those in asylums, or those ill cared for. It often coexists with the presence of tubercles in the lungs, or tubercular meningitis, and is frequently developed by the exhaustive influence of a difficult dentition or persistent summer diarrhœa. The prognosis of marasmus is always bad. The treatment is entirely nutritive.

E. DARWIN HUDSON, JR.

Marat' (JEAN PAUL), b. May 24, 1744, at Boudry, Neufchâtel, Switzerland, of Protestant parents; studied physical science and medicine, read many books, and acquired a great multitude of miscellaneous notions, but learned nothing; travelled, or rather wandered, restlessly around from place to place; published at Edinburgh in 1774 *The Chains of Slavery*, translated into French in 1792 under the title of *Les Chaines de l'Esclavage*, but generally achieving nothing; settled at Paris in 1775; began to practise as a physician, and wrote book after book on optics, electricity, etc., but found no patients and no readers; and retired at last to the service of the count of Artois, afterward Charles X., as a veterinary surgeon, hiding away from the world his enormous ambition and enormous disappointment. With the Revolution this man, a dwarf, deformed, and with a ridiculous carriage, made his appearance to take his revenge. His heart knew only two feelings, envy and hatred, and in addressing people he could appeal to them only. His understanding had actually grasped only one single fact in the whole universe, the difference between rich and poor, and whatsoever he treated his ideas always ran hither. But just these two circumstances made him the idol of the rabble. His paper, *L'Ami du Peuple*, begun under the title of *Le Publiciste Parisien* and continued as *Le Journal de la République Française* and *Le Publiciste de la République Française*, was a power in France during its whole lifetime, from Sept. 12, 1789, to July 14, 1793. Several times the editor was arraigned for the infamous calumnies with which he attacked people and the unheard-of recklessness with which he demonstrated that 270,000 persons had to be guillotined in order to save France. The first time he secreted himself in the cellar of the Cordeliers, whence, however, he continued to issue his paper; the second time he had courage enough to face his arraigners, and was acquitted; the third he defied them and triumphed; to attack this evil was simply to make it worse. His power, however, would probably never have reached such a height but for Danton. Danton, the minister of justice, the man of great talents, wished to use Marat and his paper. He introduced him in the club of the Cordeliers. Thence he crept into the Convention, and one day he stood beside Danton as member of the committee of public weal, and made Danton himself tremble. The September massacres, and the law against suspicious persons, which brought 400,000 French citizens to jail, were his greatest deeds. In the last month of his life he was evidently crazy. An inflammatory fever attacked him, and he would probably not have lived more than a few days, when he was stabbed (July 13, 1793) by Charlotte Corday. His body was brought to the Pantheon, his portrait hung in the hall of the Convention, and a pension was voted to his concubine; but hardly two years elapsed before this enthusiasm gave way to a general indignation and disgust, which have proved the last judgment of Marat. His portrait and his body were transferred to other and more proper places.

Marate'a, town of Italy, in the province of Basilicata, on the Gulf of Policastro. Pop. 5108.

Mar'athon, a plain on the coast of Attica, about 6 miles long, 1½ miles wide, and 22 miles E. N. E. of Athens. The river Charadrus runs through it, and two little hamlets (Vrana and Marathona) are on its western edge, under the hills. The battle fought there in Sept., 490 B. C., is one of the most important in history. Ancient accounts of it, however, are inexact, contradictory, and some of them very wild. On the Greek side there were 9000 or 10,000 Athenians, and 1000 Platæans; on the Persian side, at least 100,000, and perhaps 200,000. There fell of the Persians 6400, and of the Greeks only 192, who were buried under the mound which still remains. R. D. HITCHCOCK.

Marathon, on R. R., Cortland co., N. Y. (see map of New York, ref. 5–G, for location of county), 50 miles from Syracuse and 30 from Binghamton, has carriage and cheese-box manufactories, etc., an extensive tannery, and is the centre of a large dairying country, and butter, cheese, and live-stock are extensively shipped from this point. Pop. in 1870, of v., 871; in 1880, 1006.

Marbach (JOHANN), b. at Lindau, on the Lake of Constance, Aug. 24, 1521, studied theology at Wittenberg, and was in 1546 appointed pastor of the church of St. Nicholas, in Strasbourg, afterward also professor of theology and director of the church convention, and d. there Mar. 17, 1581. He was one of those Lutheran theologians who by their exclusiveness and jealousy caused so much disturbance in the Protestant churches. Strasbourg had originally adopted the Swiss Reformation, but Butzer's long residence there, and his zeal for a reconciliation between Calvinism and Lutheranism, had given the church of Strasbourg a decided stamp of toleration. Nevertheless, as soon as Marbach settled in the city, confusion and persecution began. Butzer's catechism was supplanted by Luther's, the Reformed hymns were struck out of the hymn-book, etc. Some of the Reformed pastors and professors left the city, and those who wished to remain were compelled to subscribe to the *Confessio Augustana.*

Marbeau' (JEAN BAPTISTE FRANÇOIS), b. in 1798 at Brives, in the department of Corrèze, France; studied law, practised as an advocate in Paris, became known by several treatises on political economy, was appointed adjunct-mayor of the first arrondissement of Paris, and founded in the same year the first infant asylum in France, an institution which proved very beneficial, and was adopted not only in the capital, but in all the large cities of the country. His essay *Des Crèches* (1845) was crowned by the Academy; he also wrote *Du Paupérisme en France* (1847) and *De l'Indigence et des Sécours* (1850). D. at Saint Cloud Oct. 10, 1875.

Marble. In common language any limestone which will take a good polish is called marble, but the name is only properly applied to limestones which have been exposed to metamorphic action, and have thereby been rendered more crystalline in texture, and have had their colors more or less modified or totally removed. White marble belongs to the latter category. This is formed from limestones in which the coloring-matter was organic, and was expelled by heat. A similar process may be observed in limekilns where a gray or blue stone is used, from which a snow-white lime is produced. By removing the stone when half burnt it will often be found to have entirely lost its color before parting with its carbonic acid, and while all its strength is retained. In chemical composition, marbles are either carbonates of lime or compounds of the carbonates of lime and magnesia. Many of the best marbles contain much magnesia, and some of them are true dolomites. The use of marble in architecture apparently dates from the dawn of civilization. Among the Egyptians it was extensively used at a very early period; and nearly all the great masterpieces of architecture left by the Greeks and Romans are composed of this material. Marble has also been employed in all civilized nations for the internal and external decoration of buildings constructed of this or other material, and it has been the favorite, and almost the only, stone in which the sculptor has given form to his ideal.

Marbles are found to exhibit great diversity of color and texture, running into varieties which have served different purposes among both the ancients and moderns. They are commercially classified as *white* and *colored*; but each of these divisions constitutes a group in which there are many varieties, known by distinct names. The white marbles are divided into the pure white, or statuary, and the mottled, or clouded white, in which the mass is white with more or less clouds or stains. The colored marbles are gray, blue, black, red, and yellow, or mottled with various mixtures of these colors with each other or with white. Of all these, the rarest and most highly esteemed is the pure-white or statuary marble. When this is faultless in color and texture it is worth in the great markets of the world from fifteen to twenty dollars per cubic foot. Comparatively few localities are known where good statuary marble is found, and the quarries which have supplied the material employed by ancient and modern sculptors have worldwide fame. The white marbles chiefly used by the Greeks were the Pentelic and Parian. Of these, the first was obtained from Mount Pentelicus, in Attica; the second from the island of Paros. By the ancients the Parian was regarded as the most beautiful of all marbles, and the finest works of Phidias, Scarpa, and Praxiteles were wrought in it. The Pentelic marble is very fine-grained, translucent, and somewhat waxy in appearance. The Parian is more granular, resembling in color and texture *fine* loaf-sugar. The studios of the Roman sculptors were mainly supplied from the quarries at Carrara, on the shore of the Gulf of Spezzia; and the greater part of the white marble now used for statuary in Europe and America is derived from the same source. The Carrara marble is of somewhat coarser grain than the Greek, but is very pure in color and sufficiently compact to receive a high polish. In the U. S. statuary marble has yet been quarried only at West Rutland, Vt. Here a layer from three to four feet in thickness of pure white is interstratified with forty to fifty feet of clouded marble. This is as perfect in color as the Italian, but is somewhat less strong and durable. White marble of fine quality occurs at Brandon, Vt., but in layers too thin to afford large blocks.

The clouded white marbles are much more abundant than the pure white, and usually constitute nine-tenths of the deposit where that occurs. This variety is generally employed for walls, cornices, and columns of buildings, for sepulchral monuments, mantels, etc., and the "clouded Italian marble" so largely imported into this country may be considered as a typical example of it. Most of the temples and palaces of antiquity are constructed from this variety, often taken from the same quarries which yielded the pure white in smaller quantities. The Parthenon at Athens is built of Pentelic marble, and is white, with a few spots or clouds of darker color. In North America what are called white marbles occur in a great number of localities, as in the Laurentian rocks of Canada, throughout the Alleghany belt, in the Rocky Mountains and Sierra Nevada. White or light marbles of desirable quality are, however, yet known to exist in but few places, and almost all the fine marbles, such as come in competition with the Italian, are obtained from Rutland co., Vt. The marble of this region is of the age of the Trenton limestone of New York, and forms part of a calcareous mass about 2000 feet in thickness, called the *Eolian limestone* by Prof. Hitchcock. The quantity of good marble in this mass is very variable. At West Rutland a thickness of from 40 to 60 feet is worked; at Sutherland Falls, 70 to 80; at Pittsford, 600 feet. Up to the present time most of the Vermont marble used in this country has been quarried at West Rutland and Sutherland Falls, but the marble deposits at Pittsford are much more extensive and of quite as good quality.

The marble belt of Rutland co. extends to a great distance N. and S. through the States of Vermont and Massachusetts, but the quality of the stone deteriorates in either direction. Toward the N. it becomes finer, harder, and more translucent, but is less sound; while towards the S. it is coarser. A belt of white marble, probably distinct from that described above, runs southward along the flanks of the Alleghanies from Massachusetts to and beyond the Potomac. The marble of this belt is a typical dolomite, and is very coarsely crystalline. It is quarried at Sing Sing, Tuckahoe, and various points in Westchester co., N. Y., and near Baltimore, Md. The coarseness of this marble forbids its use for any other than architectural purposes. Fairly good light marble for buildings and monuments is also found at Lee, Mass., Canaan, Conn., Dorset, Vt., and other places in New England. The Lee marble was used for the extension of the Capitol at Washington. Deposits of white and clouded marbles are known to exist at various places in the southern extension of the Alleghany belt, but none of these have been worked, or even opened, except one in Louisa co., Va.

"Colored" marbles exist in endless variety. They are either of one simple color or variegated. Among the first are the black, red, blue, gray, and yellow marbles. Jet-black marble was somewhat largely used by the ancients, and that found in the ruins of Italy is known as the *Nero antico.* It is now highly prized, and is chiefly used as a groundwork for mosaics. Black marbles are found in Derbyshire, England, Kilkenny, Ireland, and in the U. S. at Shoreham, Vt. A black limestone quarried at Glenn's Falls, N. Y., is called a black marble, and is employed for tiles, which are placed alternately with squares of white. The red and yellow marbles of the Romans are called by the modern Italians the "*Rosso antico*" and "*Giallo antico.*" Like the *Nero antico*, they were largely used by the Romans and Etruscans for the decoration of the interiors of their houses; but the localities from which they were derived are not now known. Gray marbles have always been more or less employed in architecture, chiefly for walls, cornices, and columns. The most common gray marble of the Romans is the *Cipolino.* This is of a banded or clouded gray color, having much the aspect of gray granite. The columns of the temple of Jupiter Serapis at Baiæ (bored by mollusks, and thus recording the former partial submergence of the temple) are of *Cipolino.* The variegated marbles are often spotted or veined with different colors, and are sometimes of great beauty. They are used for the decorations of the interiors of buildings, for counters, soda-fountains, mantels, etc. *Brocatello* is the name given to a peculiar mottled marble found in Spain. The marble of the mottled layers in the Rutland quarries is also called *Brocatello. Lamachello* (Fr.), or *Lumichella* (It.), is a highly fossiliferous marble or limestone, to which the enclosed fragments of shells, retaining their nacre and iridescence, give great brilliancy and beauty. *Bardiglio* is a bluish-gray marble with strongly-marked veins and spots of black. The best known foreign colored and variegated marbles brought to this country are the yellow "Sienna," the Genoese "Portoro"—black, with yellow and white veins—the "Lisbon," and others, which may be seen in the stock of any dealer.

In the U. S. the colored and variegated marbles are known to exist in various localities, and some of them are in general use for the purposes such marbles serve. Of these, the best known is the "Tennessee," a very handsome stone, mottled chocolate or lilac and white in color, and a favorite material for the interior decoration of public buildings. A scarcely less beautiful variety is the "Winooski" marble, quarried near Burlington, Vt. This is mottled with red, brown, and white, and is much esteemed; but, like many other veined and mottled marbles, it contains much silica and is difficult to work. The black marble of Shoreham, Vt., is apparently of good quality, and would be valuable in Rome, but in this country the use of such a material is so limited that there is little demand for it. The same may be said of a beautiful mottled gray marble found at Plymouth, Vt., and many other variegated marbles which are known to exist on the Atlantic slope or in the far West. Up to the present time our people have not been sufficiently rich and luxurious to make great use of purely ornamental stones. The demand for them is increasing, as is shown by the growing popularity of the "Tennessee," the "Winooski," and the blue-mottled "Columbian" of Rutland, but the spirit of the age in this country, and in all countries, is opposed to palaces, public or private, especially such as have their walls encrusted with many-colored marbles. They belong to an age which has passed away, never to return. The white marbles, on the contrary, were never so much used as now. In the form of mantels or table-tops they find their way into almost every household, and the industries concerned in their production were never so flourishing as at present. In comparing the value of property containing white or colored marbles, it should be remembered that not one cubic foot of the latter is used to a hundred of the former, and this ratio will probably never be greatly varied. The so called *verd-antique marble* is omitted from the list given above because it is not a marble. It consists of a mixture of serpentine and carbonate of lime, and will be described under its proper title.

In quarrying marble, the surface-rock, except when protected by clay or earth, is found cracked and decomposed by frost, sun, etc. to a depth of 10 to 30 feet, and is worthless. This is removed by blasting, and is discarded. The soundness and value of the marble can only be determined when the excavation has been carried beyond the reach of external agents. Even then the marble is often found to be unsound; so that the opening of marble-quarries is always expensive, and in untried territory hazardous. When the surface or "cap rock" is removed, a "floor," or level space, is formed, where the "channelling-machines" are set to work. These machines are worked by steam, and are of two kinds—viz. those which work one or two gangs of heavy chisels, like the "Wardwell machine," and those which drive the diamond drill. By these machines narrow parallel channels are cut across all the floor to the depth of perhaps six feet. The machines are then turned, and channels are cut at right angles with the first. The floor is thus cut into blocks of any required size. One of these, called the "*key-block*," is then broken out, and the others, thus rendered accessible, are drilled through at their bases—a process called "gadding"—and are lifted out by cranes. No powder is used in quarrying marble in this country, as it shatters and wastes the material. The cost of cutting and raising block marble is from seventy-five cents to one dollar per cubic foot. When removed from the quarry the blocks of marble are taken to a mill constructed for that purpose, and *sawed* into slabs of different thickness or into pyramids for monuments, blocks for building, etc. This is done with gangs of horizontal saws, which are strips of soft iron, fed with sand and dripping water. The polishing of marble is also done by machinery, the slabs or blocks being placed in a "rubbing-bed" and ground and polished with sand, emery, "putty," etc. by a rubber which has either a rotary or a to-and-fro motion. J. S. NEWBERRY.

Marble (MANTON), b. at Worcester, Mass., Nov. 16, 1835; graduated at the University of Rochester in 1855; became a writer for newspapers at Boston and New York; took part in founding the New York *World* in 1860, and was for a time its proprietor.

Mar'blehead, R. R. centre, Essex co., Mass. (see map of Massachusetts, ref. 1–I, for location of county), on the Marblehead branch and the Swampscott branch of the Eastern R. R., 20 miles N. E. from Boston, is a seaport, and has a deep and spacious harbor, nearly landlocked, and a number of shoe manufactories, the last being the principal business of the place. The fisheries, once prominent, are declining. It is a summer resort. Pop. of tp. in 1870, 7703; in 1880, 7467; in 1885, 7518.

Marble Hill, cap. of Bollinger co., Mo. (see map of Missouri, ref. 6–J, for location of county), is situated 133 miles S. of St. Louis, N. and very near Lutesville, which is a station on the St. Louis Iron Mountain and Southern R. R. Pop. in 1880, 265.

Marbois. See BARBÉ-MARBOIS.

Mar'burg [anc. *Matiacum*], town of Prussia, in Hesse-Nassau, on the Lahn. It is a quaint old town, climbing the sides of a hill whose top is crowned with an old castle dating from the thirteenth century, formerly the residence of the landgraves of Hesse, afterward a prison, and now a kind of historical museum. The church of St. Elizabeth is a fine building erected in 1235–83 by the grand-master of the Teutonic order and containing the tomb and silver sarcophagus of St. Elizabeth of Hungary. The town is the seat of a university founded May 30, 1527, and frequented by about 700 students. It was the first university established without papal confirmation. Manufactures of leather and earthenware are carried on. Pop. 11,225.

Marburg, The Conference of, took place Oct. 2–5, 1524, between the Swiss and the German Reformers, and was brought about by Landgrave Philip of Hesse for the purpose of putting an end to the fatal controversy concerning the Lord's Supper. Zwingli was anxious for reconciliation and deeply moved, but Luther was cold and stubborn; and the conference led to no result.

Marcari'a, town of Northern Italy, province of Mantua, near the left bank of the Oglia. Its mediæval history is closely connected with that of Mantua. Pop. 8244.

Mar'casite [It. *marcassita*], or white iron pyrites, a mineral having the same composition as pyrites, but differing from it in crystallizing in the trimetric system. It is also more liable to decomposition.

Marca'to [It.], a musical directive term, implying that the notes should be struck in a distinct, short, and pointed manner.

Marceau' (FRANÇOIS SÉVERIN DES GRAVIERS), b. Mar. 1, 1769, at Chartres, France; studied first law, but enlisted in 1785 in the army; became noted for his valor and magnanimity; fought with great distinction in 1792 in the army of the Ardennes; was made a general of division in 1793; commanded with success in the Vendée in 1793; decided the victory at Fleurus June 26, 1794; took Coblentz in 1794, and Königstein in 1796, but was mortally wounded on a reconnoissance at Altenkirchen in Rhenish Prussia, Sept. 20, 1796, and d. three days after. Monuments in honor of him were raised both in Chartres and Coblentz.

Marcelli'nus, SAINT, and bishop of Rome, succeeded Caius in 296, and d. Oct. 24, 304. The *Liber Pontificalis* states that under an outburst of persecution Marcellinus became a *thurificatus*—that is, a Christian who sacrificed incense on the altar of some idol in order to escape persecution; and the statement is accepted even by Roman Catholic writers.

Marcel'lo (BENEDETTO), b. at Venice July 24, 1686, of a noble family; received a careful education; studied music under Gasparini; held several important government offices; composed music to Giustiniani's version of fifty of the Psalms, for two, three, and four voices, with accompaniment of organ and string instrument; also several oratorios, masses, and cantatas, and a pastoral, *Calisto in Orsa*. D. at Brescia July 17, 1739.

Marcellus, the name of an illustrious plebeian family of ancient Rome, belonging to the gens Claudia. The most famous member of this family was Marcus Claudius Marcellus, b. about 268 B. C., and killed at Venusia, in Apulia, in 208 B. C. He was five times consul—namely, in 222, 215, 214, 210, and 208 B. C. A valorous soldier, he slew with his own hand Viridomarus, king of the Gauls, in the battle of Clastidium, during his first consulship, and dedicated the armor of the fallen foe as *spolia opima* in the temple of Jupiter Feretrius. Of still greater importance was his success at Nola in 215 B. C., where he repelled the attack of Hannibal, which was the first real check the Carthaginians suffered in Italy. But his greatest exploit was the conquest of Sicily, especially the capture of Syracuse, in 212 B. C. Archimedes led the defence of the works, and it was a traitor who at last introduced Marcellus into the city after a siege of many months. But his valor and success as a soldier, and the great services he did to the republic in the war against Hannibal, were disfigured by the cruelty and rapacity of his character. Syracuse he gave up to be plundered by his soldiers, and he carried away not only the treasury of the city, but also its works of art, thus inaugurating a custom which afterwards made the Roman generals so hateful. In Rome itself his proceedings occasioned much censure. Livy and Plutarch have drawn his picture with much partiality, and greatly exaggerated the advantages he now and then gained over Hannibal, which appears from the statements of Polybius, and may be discovered even between the lines of his panegyrists.

Marcellus I., SAINT, a Roman, is said to have become bishop of Rome in 308, and was forced by Maxentius the emperor to become a slave in his stables. D. 310.—MARCELLUS II., POPE (*Marcello Cervini*), was cardinal-legate of Julius III. at Trent; became pope, retaining his own name, and d. of poison May 1, 1555, after a pontificate of twenty-two days.

March [Lat. *Martius*, the month of Mars], the third month of the new or Gregorian style, the first of the Julian calendar.

March [Lat. *Marus;* Slavonian, *Morawa*], the principal river of Moravia, passes by Olmütz, forms for some distance the boundary between Hungary and Moravia and Austria proper, and enters the Danube 7 miles above Presburg. It is navigable 50 miles from its mouth. The plain between the lower March and the Danube has often been the theatre of war; here were fought the battles of Aspern and Essling and of Wagram.

March (ALDEN), M. D., LL.D., b. at Sutton, Mass., in 1795; graduated at Brown University in 1820, and in the same year settled as a surgeon at Albany, N. Y. He was the principal founder of the Albany Medical College and the City Hospital, and was long a professor of surgery and dean of the faculty in the former institution. He was a remarkably successful surgical operator, and was at one time president of the American Medical Association. He wrote some excellent professional papers, and introduced important changes in operative surgery. D. at Albany, N. Y., June 17, 1869.

March (AUSIAS), a Valencian poet, the year of whose birth is unknown, but who appears to have died in 1462. His poems in subject and general character resemble those of Petrarch, but his treatment of his themes is original, and he is entitled to rank not only first among the bards of his native language, but among the first of the century in which he flourished. His compositions, whether turning upon love, upon death, or upon moral or spiritual topics, are distinguished by seriousness and elevation of tone, as well as by great tenderness and delicacy of sentiment, and they are almost wholly free from the conceits so common in early Provençal and Italian poetry. His style is remarkable for force as well as simplicity, and for a naturalness of expression which seems almost peculiar to dialects not yet over-refined and rendered artificial and conventional by literary culture. Though March may be considered a follower of Petrarch, he is by no means a slavish imitator of his model, and indeed he often rises to a loftier height of poetical inspiration than was ever attained by the Italian bard. Helfferich says he soars above the Italian "as high as Schiller above Lamartine," and he finds in him the best qualities which have so much endeared the German poet to the Teutonic race. March does not even copy the poetical forms of Petrarch. His compositions are generally in stanzas of seven, eight, or ten verses, in most cases rhymed, but sometimes simply *assonant.* Four editions of the works of March, all now very rare, were printed in the sixteenth century, and a more complete edition, based upon these, was published at Barcelona in 1864 in 1 vol., 8vo, entitled *Ausias March, Obras de aquest Poeta, per Francesch Pelayo Briz.* GEORGE P. MARSH.

March (CHARLES W.), b. at Portsmouth, N. H., Dec. 15, 1815; graduated at Harvard College in 1837; studied law; engaged in journalism in New York; published *Daniel Webster and his Contemporaries* (1850); travelled in Europe; wrote *Sketches and Adventures in Madeira, Portugal, and the Andalusias of Spain* (1856); was for some time vice-consul at Cairo, and d. at Alexandria, Egypt, Jan. 24, 1864.

March (FRANCIS ANDREW), LL.D., b. at Millbury, Mass., Oct. 25, 1825; graduated at Amherst College in 1845; was tutor there 1847–49; admitted to the bar in New York 1850; was a teacher at Fredericksburg, Va., 1852–55; and became in 1858 professor of the English language and of comparative philology at Lafayette College, Easton, Pa., and has taken rank as one of the first of American philologists. He has written *A Method of Philological Study of the English Language* (1865), an *Anglo-Saxon Grammar* (1870), and an *Introduction to Anglo-Saxon* (1871), besides editing *Latin Hymns* and a portion of the *Ecclesiastical History* of Eusebius as textbooks. He has also written on philosophical topics in the *Princeton Review*, and on philology for the *Transactions* of German and American societies. In 1873 he was elected president of the American Philological Association.

Marchand (JOHN B.), U. S. N., b. Aug. 27, 1808, in Pennsylvania; entered the navy as a midshipman May 21, 1828; became a passed midshipman in 1834, a lieutenant in 1840, a commander in 1855, a captain in 1862, a commodore in 1866; retired in 1870. Served against the Seminoles in the Florida war, and aided in the capture of Tuspan, Mexico, during our war with that country; commanded the Lackawanna at battle of Mobile Bay, Aug. 5, 1864, and throughout the fight, in which he twice rammed the iron-clad Tennessee, displayed great coolness and self-possession. D. Apr. 13, 1875. FOXHALL A. PARKER.

Marche'na, town of Spain, in the province of Seville, on the Galapagar. It is a lively and thriving town, with celebrated sulphur springs in its vicinity. Pop. 13,768.

Marche'si (POMPEO), b. in 1790; studied under Canova; was appointed professor of the Academy of Art in Milan, and d. there Feb. 6, 1858. The first of his works which attracted general attention was a *Venus Urania* and a colossal statue of St. Ambrose. His principal work is a colossal group representing the *Mater dolorosa* with the dead Christ in her lap, now in the church of San Carlo in Milan, to which it was presented in 1852 by the emperor Francis. Among his other works are a statue of Goethe in the city library of Frankfort, of Volta in Como, of Charles Emanuel in Novara, of Bellini, Madame Malibran, and others. He enjoyed a very great reputation, and his conceptions have truly more strength and less sentimentality than those of Canova.

March'ing, in military tactics, is the movement of troops in ranks or files, in lines, columns, or other tactical arrangements. On long marches the *route step* is employed, an ordinary walk, the men preserving their places in the ranks. But in musters, reviews, parades, drills, and the like the cadenced step, in common, quick, or double-quick time, is employed. Music, preferably that of the drum and fife, assists in keeping the time and step. Marshal Saxe has the credit of being the first general in modern times to perfect a system of marching, but there have been many improvements made upon his system.

Marcia'na, or **Mari'na,** a maritime town of Central Italy, in the province of Leghorn. The inhabitants, chiefly sailors or shipbuilders, are industrious and skilful, and the place is prosperous. Pop. 7382.

Marciani'se, town of Southern Italy, in the province of Caserta, near Capua, in a low, unhealthy situation in the neighborhood of several small lakes, plans for drainage of which are under consideration. Pop. 9525.

Mar'cion, the son of a bishop of Sinope in Pontus; was excommunicated by his father on account of his heretical views; went to Rome about 140; associated with the Syrian Gnostic Cerdon; formed a new Gnostic system and founded a sect, the Marcionites, which found many adherents in Syria, Egypt, and Palestine, and continued as a separate sect till the sixth century. He established the first known canon of sacred books, from which, however, he excluded many writings which now belong to the New Testament. He hated Judaism, and the great object of his theological speculation was to eliminate from the doctrinal system of Christianity all those Judaizing elements which had crept in by tradition. But the absolute breach which he endeavored to establish between the New and the Old Testaments aroused a most decided opposition; all the great Christian teachers of the time wrote against him. Nor was it the speculative portion of his system which fascinated people, but its practical, moral portion, its austere asceticism. Not only flesh and wine, the circus and the theatre, were forbidden, but everything ornamental, the very elegance of refined social forms, was looked upon with contempt, if not with horror. Marriage was rejected and martyrdom set forth as the true crown of human life. (Concerning the so-called Marcion's Gospel, see the respective writings of F. C. Baur, Hilgenfeld, and Volkmar.)

Marcoman'ni ("men of the borders"), a German tribe, first settled in the regions between the Neckar and the Main; accompanied Ariovistus when in the time of Cæsar he invaded Gaul, but were later on led by their own chief, Maroboduus, into the land of the Boii (Bohemia), which they conquered, and where they maintained a standing army of 70,000 fighting men. Maroboduus's rule was of short duration, however; he was compelled to flee from his country, sought refuge with the Roman emperor, Tiberius, and d. at Ravenna. The Marcomanni continued, nevertheless, to be the ruling people in Bohemia, and soon they began to push forward towards the Danube. In the latter part of the second century Marcus Aurelius was occupied in war with them during almost his whole reign, from 161 to 180, and when he d. at Vindobona (Vienna) his son Commodus bought peace of them. In the third century they crossed the Danube and invaded Italy, though with various success. But in the general whir of the fourth century they became lost, and their name is not heard of any more in history.

Marco Polo. See POLO.

Marcou' (JULES), b. Apr. 20, 1824, at Salins, in the department of Jura, France; studied geology; received in 1847 employment at the palæontological collection of the museum of the Sorbonne; made extensive scientific travels in the U. S., 1848–50, 1853–54, and 1860, and was appointed professor in geology at Zurich in 1855. As results of his American explorations, partly undertaken in connection with Agassiz, he published in English *Geological Map of the U. S.* (1853), and *Geology of North America* (1855). He also published *Drias et Trias* (1859), *Carte géologique de la Terre* (1862), and *Derniers Travaux sur le Drias et le Trias en Russie* (1870).

Mar'cus, bishop of Rome, came to that dignity in 336, and d. Oct. 7 of that year. It is claimed that he was before election the first who bore the title of cardinal.

Mar'cus Aure'lius Antoni'nus. See ANTONINUS (MARCUS AURELIUS).

Marcy (ERASTUS EDGERTON), M. D., b. at Greenwich, Mass., Dec. 9, 1815; graduated at Amherst College 1834, and in medicine at Jefferson Medical College, Phila., 1840; was for some years a successful allopathic physician, but adopted the homœopathic doctrines, after which he "verified his theories by extended observation in the first hospitals of Europe;" settled in New York City, where he acquired an extensive practice; wrote numerous essays on medical and chemical subjects; edited from 1852 *North American Homœopathic Journal;* published *The Theory and Practice of Medicine* (1852) and *Homœopathy vs. Allopathy* (1854), which have been republished in Europe and translated into more than one language; and edited Hahnemann's *Lesser Writings* (1854).

Marcy (Gen. RANDOLPH B.), b. in Massachusetts about 1811; graduated at West Point in 1832, became lieutenant 2d Infantry 1837; was engaged in the battles of Palo Alto and Resaca de la Palma May, 1846, for which he was promoted to a captaincy; was engaged for several years in the exploration of the Red River country, in operations against the Seminoles, and in the Utah expedition 1857–58; became paymaster, with the rank of major, 1859; inspector-general, with the rank of colonel, Aug., 1861; was chief of staff to Gen. McClellan (his son-in-law) in West Virginia, on the Peninsula, and in Maryland, and was appointed brigadier-general of volunteers Sept. 23, 1861. He published *Exploration of the Red River in 1852* (1853), *The Prairie Traveller* (1859), and *Personal Recollections* (1866).

Marcy (WILLIAM LEARNED), b. at Southbridge, Mass., Dec. 12, 1786; graduated in 1808 at Brown University; was for a time a teacher, but became a lawyer of Troy, N. Y.; served as an officer of volunteers in the war of 1812–14, capturing at St. Regis, Canada, the first prisoners and the first flag taken on land in the war; became in 1816 recorder of Troy, and for a time conducted the Troy *Budget*, then a leading anti-Federalist organ; became in 1821 adjutant-general of New York, in 1823 comptroller; a judge of the State supreme court in 1829; was chosen U. S. Senator in 1831, but resigned this office the following year upon being elected governor of New York, to which position he was twice re-elected, but defeated in 1838 by W. H. Seward. In 1839, Pres. Van Buren appointed him commissioner to adjust the Mexican claims, and in 1845 Pres. Polk selected him as secretary of war. During his term of office the war with Mexico occurred, in which he displayed great ability, as well as in the settlement of numerous intricate diplomatic questions. In 1853, Pres. Pierce appointed him secretary of state, in which capacity he added to his already established reputation as a statesman of a high order. Many of his state papers are masterly productions. This was the last office he held. Retiring on the accession of Mr. Buchanan to the Presidency in 1857, he d. at Ballston Spa July 4, 1857.

Marcy, Mount, called by the Indians, *Tahawus*, or the "cloud-splitter," the highest land in New York State, is in the town of Keene, in Essex co., in a cluster containing several of the highest of the Adirondacs. It reaches 5467 feet.

Mardeen', or **Mardin,** town of Asiatic Turkey, in the district of Diarbekir. It is built on the steep sides of a rock whose top is crowned with a castle, and presents a very picturesque aspect. It is the seat of a Jacobite library and several Jacobite institutions, and carries on a considerable trade. Pop. 15,000.

Mardi Gras. See NEW ORLEANS, La., by JUDGE ALEXANDER WALKER.

Maréchal' (AMBROISE), D. D., b. at Ingre, France, in 1769; educated at St. Sulpice, and in 1792 came to Baltimore; held theological professorships in France 1803–11; declined the Roman Catholic bishopric of New York; coadjutor to the archbishop of Baltimore, Dr. Neale, whom he succeeded in 1817. D. at Baltimore Jan. 29, 1828.

Maréchal (PIERRE SYLVAIN), b. at Paris, France, Aug. 15, 1750; studied law, and was admitted as an advocate, but soon devoted himself exclusively to literature; acquired by his earlier verses some reputation and the appointment of sub-librarian at the Collége Mazarin; took Lucretius as his model; published some "fragments of a moral poem on God" (1781), in which he avowed atheistical opinions; wrote a parody upon the Psalms, purporting to be translations from an ancient MS. (1784), for which he was dismissed from his post; issued an *Almanach des honnêtes Gens* (1788), in which a calendar of his own invention replaced the usual lists of saints; wrote, besides other works, hymns in honor of the Goddess of Reason (1795), the *Voyages de Pythagoras* (1799), and, with the astronomer Lalande, a *Dictionnaire des Athées anciens et moderne* (1800). D. at Montrouge, near Paris, Jan. 18, 1803.

Maree', Loch, a lake of Scotland, in the western part of Ross-shire, is 18 miles long and 3 miles broad, and sends its waters to the sea through the river Ewe. It is studded with islands and surrounded by beautiful scenery.

Mare Island, in Solano co., Cal., is an island in the N. E. part of San Pablo Bay, near Vallejo, with which it is connected by ferry. It has a U. S. navy-yard, sectional floating dock, and naval arsenal.

Marem'me (*Ora Maritima*), a name applied to a vast, marshy, unhealthy territory bordering on the Tyrrhene Sea, from the mouth of the Magra to that of the Volturno. It covers about 1000 square miles, and is divided into the Tuscan Maremma and the Roman Maremma, these being again subdivided. This great tract is covered with stagnant water or immense deposits of sea-weed, interspersed with thorny thickets, wild forests, and verdant meadows. During the winter it is frequented by Apennine shepherds and haunted by lawless persons. In summer the fertile portions are cultivated on a large scale by peasants who descend from the mountains of Lucca, from the Sabine Hills, and the Abruzzi to plough and sow, then return home to wait for the harvest, when they redescend for as short a time as possible. But even this costs hundreds of lives every year. There are few villages, or even roads, in the Maremme, and the pestiferous exhalations extend even to the more elevated portions. They are, however, least felt on the slopes descending to the Arno and the Tiber. Draining on a large scale, with careful cultivation and extensive planting of trees, may in time overcome the malaria, and the effects which have already followed wherever such efforts have been made are encouraging. The railroad opened within the last few years along the Tyrrhene shore has produced very favorable results.

Maren'co (CARLO), b. at Ceva in 1800; received his legal degree from the University of Turin when scarcely eighteen years old, and was already remarkable for his poetic culture. In 1828 his first tragedy, *Buondelmonte*, was represented in Turin with marked success. His subsequent tragedies were *Famiglia Foscari*, *Adelisa*, *Manfredi*, *Giovanna I.*, *Pia*, *Berengario*, *Arrigo di Sveria*, *Corso Donati*, *Ezzelino Terzo*, *Ugolino*, *La Guerra de' Baroni*. D. at Savona in 1846, leaving nine children, one of whom, LEOPOLD, himself became a renowned dramatic poet. (See his *Giorgio Gandi*, *Celeste*, *Il Falconiere*, etc.)

Maren'go, a v. of Italy, in the province of Alessandria, is famous for the battle fought here June 14, 1800, in which Napoleon defeated and routed the Austrians.

Marengo, McHenry co., Ill. (see map of Illinois, ref. 1–F, for location of county), 66 miles N. W. of Chicago, on the Chicago and North-western R. R., is situated in the midst of a rich and fertile section of country, has a fine school-house, a steam flouring-mill, a steam foundry, a large carriage-factory, extensive fruit-nurseries, and is in an excellent farming district. Pop. in 1870, 1327; in 1880, 1264.

Marengo City, cap. of Iowa co., Ia. (see map of Iowa, ref. 5–I, for location of county), 85 miles W. by N. of Davenport, is situated on the Iowa River and the Chicago Rock Island and Pacific R. R., has a high school, a woollen and a grist-mill, several elevators, and is surrounded by a good farming and grazing country. Pop. in 1870, 1693; in 1880, 1738.

Ma'renholz-Bülow (BERTHA VON BÜLOW), BARONESS, the principal apostle of Froebel's Kindergarten idea, and the foremost authority on it, through her personal intimacy with him, her devotion to the system, and his expressed confidence in her powers. Through her intercession the injunction laid against Froebel's institution by the Prussian government was removed. In 1855 she held séances in her own parlors at Paris, and had the support of Michelet, Quinet, Abbé Michaud, and other distinguished people. Her lectures were in substance published, and went through two editions. She assisted personally in the establishment of kindergartens in Germany, Switzerland, Holland, Belgium, England, and Italy (aided in Florence by the influence of Mrs. George P. Marsh); in Berlin she lectured gratuitously during three years in a normal school for the education of kindergartners. Her lectures in Italy were condensed into a pamphlet, which was translated from the French into English, and printed in the *American Circular for Information* for July, 1872. Other works are *The Kindergarten, The Educational Mission of Woman, The Child and its Being.* She is at present chief lecturer in the new college for kindergartners in Dresden, and is writing reminiscences of Froebel in the monthly magazine *Erziehung der Gegenwart.* ELIZABETH P. PEABODY.

Mareo'tis, Lake, or **Birket-el-Marioot,** a salt lake or marsh in Lower Egypt, 30 miles long, 15 miles broad, and separated from the Mediterranean by a narrow isthmus of sand. It had been perfectly dry for three centuries, when in 1801, during the war between England and France, the English, ascertaining that the tract of land lay below the level of the sea, and having some military purpose in view, dug through the isthmus and let in the waters. This passage was closed by Mehemet Ali.

Marey' (ÉTIENNE JULES), b. at Beaune, in the department of Côte-d'Or, France, in 1830; studied medicine at Paris, and was appointed professor in natural history at the Collége de France in 1867. His *La Machine Animale,* resting on many original and ingenious experimental researches on the movements of animals, was translated into English, entitled *Animal Mechanism* (New York, 1874).

Marfo'ri (CARLOS), b. in 1819, the son of an Italian cook; obtained an office in the Spanish civil service through the influence of Gen. Narvaez, of whom he had married a relative. He afterwards became a deputy and counsellor in the administration of various financial associations, and was known to the Queen Isabella, who honored him very much. Always in association with Narvaez, who soon learned to appreciate the value of his friendship, he by degrees obtained political influence, and in 1866, when Narvaez became minister, Marfori was appointed governor of Madrid and chief of the royal household. Hated and scoffed at by the people, he was overloaded with honors by the queen. He contributed more than all her political mistakes to undermine her position. In 1868, when the revolution broke out, she was told from all sides, even by Napoleon III., that the dismission of Marfori was the only means of preserving the throne, but she remained faithful to her favorite, and sacrificed her crown. Also in exile, during her residence at Paris and other places, Marfori still continued to be the *maître de la maison* of the queen. AUGUST NIEMANN.

Mar'garet, queen of Scotland (called THE SAINT), b. in Hungary in 1046, was grand-niece of King Edward the Confessor and daughter of Edward, son of Edmund Ironside, who was driven into exile by Canute. She resided at the English court at the time of the Norman Conquest, when she accompanied her brother, Edgar Atheling, in his flight to Scotland. She there attracted the admiration of King Malcolm Canmore, whom she married in 1070, and earned canonization by her efforts in diffusing Christianity, and especially by connecting the Scottish with the Romish Church. D. Nov. 16, 1093, four days after the death of her husband, killed in battle while fighting against William Rufus. She was canonized in 1251, and made the patron saint of Scotland in 1673.

Margaret of Angoulême', generally known as **Marguerite de Valois,** queen of Navarre, b. at Angoulême Apr. 11, 1492, a sister of Francis I., and married in 1509 to the duke of Alençon. She was beautiful, witty, and exceedingly fascinating. Still more gifted by nature than her brother, she received an excellent education. She spoke Latin, Spanish, and Italian, understood Greek and Hebrew, and to these literary attainments added great practical ability. After the battle of Pavia in 1525, in which she lost her husband, while her brother, the king, was taken prisoner and brought to Madrid, she repaired to this capital—an undertaking which was connected with the greatest dangers, and could be accomplished at that time and for such a purpose only by a lady of eminent courage and inexhaustible resources under all emergencies; but her courage was rewarded, and her skilful negotiations at the court of Charles V. exercised great influence on the destiny of her brother and on the relations between France and the German-Spanish empire. In 1527 she married Henry d'Albret, count of Béarn and titular king of Navarre, and from this time, and up to her death (Dec. 21, 1549), she resided in Béarn, to whose progress and prosperity she contributed much by encouraging agricultural and industrial improvements, and by the liberal spirit which pervaded her government. The Protestants found shelter in Béarn and Alençon against the persecutions of the infuriated Roman Catholics, and her book, *Le Miroir de l'Ame Pécheresse* (1533), shows a leaning towards Protestantism; it was condemned by the Sorbonne, and she herself was openly denounced by the monks as a heretic who ought to be sewn in a sack and thrown into the Seine. She was a voluminous writer, and her *L'Heptaméron des Nouvelles*, an imitation of Boccaccio's *Decamerone,* first published in 1559, and afterwards republished in numerous editions, is considered a classic work in French literature. It has great historical interest and considerable æsthetic merit, but its elegance, vivacity, and rich invention are often marred by indecencies. A collection of poems was published in 1547 under the title of *Marguerites de la Marguerite, etc.* She left one child, Jeanne d'Albret, mother of Henry IV.

Margaret of Anjou, queen of Henry VI. of England, and daughter of René, count of Provence, b. at Pont-à-Mousson, Lorraine, Mar. 23, 1429; married Apr. 22, 1445; became unpopular in England on account of the cession of the provinces of Maine and Anjou, then in the hands of the English, to her father. She founded Queen's College, Cambridge, in 1449, and, the king being subject to protracted periods of imbecility, she soon became the real ruler of the kingdom. This power being contested by the duke of York, who claimed the throne by an elder line of descent, gave rise to the "Wars of the Roses," which continued thenceforth for several reigns. Margaret was at first victorious; afterwards forced to flee to Scotland, she invaded England and killed the duke of York at Wakefield (1460); released her captive husband by the battle of St. Alban's, Feb. 17, 1461; was herself defeated at the great battle of Towton, Mar. 29, and forced to escape to Scotland and France; made another unsuccessful invasion 1464; succeeded by the aid of Warwick the "king-maker" in momentarily reinstating Henry upon the throne 1470; but Warwick being killed at Barnet, Margaret was defeated and captured at Tewkesbury May 4, 1471, her only son, Prince Edward, being killed, and the king put to death soon after. Margaret was kept in prison in the Tower or at Windsor until 1475, when she was ransomed by Louis XI. of France at the cost of the independence of Provence, ceded to that monarch by her father. She lived in strict seclusion thenceforth at Reculée, near Angers, and d. at Dampierre Aug. 25, 1481. Margaret was a beautiful, talented, and educated princess; her valor and reverses of fortune have invested her name with a romantic interest.

Margaret of Denmark, queen-regnant of the three Scandinavian kingdoms, b. in 1353, a daughter of Valdemar IV. Atterdag, king of Denmark, and married in her tenth year (Apr. 9, 1363) to Haco VI., king of Norway, to whom she bore in 1371 a son, Olaf. In 1375, Olaf succeeded his grandfather as king of Denmark, and in 1380 his father as king of Norway. During his minority Margaret conducted the government of both countries, and this difficult task she fulfilled with so much discretion and vigor that on the death of Olaf in 1387 the estates of both kingdoms chose her queen-regnant, and left to her to appoint her successor. In Sweden a large party was strongly opposed to the king, Albert of Mecklenburg, and opened negotiations with Margaret; and as Albert always had shown himself very hostile to her, she sent her general, Ivar Lykku, into Sweden with an army. On Feb. 24, 1389, the combined Danish-Swedish army defeated Albert's German mercenaries at Falköping. The king himself was captured, and detained in prison for seven years, and after a short struggle with his party Margaret was acknowledged queen-regnant also of Sweden. She combined in her person a high degree of womanly fascination with a rare force of character. She was courageous, but she was also shrewd, and in her political actions she was led probably less by personal ambition than by plans of far-seeing statesmanship. On July 20, 1397, she promulgated an act of union between the three Scandinavian kingdoms, the so-called Calmar Union, drawn up and agreed upon by emissaries from all three countries; and this act shows that her idea was not to get possession of as much land as possible, but to form a powerful Northern empire. During her lifetime her plan succeeded in spite of the jealousies of the three peoples, but her successor, Eric of Pomerania, was a miserable person, and soon after her death (Oct. 28, 1412) the Calmar Union became the source of many calamities to the three Scandinavian countries.

Margaret of Parma, b. in 1522 at Brussels, a daughter of Charles V. by Margaret van Gheenst, was educated at the court of Mary, queen-dowager of Hungary, whom she somewhat resembled. She was first married in 1536 to Alessandro of Medici, duke of Florence, who was assassinated in the following year, and then in 1542 to Ottavio Farnese, duke of Parma and Piacenza, to whom she bore a son, the celebrated general, Alexander Farnese. She was rather masculine in her appearance, and liked to dress in man's costume. She had a moustache, rode on horseback astride, was fond of hunting and strong wine, and suffered from gout. But with a peremptory and somewhat imperious character she connected an honest and benevolent disposition, great shrewdness in judging character, and much adroitness in handling political affairs. In 1559, Philip II. made her regent of the Netherlands, which position she filled for eight years, but it was impossible for her, as it would have been for any person, to reconcile the principles of Philip II. and the instincts of the Dutch. She had some sympathy for the Netherlanders, and in 1564 she dismissed Cardinal Granvella, but immediately after her relations to Philip II. became desperate. In 1567 she retired to Italy, richly endowed by the king, and not unregretted by the people. D. at Ortona in 1586. A fine delineation of her character and history is found in Prescott's *Philip II.*

Mar'garetsville, a port of entry of Annapolis co., Nova Scotia, on the Bay of Fundy, exports fish, agricultural products, and firewood to the U. S. It has a lighthouse. Pop. about 300.

Mar'garetville, Delaware co., N. Y. (see map of New York, ref. 6–H, for location of county), 23 miles from Delhi, 45 miles from Kingston, and 1¼ miles from Arkville, on the Ulster and Delaware R. R. It has a tannery, a large cooperage, a foundry, a carriage manufactory, and various other industries. Pop. in 1880, 418.

Margar'ic Acid and **Margarine.** By the action of potash on cyanide of cetyl (margaronitrile) there is produced, besides cetylic ether, cetylic aldehyde, ammonia, and other products, a potassic salt of an acid which has the composition $HC_{17}H_{33}O_2$, intermediate between palmitic acid, $HC_{16}H_{31}O_2$, and stearic acid, $HC_{18}H_{35}O_2$. This acid exhibits all the properties of a pure fatty acid. It melts at 59.9° C., and cannot be resolved into acids differing in melting-point. This is the only process by which margaric acid can be prepared. The acids obtained from natural oils and fats by saponification, to which the name and formula of margaric acid were applied, were mixtures of stearic acid with palmitic acid or other acids of lower melting-point. Margarine, the tri-margarate of propenyl, the glyceride of margaric acid, which would be the neutral fat of this acid, has not been prepared. (For further information with regard to margaric acid see Heintz, *Pogg. Ann.*, cii. 272.) The so-called margaric acid and margarine of natural fats were announced by Chevreul in 1820, though he was not then fully satisfied that the acid was not a mixture of stearic acid with some acid of lower melting-point. Many other chemists announced the discovery of margaric in natural fats and their products: Varrentrapp in human fat and in the products of the dry distillation of beef-suet, lard, olive oil, etc.; Gottlieb in goose-fat; Thomson and Wood in shea-butter; Bromeis in the products of oxidation of stearic acid and by the action of nitric acid on oleic acid; Ridtenbacher in the products of the dry distillation of stearic acid; Anderson in the products of the dry distillation of almond oil with sulphur; Poleck, Lewy, and others among the products of the saponification or dry distillation of wax. Heintz in 1852 and subsequent years published the results of investigations on this acid, which have shown that none of the acids derived from natural fats or oils are the true margaric acid, but simply mixtures of stearic, palmitic, and other acids. (See Watts's *Dict.*, iii. 851.) C. F. CHANDLER.

Margari'ta, an island in the Caribbean Sea, belonging to Venezuela. Area, 441 square miles. Pop. 20,206. It is high, with a hot but healthy climate, and produces rice, fruits, poultry, and salt, and has important fisheries along its coasts. It was discovered by Columbus in 1498, and in the sixteenth century it was very famous for its pearl fisheries, from which it received its name, the Latin word *margarita* signifying a "pearl." These, however, lost their importance in the seventeenth century, and have now ceased altogether.

Mar'garite [Gr. μαργαρίτης, "pearl"], or **Pearl Mica,** a beautiful mineral crystallizing in the trimetric system, with micaceous cleavage and a pearly lustre, consisting essentially of a silicate of alumina and lime. It is generally found associated with deposits of corundum and emery, as at Chester, Mass.

Mar'gate, a seaport town of England, on the Isle of Thanet, Kent co., England. Its fisheries are important, but it is best known as a fashionable watering-place, much frequented during the summer. Pop. 15,889.

Margay', the *Felis tigrinus*, a handsome little tiger-cat of tropical America. When taken young it may be domesticated, and is highly prized as a destroyer of rats. *F. tigrinoides*, a similar species, is called the false margay.

Margoliouth (MOSES), PH. D., LL.D., b. in London, England, Dec. 3, 1820, of Jewish parents; was converted to Christianity in youth; studied at Trinity College, Dublin; took orders in the Church of England 1844, and after holding benefices in Liverpool, Glasnevin, and Kildare, became assistant minister of St. Paul's, Onslow Square, Kensington. He wrote much upon the religious prospects of the Jewish race, contributed to Cassell's *Bible Dictionary*, wrote a *History of the Jews* (12 vols.), *Rabbinical Hermeneutics of the Old Testament* (2 vols.), and executed a revision of the authorized translation of the Old Testament. D. Mar. 1, 1881.

Marhei'neke (PHILIPP KONRAD), b. May 1, 1780, at Hildesheim, in Hanover; studied at Göttingen, and became professor of theology in 1806 at Erlangen, in 1809 at Heidelberg, in 1811 at Berlin, where he was also appointed pastor of Trinity church, and where he d. May 31, 1846. One of his principal works is his *Grundlinien der christlichen Dogmatik*, of which the first edition (1819) is based on the philosophy of Schelling, the second (1827) on that of Hegel. The attempt to mediate a full harmony between the data of science and the doctrines of Christianity by raising both into a higher, ideal, speculative sphere, the sphere of truth, is here undertaken with great ingenuity, but the enthusiasm with which the book was received has now waned, and the standpoint from which Marheineke wrote his philosophical works, and even his sermons, has been given up as barren. His *Geschichte der Deutschen Reformation* (4 vols., 1816–34) is of lasting worth.

Mari'a Christi'na, b. at Naples Apr. 27, 1806, a daughter of Francis I., king of the Two Sicilies, was married, Dec. 11, 1829, to Ferdinand VII., king of Spain, his fourth wife. On Mar. 29, 1830, when the queen declared herself pregnant, the king abolished the Salic law of inheritance, to which the Bourbons had conformed, and according to which only the male members of the family could inherit the throne, and reintroduced, by a pragmatic sanction, the old Castilian law, according to which the crown could be inherited also by females. On Oct. 10, 1830, the queen bore a daughter, Isabella (afterwards Queen Isabella II.), and immediately the court and the country became divided into two parties, the Carlists and the Christinos, the former headed by Don Carlos, brother to the king, heir-presumptive to the throne according to the Salic law, and supported by the Ultramontane clergy and the absolutists—the latter headed by Maria Christina, vindicating the throne for her daughter according to the pragmatic sanction, and supported by the liberals. On the death of the king (Sept. 29, 1833) the two parties took up arms, and a civil war commenced which lasted till 1840, devastating the country and demoralizing the people. Meanwhile, Maria Christina, who was appointed regent during the minority of Isabella II., soon lost the popularity she had gained by her alliance with the liberals. She was intrinsically indifferent in political matters, but her instincts were absolutist rather than constitutional. Her subserviency to the policy of Louis Philippe placed her in opposition to the progressists or radicals, who found much sympathy in England; and her personal relations gave general scandal; she bore ten children to one Fernando Muñoz, a member of her body-guard, created duke of Rianzares, to whom she was not publicly married until Oct. 13, 1844. On Oct. 12, 1840, she was compelled to abdicate the regency to Espartero and leave the country. She resided for some years in Paris, but returned after the fall of Espartero in 1844 to Spain, and although Isabella II. had been declared of age in 1843, Maria continued to meddle with the government, until she was once more expelled in 1854. For ten years she lived in France, Italy, and England, returned in 1864 to Spain, from whence, by the revolution which dethroned Queen Isabella, she was again expelled in 1868. D. Aug. 22, 1878.

Maria Louisa, b. Mar. 12, 1791, a daughter of the emperor Francis I. of Austria: was married Apr. 2, 1810, at Paris, to Napoleon I., who had obtained a divorce from his wife, the empress Josephine, for the sake of this connection with Austria, and bore him a son Mar. 20, 1811. During the campaigns of 1812 and 1813 she was appointed regent, and her actions under the difficult circumstances were marked by ability and dignity. She was not allowed to follow her husband when he abdicated and went to Elba. She took up her residence in Schönbrunn, near Vienna, where she remained also during the Hundred Days. By the Peace of Paris, Parma, Piacenza, and Guastalla were given to her, and she governed them quietly for more than thirty years. After the death of Napoleon she contracted a marriage with Count Nieppcrg. D. Dec. 18, 1847.

Maria′na (JUAN), b. at Talavera, Spain, in 1536; educated at the University of Alcala; joined the Society of Jesus at an early age; became professor of theology in the Jesuit college at Rome in 1561; was afterward a lecturer on divinity in Sicily and in Paris; settled at Toledo; wrote a treatise, *De Rege et Regis Institutione* (1599), which was burned by the hangman in Paris on account of its justification of tyrannicide; published various works on theological and political topics, and a *History of Spain* (1592–1609). D, at Toledo Feb. 6, 1623.

Marian′na, city of Brazil, in the province of Minas Geraes, was originally founded by gold-miners, and was a busy place. After the mines ceased to be worked the town greatly declined, and it now derives its sole importance from being the seat of a bishop and of some educational institutions. Pop. about 7000.

Marianna, on R. R., cap. of Lee co., Ark. (see map of Arkansas, ref. 3–E, for location of county). Pop. in 1880, 627.

Marianna, city, cap. of Jackson co., Fla. (see map of Florida, ref. 1–C, for location of county), 60 miles N. W. of Tallahassee. It has 2 academies. Principal business, farming. Pop. in 1870, 663; in 1880, 586.

Marianne Islands. See LADRONES.

Mari′a There′sa, b. at Vienna May 13, 1717, a daughter of the emperor Charles VI.; was declared sole heir of all the possessions of the house of Hapsburg by the PRAGMATIC SANCTION (which see), and married (Feb. 12, 1736) to Francis Stephen, grand duke of Tuscany. On the death of her father (Oct. 20, 1740) she ascended the throne, and on Nov. 21 in the same year appointed her husband co-regent, but in spite of the Pragmatic Sanction claims to various parts of her inheritance were raised immediately from different sides, a formidable alliance was formed against her between Spain, France, Bavaria, Saxony, and Prussia, and the Austrian WAR OF SUCCESSION (which see) was opened by the invasion of Silesia by Frederick II. The heroic resoluteness of the young empress, however, and the chivalrous enthusiasm of the Hungarian people, saved her crown, and by the Peace of Aix-la-Chapelle (Oct. 18, 1748) she lost only Parma and Piacenza to Spain and Silesia to Prussia, while her husband was recognized as emperor of Germany. But the loss of Silesia she could never forget. In 1753, Prince Kaunitz, in whom the empress soon learnt to put entire confidence, became Austrian chancellor, and he succeeded in forming an alliance between Austria, France, Saxony, and Russia for the humiliation of Prussia. Maria Theresa even stooped so far, in order to get revenge on Frederick II., as to write a letter to Madame de Pompadour and address her as "My dear cousin." But the SEVEN YEARS' WAR (which see), although conducted by Austria with great vigor and some success, brought no result; the Peace of Hubertsburg (Feb. 15, 1763) left Silesia a Prussian possession. On Aug. 18, 1765, the emperor Francis I. died, and Maria Theresa now took her eldest son, Joseph, as co-regent. His policy was decidedly one of aggrandizement, and it was probably due to his influence that she participated, though not until she received the consent of the pope, in the first partition of Poland (Aug. 5, 1772), which brought Galicia and Ludomeria under the Austrian dominion. Turkey was compelled to cede Bukowina (Feb. 25, 1777), but the plan of annexing Bavaria was foiled, and the Austrian influence in Germany received a severe check by the formation of the so-called *Fürstenbund* under the auspices of Frederick II. In the interior her government was successful, and marked with great energy and wisdom. The finances, the weakest point in the Austrian household, were improved by the emperor and Count Haugwitz. The army, an ineffective and disorderly mob, was organized and strengthened by Joseph and Count Lasey. Servitude and torture were abolished, a number of schools of different grades established, and a better criminal code was introduced; which improvements were partly due to the exertions of Van Swieten. Although she was herself a pious Catholic, and not disposed to be indulgent to her Protestant subjects, she had an open eye for the infamous abuses of the Roman Church, and stopped them at many points. She forbade the priests to be present at the making of wills, and any person, male or female, to take monastic vows before their twenty-fifth year, and in 1773 she expelled the Jesuits. D. at Vienna Nov. 29, 1780, leaving four sons, of whom the eldest, Joseph II., succeeded her, and six daughters, of whom the next to the youngest was Marie Antoinette. Even Frederick II. of Prussia, her great adversary, bore testimony to the purity and nobleness of her personal character, writing to D'Alembert at the occasion of her death: "I have shed tears at her death—sincere tears. She was an honor to her sex and to the throne. I have waged wars against her, but I have never been her enemy." (See Duller, *Maria Theresa und ihre Zeit*, 1843–44, 2 vols.; Wolf, *Oestrich unter Maria Theresa*, Vienna, 1855; Lotheisen, *Oestrich unter Maria Theresa*, 1860.)

Marico′pas, or **Coco-Maricopas,** an Indian tribe of Arizona belonging to the Pueblo family, living with the Pimos upon a joint reservation of 100 square miles extending on both sides of the Gila River, about 150 miles above its mouth. Their language is very different from that of the Pimos, but otherwise the Maricopas have all the characteristics of close affinity to them, as well as to the Pueblo Indians of New Mexico, all being probably descended from the ancient people of the rock-habitations in the Colorado Valley. They are semi-civilized, agricultural, and pacific, living in comfortable huts, employing artificial irrigation, spinning and weaving cotton, making pottery, and plaiting baskets. Their language resembles that of the Yumas. They occupy two villages, are rapidly decreasing, and number little more than 300 souls.

Marie′ Antoinette′, the fifth daughter of Maria Theresa and Francis I., b. at Vienna Nov. 2, 1755, and married at Versailles May 16, 1770, to the dauphin (afterwards Louis XVI.), to whom she bore four children, of whom two died in infancy; the other two were Louis XVII. and the duchess of Angoulême. Her position at the French court was difficult from the very first, and it soon became dangerous. There was a difference of character between her and the people among which she had come to live which proved fatal in the end. Her morals were perfectly pure and her heart full of noble and generous instincts. But she felt a haughty independence of etiquette, ceremonies, public opinion, etc., and in her character gay levity and impulsive caprices were singularly mixed up with innocence, virtue, and elevated purposes. At the French court every vice was committed, but none was shown; an elegant hypocrisy covered the rottenness. But it was evident that such a character under such circumstances could not escape slander and intrigue, and after the affair of the "diamond necklace" (see LAMOTTE, COUNTESS DE) in 1785 the young queen was completely overwhelmed and ruined by them. The indolence of her husband and the desperateness of affairs compelled her to meddle with politics, for which she had no interest and no ambition. And again the character of her husband prevented him from following her influence, the result of which circumstance was a series of half measures which became blunders, and of violence which ended in weak submission. At the outbreak of the Revolution she was actually hated by the French people, and after the unfortunate attempt at flight (June 21, 1791) her doom was certain. But her character developed with the situation, and under the horrors which surrounded her she grew heroic. Although broken both in body and mind, when placed after a long imprisonment before the Revolutionary Tribunal (Oct. 13, 1793) she flung back the accusation of having seduced her own son with an indignation which made every heart in the room tremble; and during the two hours' ride to the scaffold on Oct. 16, between rows of stern soldiers and under the execrations of a furious mob, she preserved her dignity to the last. (See *Mémoires*, by Weber (1822), Lafont d'Ausonne (1824), Mde. Campan (1826), and *Histoire*, by Goncourt (1859).)

Marie de Médicis, b. at Florence Apr. 26, 1573, a daughter of Francis I., grand duke of Tuscany; was married Dec. 16, 1600, to Henry IV., king of France, to whom she bore in the next year a son, afterwards Louis XIII. She was beautiful, passionate, ambitious, but singularly low and mean; Henry always avoided her, and she was not crowned until the day before his assassination (May 13, 1610). From this time she conducted the government together with her favorites, the Concinis, till the conspiracy of De Luynes (Apr. 14, 1617), after which she was confined in the castle of Blois. On the death of De Luynes (Dec. 14, 1621) she returned to the court and took her place in the king's council, having been reconciled to him by Richelieu; but, jealous of the growing power of the new minister, she began intriguing against him, too, and was sent once more from the court in 1630, and confined in the castle of Compiègne. Thence she escaped, wandered several years in England and the Netherlands, dying at Cologne July 3, 1642, in miserable circumstances.

Marie′ Galante′, one of the Lesser Antilles, in the West Indies, belonging to France. Area, 60 square miles.

Pop. 12,456. It is high, with steep coasts, and surrounded with coral reefs. The soil is fertile, but adapted only to the cultivation of coffee and cotton; rain-water must be gathered in large cisterns. Principal town, Basseterre.

Mari′enbad, small town of Bohemia, picturesquely situated among wooded hills at an elevation of 2200 feet, and much frequented as a watering-place and on account of its saline springs. The waters resemble those of Carlsbad, but are cold and contain more purgative salt. They are used both internally and externally in cases of gout, skin-diseases, rheumatism, etc. The baths are annually visited by about 13,000 persons. The permanent population is about 2000.

Mari′enberg, town of Germany, in the kingdom of Saxony, manufactures linen, lace, and straw-plaiting, and has rich copper and iron mines in its vicinity. Pop. 6162.

Mari′enburg, town of Prussia, 27 miles S. E. of Dantzic. Its castle, a magnificent and imposing edifice of Gothic architecture, was erected from 1276 to 1341 by the knights of the Teutonic order, whose grand masters resided there for several centuries. At that time the building was one of the strongest castles in Europe. Under Polish rule it was allowed to fall into decay, but it was carefully restored in the beginning of this century. The town has several chemical factories, important cattle, horse, and wool markets, and a considerable trade in grain, linen, feathers, brushes, etc. Pop. 3955.

Mari′enwerder, city of Prussia, the capital of the province of West Prussia, at the confluence of the Vistula and the Nogat. It is a handsome city, with many fine buildings, among which is the cathedral from the thirteenth century, and the castle built by the knights of the Teutonic order in the fourteenth century. It has many benevolent and educational institutions, and some manufactures. Pop. 8238.

Marienzell′, or **Mariazell,** a v. of Austria, in the province of Styria, has a handsome church with a celebrated image of the Holy Virgin, annually visited by more than 100,000 pilgrims. Pop. 900.

Mariet′ta, R. R. centre, cap. of Cobb co., Ga. (see map of Georgia, ref. 2–G, for location of county), 2 miles from Kenesaw Mountain, on the Western and Atlantic R. R., 20 miles N. of Atlanta, has a female college, a male academy, several large steam-mills, a paper-mill, and several factories. Pop. in 1870, 1888; in 1880, 2227.

Marietta, city and R. R. centre, cap. of Washington co., O. (see map of Ohio, ref. 7–H, for location of county), on the Ohio River at the mouth of the Muskingum River, 180 miles from Pittsburg, 300 from Cincinnati by water, 115 miles from Columbus, and 175 miles from Cleveland by rail, has art-galleries, fine city-hall, a children's home, fine public-school buildings, one of the leading colleges of the West, a large rolling-mill, flouring-, planing-, and saw-mills, carriage- and hub-factories, bucket-factory, chair-factory, lockworks, machine-shops, hollow-ware foundries, tanneries, breweries, boatyard, woollen-mill, spike-mill, car-shops, and oil-refineries. It is in the great oil-region of Ohio and West Virginia, and within a few miles of rich iron and coal deposits. Pop. in 1870, 5218; in 1880, 5444.

Marietta, Lancaster co., Pa. (see map of Pennsylvania, ref. 6–H, for location of county), on R. R., the Susquehanna River, the Pennsylvania Central R. R., and the Pennsylvania Canal, 25 miles E. of Harrisburg and 81 miles W. of Philadelphia, has several furnaces, rolling-mill, foundry and machine-shop, large hollow-ware and enamelling works, saw- and planing-mills, and is the Eastern market for all the timber and lumber brought down the river. During the lumber season most of the men are engaged as pilots on the river from here to Port Deposit. Pop. in 1870, 2397; in 1880, 2503.

Marietta College, Marietta, O., is located where the first settlement of the "territory north-west of the river Ohio" was made, Apr. 7, 1788. The Ohio company, organized in Massachusetts in 1786 by officers of the Revolution under the lead of Gen. Rufus Putnam, purchased of Congress, through Rev. Manasseh Cutler, 1,500,000 acres of land. While he was negotiating for this land the celebrated ordinance of 1787 was enacted. For that ordinance we are chiefly indebted to Rev. Dr. Cutler: "The ordinance of 1787 and the Ohio purchase were parts of one and the same transaction. The purchase would not have been made without the ordinance, and the ordinance could not have been enacted except as an essential condition of the purchase" (*N. Am. Rev.*, Apr., 1876). The college was founded by the sons of the pioneers, among whom there were many graduates of Yale and Harvard. It was opened for instruction in 1833 as "The Marietta Collegiate Institute and Western Teachers' Seminary," but in 1835 a new charter was obtained, under the name "Marietta College." The first president of the trustees was a graduate of Harvard, and the first faculty were all graduates of Eastern colleges. In its course of study and general arrangements the college has adhered to the New England type. The aim has been from the first to make it a place of genuine literary culture. The college is independent alike of ecclesiastical and of State control, having a self-perpetuating board of trustees. Though not denominational, its affiliations are rather with the Congregational and Presbyterian bodies. There are two courses of study, of four years each, leading to the degrees of B. A. and B. Ph. The latter course substitutes the modern languages for the Greek. The first class was graduated in 1838, and the whole number of graduates to 1884 is 561, of whom 538 have received the degree of B. A. Of the whole number matriculated, sixty-three per cent. have completed the course. In cabinets, apparatus, etc. the college is well fitted for its work. The number of volumes in the college and society libraries is about 32,000, besides a large number of pamphlets. The library is specially rich in works of American history and of the early history of the North-west, including many valuable manuscripts. The presidents have been Rev. Joel H. Linsley, D. D., 1835–46; Rev. Henry Smith, D. D., LL.D., 1846–55; Rev. Israel W. Andrews, D. D., LL.D., 1855–85.

Israel W. Andrews.

Mariette′ (Auguste Édouard), known as Mariette Bey, b. at Boulogne-sur-Mer Feb. 11, 1821; studied in the college of Boulogne, in which he became an instructor; was early a student of archæology; entered the Egyptian museum at the Louvre 1848; was sent in 1850 on a scientific mission to Egypt; was afterward made inspector-general and keeper of national monuments in Egypt, and keeper of museum at Boulak. He made many important archæological discoveries, and published several vols. and reports relating to his labor in Egypt. D. Jan. 18, 1881.

Marie′ville, post-v., cap. of Rouville co., Quebec, Canada, has a large trade in produce, and is in a good agricultural region. Pop. in 1881, 999.

Mariglia′no, town of Southern Italy, in the province of Caserta, near Nola. It is a walled town, and has a castle with towers, moat, drawbridge, etc. Its one fine church contains some good pictures. This town suffered severely from an eruption of Vesuvius in 1631, and again in 1793. Pop. 10,215.

Mar′igold, a popular name for various yellow-flowered plants, but especially for those of the genera *Tagetes* and *Calendula*, of the order Compositæ. The so-called African and French marigolds are of the first-mentioned genus. Both are South American. The true marigold (*Calendula officinalis*), indigenous to the S. of Europe, has long been cultivated in gardens, and is prized in domestic medicine. It is sometimes employed in flavoring soups.

Mari′na, or **Malint′zin,** b. about 1505, daughter of a Mexican chief; in childhood sold into slavery; became acquainted with the Mexican and Spanish languages, and as interpreter was of great assistance to Cortez, by whom she had a son who was prominent in the colonial history; married a Spanish officer, whom she survived; d. at Jalpan, Tehuantepec, where her burial-place is still shown. (See Prescott's *Conquest of Mexico*, bk. ii.)

Marine Glue. See Glue, Marine, and India-Rubber.

Marine Insurance. See Insurance, by J. Wilder May.

Marine′o, town of Sicily, in the province of Palermo, in a grain, vine, and olive-bearing district, about 15 miles S. of the city of Palermo. In a little country church near Marineo are some very fine frescoes of the fourteenth century. Ficuzza, an old feudal seat and a favorite summer retreat of Ferdinand III., is in this neighborhood. Pop. 8991.

Mariner's Compass. See Compass.

Marines, U. S. Corps of. Considered in the light of infantry serving afloat, marines are, as a distinct corps, coeval with navies. Among the Greeks they were known as *epibatæ*, a class described by historians as the fighting men who served exclusively on board ships of war. Though armed like the infantry on shore, they were yet distinct from the land troops, and entirely unlike the rowers or mariners who served in the fleet. The number of epibatæ assigned to each vessel bore about the same proportion to the crew as the number of marines to the crew of a modern man-of-war. In the Roman navy marines were styled *classiarii milites*. In the early history of the English navy we read of men-at-arms still serving afloat, their armor and weapons differing but little from those of the ancients. The Scandinavians called them *båt-karler* or sea-soldiers—that is, carls, or sturdy fellows, who fought in boats. Later they were called *supra-salientes*, a word still pre served in the Spanish *sobresaliente*. The Genoese crossbowmen, the best marines of the period, were in the thirteenth century employed, and very highly esteemed, in the English navy. In Aug., 1387, Sir Henry Percy ("Gunpowder Percy") was appointed "captain of all the men-at-arms and archers of the fleet." He was, in fact, commandant of marines.

With the introduction and gradual increase of naval ordnance the occupation of men-at-arms afloat passed away. The earliest employment of marines under their present form was in 1653, when Admiral Blake embarked a number of soldiers to act as small-arms men (Schomberg's *Chronology*, vol. i. p. 51) in the battle with Von Tromp off Portland. Subsequently, in 1664, troops from the line were detailed for service afloat, and came to be called *marine soldiers* or *marines*. (Grose's *Military Antiquities of the English Army*.) For good conduct in battle, but more particularly for steadfast loyalty during the great mutinies in the fleet at the Nore and at Spithead, they were, in general orders dated Apr. 20, 1802, styled "royal marines."

The U. S. marine corps was first established by the act of Congress of Nov. 10, 1775, authorizing the enlistment of two battalions, to be styled "first and second battalions of marines." After the adoption of the present Constitution and the reconstruction of the navy, the marine corps was again called into existence by the act of July 11, 1798, "establishing and organizing a marine corps." By this act the marine corps is at any time liable to do duty in the forts and garrisons of the U. S. on the sea-coast or any other duty on shore, as the President may direct. By the act making appropriations for the navy for 1883–84 the corps consists of 1 colonel commandant, 1 colonel, 2 lieutenant-colonels, 1 adjutant and inspector, 1 quartermaster, 1 paymaster, 4 majors, 2 assistant quartermasters, 19 captains, 30 first lieutenants, 22 second lieutenants; also 1 sergeant-major, 1 quartermaster-sergeant, 1 leader of band, 1 drum-major, 50 first sergeants, 140 sergeants, 180 corporals, 30 musicians, 96 drummers and fifers, 1500 privates. Total, 2084. The naval appropriation bill approved Aug. 5, 1882, enacts that from the naval cadets (Naval Academy, Annapolis) who successfully complete the six years' course, appointments shall be made to fill vacancies in the lower grades of the line and engineer corps of the navy, and *of the marine corps*, in the order of merit, as determined by the academy board of the Naval Academy, the assignment to be made by the Secretary of the Navy on the recommendation of said board. Marine officers are on the same footing as to rank and privileges as similar grades in the army; take precedence of like rank in the volunteers and militia; may be associated with officers of the army on courts-martial, the senior to preside; are promoted up to colonel by seniority; cannot exercise command over navy-yards or vessels of the U. S.; and no officer can absent himself without leave until notified of the acceptance of his resignation. The staff is separate from the line and appointed by the President by selection. The colonel commandant is also appointed by selection. Officers may be advanced thirty numbers in rank for gallant conduct in battle or extraordinary heroism, and retire at the age of 62. (See *Laws U. S. Navy*.) The judge-advocate-general of the navy may be appointed from the officers of the marine corps. Privates enlist for five years. The recruit must be at least 5 feet 6 inches high, between eighteen and thirty-five years of age, able to read and write, of steady habits, unmarried, well made, and in good health. Credit is given to both officers and men for previous service in the volunteer army or navy, and re-enlistment in either the army or the marine corps within thirty days after honorable discharge will count as continuous service, which brings increase of pay. Marines are exempt from arrest for debt or contract. The marine guard of a "first-rate" (Minnesota class) consists of 1 captain, 1 lieutenant, 3 sergeants, 4 corporals, 2 musicians, 40 privates; total, 51. From that it decreases according to the rate and character of ship. A fourth-rate is entitled to 1 sergeant, 2 musicians, and 10 privates; total, 13. The marine guard constitutes the police force, and is an indispensable element, of the organization of a ship-of-war. Marines may be detached for service on board the armed vessels of the U. S., and the President may detach, and appoint for service on board said vessels, such officers of said corps as he may deem necessary. (Sec. 1616, *Revised Statutes*.) The marine corps shall at all times be subject to the rules and regulations for the better government of the navy, except when detached for service with the army by order of the President, when they come under army regulations. Headquarters of the corps are at the U. S. marine barracks, Washington, D. C. S. B. LUCE.

Marinette′, on R. R., cap. of Marinette co., Wis. (see map of Wisconsin, ref. 4–F, for location of county), on the Chicago and North-western R. R., 50 miles N. of Green Bay, at the mouth of Menominee River, has several large steam saw-mills, also planing-mills and iron-works. Principal business, lumbering. Pop. in 1870, 1334; in 1880, 5412, including 2750 in v.

Mari′ni (GIOVANNI BATTISTA), b. at Naples Oct. 18, 1569; devoted himself to poetry under the influence and encouragement of Torquato Tasso; lived in Rome, Turin, and France, where Marie de Médicis gave him a pension; returned to Italy in 1622, and d. at Naples Mar. 25, 1625. His principal work is *Adone* (1623), a heroic poem, much admired, but marred by numerous licentious descriptions. Many of his sonnets are among the most beautiful in Italian literature, and he became the head of a literary school, the Marinists, which enjoyed a great reputation in the seventeenth century, but is now generally depreciated on account of its florid mannerism.

Mari′no, town of Italy, in the province of Rome, beautifully situated on a slope of the Alban Hills, about 13 miles S. E. of the city of Rome. The walls and towers of this town present a very picturesque appearance; its streets and squares are broad, and the public buildings, especially the churches, are well worthy of notice, both for their external architecture and their interior decorations, the latter often by the hand of renowned artists. It was formerly supposed to be the ancient *Castrimœnium*, though modern archæologists dispute it. In 1347 it was the scene of a conflict between Rienzi and the great Orsini family, after which it was for a long time in the hands of the Colonna, who still have large possessions here. There is more manufacturing industry in this place than is usual in this part of Italy. Marino was the birthplace of the celebrated Victoria Colonna, also of the poetess Maria Domenica Fumazoni, who is said to have first wrought asbestos into tissues. Pop. 6509.

Mari′o (GIUSEPPE), MARQUIS DI CANDIA, b. at Cagliari, Sardinia, Oct. 18, 1810; served for some time in the Sardinian army, from which he resigned, and, upon his resignation not being accepted, succeeded in escaping to Paris. Having received a fine musical education, and possessing an admirable tenor voice, which he further improved by two years' study in Paris, he accepted an engagement in opera, and made his *début*, under the assumed name of Mario, in *Robert le Diable*. He soon became the acknowledged leading tenor, and was a great favorite in England and on the Continent. He married Giulia Grisi, by whom he had several children. In 1854, in company with Grisi, he fulfilled a successful operatic engagement in the principal cities of the U. S. In 1871 he retired from the stage in London, but in 1872 appeared in concert in the U. S. with poor success, his voice having lost its beauty. D. Dec. 11, 1883.

Mariolatry, or the worship of Mary, the mother of Jesus, has no foundation whatever in the New Testament, but developed naturally enough in the consciousness of the Christian Church from the idea of Christ as the God-Man. Before the close of the fourth century there had been produced quite a considerable amount of apocryphal and legendary descriptions intended to supplement the meagre information which the Gospels give concerning the mother of Jesus. From the Nestorian controversy this whole movement received a decided impetus. The question arose and was hotly discussed whether Mary should be styled "mother of God" or only "mother of Christ." Nestorius rejected the former title as inappropriate, but was condemned by the Synod of Ephesus (431), and the Fathers who had defended "mother of God" were accompanied with torchlights and incense-burning from the assembly-room of the synod through the illumined city to their respective stopping-places. Thus the worship of Mary was established, and it rapidly increased during the next centuries. After the iconoclastic controversies, images of her became very frequent not only in the churches and houses, but also in the streets and along the roads, and it became customary to light candles and burn incense in front of them. Numberless miracles were wrought by her relics and images, and Saturday was consecrated to her memory. The synod of Toulouse (1229) fined people for neglecting her worship.

Marion, on R. R., cap. of Perry co., Ala. (see map of Alabama, ref. 5–C, for location of county), has 2 colleges, 2 female seminaries, also mills, carriage-factory, and railroad repair-shops. Principal business, planting. Pop. in 1870, 2646; in 1880, 2074.

Marion, on R. R., cap. of Crittenden co., Ark. (see map of Arkansas, ref. 3–F, for location of county), 8 miles N. W. of Memphis, Tenn. Pop. in 1880, 199.

Marion, city, on R. R., cap. of Williamson co., Ill. (see map of Illinois, ref. 11–E, for location of county). Pop. in 1880, 881.

Marion, R. R. centre, cap. of Grant co., Ind. (see map of Indiana, ref. 4–F, for location of county), contains large flouring-mills, flax-factories, a foundry, and several woodworking factories. Pop. in 1870, 1658; in 1880, 3182.

Marion, R. R. centre, cap. of Linn co., Ia. (see map of Iowa, ref. 4–J, for location of county), has 2 parks, flouring-mills, a lint-factory, foundry, brewery, carriage, furniture, plough, wagon, and agricultural implement manufactures. Pop. in 1870, 1822; in 1880, 1939; in 1885, 2673.

Marion, or **Marion Centre,** city, on R. R., cap. of Marion co., Kan. (see map of Kansas, ref. 6–G, for location of county). Pop. in 1880, 857.

Marion, cap. of Crittenden co., Ky. (see map of Kentucky, ref. 4–D, for location of county). Pop. in 1870, 102; in 1880, 355.

Marion, cap. of McDowell co., N. C. (see map of North Carolina, ref. 3–C, for location of county), on the Western (N. C.) R. R. Pop. in 1880, 372.

Marion, R. R. centre, cap. of Marion co., O. (see map of Ohio, ref. 4–E, for location of county), 40 miles N. of Columbus, has rake, chain, wagon, and carriage factories, large machine-shops, and grain-elevators. Pop. in 1870, 2531; in 1880, 3899.

Marion, or **Marion C.-H.,** cap. of Marion co., S. C. (see map of South Carolina, ref. 5–G, for location of county), on the belt between the Great and Little Peedee rivers, and on the Wilmington Columbia and Augusta R. R., 85 miles from Wilmington, 125 miles from Columbia, and 8 miles from the Great Peedee River, navigable by steamers. Pop. of v. in 1870, 968; in 1880, 824.

Marion, on R. R., cap. of Smyth co., Va. (see map of Virginia, ref. 7–C, for location of county), 160 miles W. of Lynchburg, has a female college, a male school of high grade, large flouring-mills, an iron-foundry, a plough-factory, etc. Principal business, farming and cattle-raising. Pop. of v. in 1870, 368; in 1880, 919.

Marion (Gen. Francis), b. at Winyaw, near Georgetown, S. C., in 1732, of Huguenot ancestry; received a very limited education; went to sea at the age of sixteen, and barely escaped with his life from a vessel that foundered on a voyage to the West Indies. He was afterward engaged in agricultural pursuits; volunteered in the expedition of Gov. Lyttleton against the Cherokees (1759), serving as lieutenant in a cavalry troop commanded by one of his brothers; was engaged in Montgomery's campaign the following year. In 1761 he was a captain in Middleton's regiment; participated in Col. Grant's expedition, and led the forlorn hope at the bloody battle of Etchoee. In 1775 he was elected a member of the provincial Congress of South Carolina, and in June was commissioned captain in Col. William Moultrie's regiment; was engaged in the early operations against the forts and British shipping in Charleston harbor; was promoted to major, placed in command of a fortification at Dorchester, and aided in the memorable defence of Fort Moultrie, then being erected on Sullivan's Island, against a formidable British fleet, which was repelled with great loss of life (June 28, 1776). He served during the next year in the defence of Georgia at the head of a body of 600 men; was in 1779 left in command at Fort Moultrie during Gen. Prevost's operations against Charleston; was engaged in the siege of Savannah by the combined French and American forces in the same year, and in the defence of Charleston when again besieged in 1780. Having accidentally broken his leg, he was sent into the country, and thus escaped falling into the hands of the enemy when Charleston was surrendered to Clinton in May. In the summer Marion, now a colonel, recruited a few companies from among his neighbors, who were obliged to content themselves with the rudest arms and equipments, and joined Gen. Gates in North Carolina, but this reinforcement met only with ridicule on account of its ragged condition. Marion was returning from a bootless errand against the British boats on the neighboring rivers at the time Gates was defeated at Camden (Aug.), and falling suddenly upon the British guards he succeeded in rescuing the Continental prisoners. A few days later he surprised and dispersed in quick succession two bodies of Tories, baffled pursuit by Tarleton, and from that time was for more than two years engaged in a constant series of adventurous forays, skirmishes, surprises, and manœuvres utterly unintelligible to the enemy, which procured him the name of the "Swamp Fox," and laid a basis for a thousand legendary tales. He occasionally undertook more formal warfare in the capture of British outposts, and took part in several battles in connection with the army of Greene. During this time his forces gradually increased, and they were dignified with the title of brigade, though never regularly organized. After the evacuation of Charleston (Dec., 1782) Marion disbanded his forces and resumed the life of a farmer, and married a lady of wealth. He served in the State senate and the constitutional convention of 1790, was until 1794 a general of the State militia, and d. on his plantation near Eutaw Feb. 29, 1795. He was buried at Belle Isle, St. John's parish. (See his *Life*, by Horry and Weems, and that by W. G. Simms.)

Marionettes', or **Puppets** [Fr.], a spectacle in which the action of a pantomime is represented on a miniature stage by means of small figures set in motion by a concealed mechanism of springs and wires or cords. This amusement was known both to the Greeks and Romans [Gr. *αγάλματα νευρόσπαστα*; Lat. *imaguncula*], has been popular in Italy from the Middle Ages to the present time under the name of *fantoccini*, and was introduced into France in the time of Charles IX. (1560–74) by an Italian named Marion, whence the name by which it is known in several languages. In England the puppet-show was common in the time of Elizabeth, as may be gathered from allusions in *Hamlet*, *Two Gentlemen of Verona*, and Ben Jonson's *Bartholomew Fair*. There was a "master of the motion," who introduced the puppets and made occasional remarks explanatory of their pantomimic actions. The figures themselves were sometimes made to "speak their parts," and even to reply to remarks from the audience. Regular dramas were sometimes attempted, as in the case of Jonson's *Bartholomew Fair*, so named from the locality in London which was then the chief resort of puppet-players, as it continued to be a century later, when, however, a more artistic performance of the same kind was introduced in Covent Garden and performed before Charles II. at Whitehall. Puppets were still popular in the days of Swift and the *Spectator*, but for a century and a half thereafter were rarely seen except at country-fairs or as strolling "Punch-and-Judy shows," until in 1872 they reappeared in London, under the name of "marionettes," as a French novelty, and were exhibited for many months with very complete apparatus and scenery at the Egyptian Hall. Since that time the marionettes have been represented in various parts of the U. S. and in the Spanish-American republics.

Mariotte's' Law, the principle, called otherwise **Boyle's Law,** that if the temperature remains the same the volume of a gas will vary inversely as the pressure. This formula was enunciated independently both by Mariotte (a French physicist, d. 1684) and Boyle (which see), and is found true in experiment with gases incapable of liquefaction. With those which under severe pressure become liquefied, departures from the law occur, which are wider the more nearly the point of liquefaction is approached, the diminution of volume being more than proportional to the increase of pressure.

Mariposa, cap. of Mariposa co., Cal. (see map of California, ref. 4–C, for location of county). Pop. in 1880, 342.

Maris'cal (Ignacio), b. in Oaxaca, Mexico, July 5, 1829; was admitted to the bar in 1849; became solicitor-general of Oaxaca 1850; removed to the city of Mexico 1853; was elected in 1856 a deputy to the congress which framed the constitution of 1857; appointed judge of the supreme court of Oaxaca 1859, and a federal circuit judge 1860; was again a member of congress 1861–62; a supernumerary justice of the supreme federal court 1862, assistant secretary of state 1863, secretary of legation in the U. S. 1863–66, and was chargé d'affaires 1867–68. In July, 1868, he was appointed minister of justice by Pres. Juarez; returned to the U. S. as envoy extraordinary, being received in that capacity Aug. 11, 1869, and was Mexican secretary of state from May 25, 1871, to June, 1872, since which time he again resided as minister in the U. S. 1872–77, was a judge in Mexico 1877–79, minister of justice 1879–80, and premier and sec. of state under Pres. Gonzales from Dec., 1880. Señor Mariscal is a master of the English language and literature, and has produced some pleasing Spanish verse, of which the best-known specimen is a fine translation of Poe's *Raven*.

Mar'itime Law. See International Law, Summary, by Theodore D. Woolsey, S. T. D., LL.D.

Marit'za, the ancient *Hebrus*, is a river in European Turkey, in the province of Room-Elee, passing by Adrianople, where it becomes navigable, and falling into the Ægean Sea.

Ma'rius (Caius), b. at Cereatæ, near Arpinum, in 157 B. C.; grew up in very humble circumstances, but distinguished himself greatly in the Numantian war (133). In 119 he was elected *tribunus plebis*, became the leader of the popular party, and married Julia, the aunt of Cæsar. Having been consul in 107, Numidia was assigned to him as his province, and his brilliant victories over Jugurtha made him at once the most conspicuous man in the Roman republic. At this time the Teutones and Cimbri, two wild Scandinavian swarms, appeared on the frontiers of the republic, plundering, burning, devastating everything; and when the Teutones broke into Gallia Transalpina, and the Cimbri, gliding on their shields down the snow-clad precipices of the Alps, showed themselves in Gallia Cisalpina, Rome was struck with terror. Marius was chosen consul five times in succession from 104 to 99, and he fully justified this extraordinary distinction. He routed, or rather destroyed, the Teutones at Aquæ Sextiæ (Aix) in 102, and the Cimbri at Campus Raudius in 101; and when he returned to Rome he was hailed by the grateful population as the third founder of the city, after Romulus and Camillus. But, having no talent as a politician, his popularity soon decreased during times of peace, and it is probable that he himself instigated Mithridates to declare war against Rome, sure to be chosen commander by the republic, and hoping thus to retrieve his fortune. But he was disappointed. Sulla, the leader of the aristocratic party, and to some extent his rival in military glory, was appointed commander-in-chief by the senate in 88, and this infuriated the old man to such a degree that he undertook, by the aid of the popular party, to overthrow the decision of the senate by force. But Sulla marched to Rome at the head of a well-disciplined army, and Marius was compelled to flee for his life through Southern Italy to Africa, literally hunted from place to place like a wild beast. Hiding in the swamps of Minturnæ, wandering about among the ruins of Carthage, he thought of nothing but revenge; and he succeeded in getting it. By the aid of Cinna, one of his partisans, he returned to Rome in 86. At the head of a guard composed of liberated slaves and the rabble of the Roman population he entered the city, declared himself and Cinna consuls, let loose his soldiers to murder and plunder; and d. in Rome in 86 B. C., on the seventeenth day after his return, amidst an uproar and massacre such as Rome had never before seen.

Marivaux', de (PIERRE CARLET DE CHAMBLAIN), b. at Paris Feb. 4, 1688; d. there Feb. 12, 1763. His comedies, which enjoyed a great reputation in their time, are distinguished by an adroit management of the plot and a fluent dialogue, but contain no characterization. His romances are without interest, and his *Le Spectateur Français* is a mediocre imitation of the English *Spectator*. A collection of his dramas was published in 5 vols. in 1758; all his works in 10 vols. in 1827–30.

Mar'joram [Ger. *Marjoran*], a popular name for several aromatic labiate herbs of the genus *Origanum*. The common marjoram (*O. vulgare*) has been naturalized in the U. S. from Europe. Its leaves are used in cookery, and its essential oil is employed in liniments. The sweet marjoram of the gardens is either the descendant of *O. Majorana* of the S. of Europe and the Levant, or of *O. Majoranoides* of Barbary. It is much pleasanter in odor and taste than the preceding, and is employed in garnishing meats and seasoning soups.

Mark, a term employed since the middle of the eleventh century, throughout the states of Germany and also in Spain and Portugal, to signify a half-pound weight of gold or silver. The same term has also been used in many of these states to designate the unit of account in their monetary systems. These monetary units were originally identical with the unit of weight, but by the continual degradation and debasement of the coinage came in the lapse of time to represent very inferior and, in different states, very unequal values. Thus, the silver mark current of Hamburg became worth no more than 1*s*. 2⅓*d*. sterling = $0.29, the mark banco = 1*s*. 5.57*d*. = $0.35½. A mark also was used in England, equal to 13*s*. 4*d*. = $3.24⅓; and another in Scotland, equal to 13⅓*d*. = $0.27. In most of the German states it has been the usage during the past century or two to fix the standard of the silver coins in actual use by declaring what number of such coins shall be struck from one mark by weight of pure silver, the standard mark being the mark of Cologne, containing 3608 English grains, exceeding half an avoirdupois pound by 108 grains. Thus, 11⅓ thalers of Lubeck were coined from one Cologne mark of fine silver, and 14 thalers of Prussia from one such Cologne mark.

Since the formation of the German empire the term "mark" has been applied to the standard unit of the imperial monetary system, the value being fixed by the enactment that one hundred and thirty-nine and a half ten-mark pieces, or sixty-nine and three-quarters twenty-mark pieces, shall be made from one German pound (five hundred grammes) of fine gold. A mark of the empire has therefore the value of $0.23.8213 of the money of the U. S. As the standard of gold coinage is but nine-tenths fine, a ten-mark piece weighs 3.9825 grammes = 61.4593 grains, and a twenty-mark piece 7.965 grammes = 122.918 grains troy.

F. A. P. BARNARD.

Mark (SAINT), the author of the second book of the New Testament. I. *Life*.—There was in the primitive Church an office which occupied an intermediate position between the apostolate and the ministry—namely, that of *evangelist* or missionary of the second order, subordinate to the apostles (Eph. iv. 11). Mark belonged to this class of ecclesiastical functionaries. He was of Jerusalem ancestry, where his mother, called Mary, owned a house (Acts xii. 12). His Israelitic name was John, but to this was added, according to a Jewish custom of that time, the Roman surname of Mark. A singular tradition preserved in some old documents tells that he was of priestly descent, and, having once embraced Christianity, he cut off one finger in order that the defect might make him unsuitable for the performance of any service in the temple.[*] The first part of this tradition is supported by the circumstance that, according to Col. iv. 10, he was a cousin of Barnabas the Levite. He was no doubt won to the faith by St. Peter, who was a friend of his family (Acts xii. 13, 14), and calls him *his son* in the same spiritual sense of the word in which Paul gives this name to Titus and Timothy (1 Pet. v. 13). The Gospel of Mark contains a short narrative, omitted in the other Gospels, of a young man who, observing what took place at Gethsemane, fled when surprised by the constables, leaving behind him the linen robe in which he was wrapped. Why, now, has the evangelist preserved this small trait, which is of no interest for the principal story? It leads naturally to the conclusion that this young man was Mark himself, who, living in the vicinity, heard the noise and would see what was going on. Mark appears for the first time in the evangelical history in Acts xiii., when, about the year 44, Paul and Barnabas set out on their first missionary journey among the pagans to the island of Cyprus and the adjacent parts of Asia Minor. On their arrival in the wild regions of the Taurus Mountains, Mark left the two missionaries and returned to Jerusalem; and this circumstance was the reason why on his second journey St. Paul absolutely refused to have him for a companion, though Barnabas, whom their relationship no doubt made more lenient, insisted on it. The two missionaries then separated, Paul taking Silas along with him, instead of Barnabas, and Timothy instead of Mark, while Barnabas, together with Mark, went to the island of Cyprus, and thence to other countries which are not specially mentioned in the history (Acts xv. 37 *seq.*). Later on, however, Mark became reconciled to St. Paul. We find them together at Rome about the year 62, when Paul remembers him to the Colossians and Philemon (Col. iv. 10; Philem. 24), and towards the close of his life Paul called him a second time to stay with him as a coadjutor "profitable for the ministry" (2 Tim. iv. 11). Nevertheless, Mark appears to have been most closely connected with Peter. A tradition, almost unanimous, designates him as the companion of Peter, either his secretary or his interpreter. It is difficult, however, to ascertain at what time Mark thus accompanied Peter. In 62, when he was in Rome with Paul, Peter was certainly not there, since he is not mentioned in the Epistles written during the Roman captivity (Colossians, Ephesians, Philippians, and Philemon). It must have been either before or after. If *before*, it is necessary to consider the city of Babylon, whence Peter wrote his First Epistle (1 Pet. v. 13), as Babylon proper, situated on the Euphrates, and to admit that before Peter went to the Occident he had visited, together with Mark, the numerous Jewish settlements in Syria and Mesopotamia. But, then, why should Mark separate from him and go to Rome to stay with Paul? If *after*, there remain only the year 63 and the first half of 64 for the voyages of Mark with Peter, which is a very short term. In this case it must be admitted that at the time when the Epistle to the Colossians was sent off Mark himself was going to the Orient (iv. 10); that he met Peter in Asia Minor, accompanied him, and came with him to Rome, whence Peter wrote his First Epistle to the churches of Asia. If so, Babylon is used figuratively for Rome, which, indeed, is the conception of most of the Fathers. Several ancient writers attribute to Mark the foundation of the church of Alexandria. According to them, he was the first bishop of that church, died there, and left the episcopal see to Anianus.[†] At all events, it was from Alexandria that in the Middle Ages the Venetians carried his ashes, and deposited them in the cathedral to which they gave his name. It is possible that Barnabas and Mark after leaving Paul went to Alexandria, where there was a numerous

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[*] This is perhaps the reason why the *Philosophumena* call him the *κολοβοδάκτυλος*, the "stump-fingered," though it would not be impossible to explain this surname from the mutilated state of the last part of his Gospel.

[†] Eusebius, *Historia Ecclesiastica*, ii. 24.

and rich Jewish population wishing to have the gospel preached to them. When St. Paul wrote the Epistle to the Romans, in the winter of 58–59, he declared that all the great centres of the Orient were evangelized, and that there was no more room for his labor in those countries (Rom. xv.). Could he have spoken thus if no missionary had as yet visited Egypt? But if Mark and Barnabas are the founders of the church of this country, it is easy to understand that it was hither Mark went when in 64 he left Peter at Rome during the persecutions of Nero. Chrysostom, moreover, asserts that it was at Alexandria he composed his Gospel. Thus, the career of Mark, although not so very conspicuous, is nevertheless very interesting. He forms a connecting link between the great apostles. Attached now to Barnabas, now to Paul, and now to Peter, he resembles a comet which successively traverses the orbits of the great planets, accompanying them for some moments, though always preserving its independence. And to these personal relations correspond the relations between his and the three other Gospels.

II. *Gospel.*—The testimonies of the Fathers relative to our second canonical Gospel are nearly unanimous with respect to the following three points: (1) That it was composed by the evangelist Mark; (2) that Mark wrote it from the statements which he heard from the lips of Peter in the churches which he visited together with him; (3) that it was written at Rome, and on the demand of the Christians of that capital. With respect to the first point, it follows from the title, "according to Mark," which title the work must have received at the time when the collection of our Gospels was made; that is, at the latest, in the first half of the second century. With respect to the second point, we will only quote the tradition given by Papias, and by him received from an ancient presbyter of Palestine called John, who by some is identified with the apostle St. John: "Mark, having become the secretary of Peter, wrote down exactly all that he remembered of the words and deeds of Christ, though not in order. For he had never himself heard or accompanied the Lord, but, as above mentioned, he accompanied Peter, and Peter made his statements according to the demands of the moment, and not for the purpose of giving a complete exposition of the discourses of the Lord. Thus, Mark has made no fault in writing down the facts detached as he remembered them, simply wishing not to omit anything of what he had heard, nor to alter it." With respect to the third point, the composition of the Gospel as having taken place at Rome, we have a detailed testimony in two passages of Clement of Alexandria, of which we give this one: "As Peter preached the gospel publicly at Rome, and stated several words of Christ in the presence of a number of prominent men, these desired to keep firmly in their memory what they had heard, and applied to Mark, the companion of the apostle, who afterwards wrote those accounts, which are called the Gospel according to Mark." The contents of the Gospel itself confirm these three points. To begin with the last: (1) Is it not evident that the second Gospel was written for Christians of pagan origin, since it omits throughout the evidence of the Messiahship of Jesus drawn from the prophecies of the Old Testament, and gives explanations of Jewish customs unnecessary to Christians of Hebrew origin? The most striking example is found in Mark vii. 1–4, especially when compared with Matt. xv. 1–2, destined for converted Jews. Furthermore, is it not evident that these Christians were of Latin origin, since Mark always prefers Latin terms, Hellenized, to the Greek terms, and in the account of the poor widow even transfers the Greek money into Roman (xii. 42), which Luke does not? And does it not follow from the notice relating to Simon of Cyrene, "the father of Alexander and Rufus" (xv. 21), that these Latin Christians were those of Rome, since Rufus was a member of the church of Rome (Rom. xvi. 13), and this small detail could interest none who were not personally acquainted with the members of this family? (2) It is as incontestable that the statements of Peter must have served as a basis for the work. A multitude of small details betray the remembrance of an eyewitness, while of a grave history they would have formed no very dignified element: "And he was in the hinder part of the ship, *asleep on a pillow*" (iv. 38); "and he, *casting away his garment*, rose, and came to Jesus" (x. 50); "*And when he had looked round about on them with anger*, being grieved for the hardness of their hearts, he saith unto the man" (iii. 5); "*And looking up to heaven, he sighed*, and saith unto him" (vii. 34); "*Then Jesus beholding him, loved him*" (x. 21); not to speak of a number of small traits in the discourses of Jesus which are of considerable importance.[*] Who else but an eyewitness, very intimate, and observing with deep interest the emotions which painted themselves on the face of Jesus, could have scattered such traits throughout the narrative? The same conclusion follows from the Aramaic expressions which Mark inserts, such as *Abba*, *Talitha-cumi*, etc. The narrator reproduces the very words of the Lord, whose voice he seems to hear. But this witness so intimate cannot be he who among the disciples loved Jesus most; it must be he who admired him most. Throughout the whole narrative he strives at one aim only—to impress the reader with that admiration which penetrated all who came in contact with Jesus. And all people were *amazed* and *filled with fear*, etc., are expressions common throughout the whole narrative, but such expressions make us immediately think of Peter, the passionate admirer and enthusiastic confessor of Christ. And of whom else could we think when reading the scene between Jesus and his disciples at Cæsarea Philippi (viii. 27–33)? Our evangelist here reports the crushing words of Jesus to Peter: "Get thee behind me, Satan: for thou savorest not the things that be of God, but the things that be of men;" but he omits the honoring words which preceded immediately, "And I say also unto thee, that thou art Peter, and upon this rock I will build my Church"—two traits which are closely connected in the account of Matthew (xvi. 13–23). Such a manner of narrating must either proceed from Peter himself or from a declared enemy of his, which latter supposition would be absurd. It is also in this Gospel alone that we find mentioned the crowing of the cock twice, a little trait which makes the denial of Peter still more inexcusable. In the Acts (x.) we find a specimen of Peter's manner of teaching while founding or travelling in order to build up the churches. This speech of the apostle to Cornelius is a sketch of the history of Jesus, exactly such as it is developed into details in our second Gospel; it is, indeed, as it has sometimes been called, the Gospel of Mark in a nutshell. (3) The authorship of Mark might be inferred from the two following facts, even if we had no tradition: first, the style of our Gospel is so absolutely different from that of the First Epistle generally attributed to Peter that even though the statements belong to Peter the narrative must have proceeded from another; next, in his Epistle Peter calls Mark his son, thus designating him as his spiritual heir, with whom he had deposited his most precious treasure, his personal acquaintance with Jesus. The objection to this explanation of the origin of the second Gospel, which rises from the resemblance between this work and those of Matthew and Luke, has in the latter's time often been met with the supposition that Mark was the source from which the two others have drawn, the freshness and originality of his work forbidding us to suppose that he had used those of the two others. But ought not the problem to be solved in quite a different manner? An apostolical tradition concerning the acts and discourses of Jesus was formed at Jerusalem, first in Aramaic and then in Greek, and on account of its sincerity and simplicity it immediately received a fixed form, which was reproduced nearly identically in the reports of the apostles and evangelists. It is this narrative—so to speak, stereotyped—which constitutes the foundation of our first three Gospels, and it is from this the striking resemblance between Matthew and Mark arises. Matthew first wrote down this tradition at Jerusalem; Peter reproduced it in the churches through oral recital, introducing only such minor significant details as sprang from his personal remembrance. And thus the double fact which we have indicated may be easily explained: on the one hand, the common foundation for Mark and Matthew; on the other, the small picturesque traits which characterize the narrative of the former. A recent critic, Klostermann, supposes that Mark wrote with the work of Matthew before him, but such a supposition materializes the relation between the two evangelists in a manner open to very serious objections, from which our explanation is exempted. If Mark wrote, or began to write, his Gospel at Rome, it dates from the year 64 or 65, which date corresponds to a remark with which he interrupts the discourse of Jesus on the destruction of Jerusalem (xiii.). In the passage indicating the signs which shall show to the Christians of Judæa the moment when they must flee in order to escape from the catastrophe which threatens the country, Mark, like Matthew, interrupts the discourse of Jesus in order to fix the attention of the reader on the importance of the indication: "Let him that readeth understand" (14). This remark, which no doubt was used when the discourse was repeated in the churches of Palestine, proves that the present form of the discourse belongs to the time before the destruction of Jerusalem. At all events, the notice relating to the two sons of Simon of Cyrene shows that they were personally known to those for whom the Gospel was destined, and that the composition of the work thus belongs to the time of the apostles. The end of the second Gospel, from verse 9 of chapter xvi., is lacking in the oldest manuscripts (C. Sinaiticus and C. Vaticanus), and even the Fathers mention this gap. But how is it to be explained, and whence is derived the traditional termination of the Gospel? Did Mark die before finishing the work, or has the last leaf of his manuscript been lost? And has another ecclesiastical writer finished the narrative? At all events, Mark could not stop with the word γάρ, with which the eighth verse terminates. Furthermore, an angel had promised an apparition of Jesus, and the author must have had the intention of narrating it. But is it not possible that it was the persecution of Nero during the sojourn of Peter at Rome in 64 which caused the interruption of the work of Mark, and that an incomplete copy remained at Rome, whence the manuscripts having no conclusion, while the copy which Mark carried along with him was completed afterwards, and hence the version which has finally prevailed in the Church? With respect to the plan of the work, which Papias found inconsistent with the historical order, it seems very natural, on the contrary, from our point of view. The author having placed Jesus in the centre of his activity at Capernaum, shows us how this activity expands in every direction through excursions more and more prolonged, though at the end of each excursion the Lord always returns to Capernaum.[*] And his final departure for Jerusalem thus appears as his last missionary voyage. The Gospel of Mark is the most picturesque delineation of the ministry of Jesus in its office of evangelization; and the first and the last words of the work confirm this view: "The beginning of the gospel of Jesus Christ, the Son of God" (i. 1); "And they went forth, and preached everywhere, the Lord working with them, and confirming the word with signs following" (xvi. 20). Thus, from heaven Jesus still continues through his apostles that office of evangelization which he filled himself so faithfully during his ministry on earth. (See Godet, *The Origin of the Four Gospels*, in his *Studies on the New Testament*, translated into English, published in London, 1876.)

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[*] Thus: "Father, all things are possible unto thee" (xiv. 36); "But of that day and that hour knoweth no man, no, not the angels which are in heaven, neither the Son" (xiii. 32), etc.

Frédéric Godet.

Mark'et O'vert [*i. e.* "open market"]. The general legal principle, that no man can sell goods and convey a valid title to them unless he is the owner or lawfully represents the owner, is qualified in England by the doctrine that sales in market overt, as it is termed, or open market, shall be deemed valid, even though the vender had no title at all in the goods. This rule is established for the benefit of purchasers, that they may not be compelled to investigate the ownership of goods offered for public sale. In the country districts market overt is held only on the special days provided for particular towns by charter or prescription, but in London every day is market-day except Sunday. In the country, also, market overt can only be held at the particular place set apart by custom for the sale of particular goods, and this does not include shops; but in London every shop in which goods are publicly offered for sale is a market overt for such articles as are usually sold therein. But if goods in which the vender has no title be disposed of at secret sale, no right of ownership is conferred upon the purchaser. The ground of the distinction between open and secret sale is that in the former case opportunity is presumed to be afforded to the real owner of the goods to trace them and prevent their being sold. But even a sale in market overt will not give a good title to goods belonging to the sovereign, or to goods which are known by the purchaser not to belong to the vender. Fraud in the sale will also render it voidable. The sale must not be made in a concealed place, as a back room or warehouse, nor between sunset and sunrise. If the first vender who sold without title again obtains possession of the goods, the title of the original owner revives. By a recent statute (24 and 25 Vict. ch. 96, § 100) it is provided that if any person guilty of stealing or embezzling or otherwise criminally obtaining the property of another shall be indicted for such offence by or on behalf of the owner of the property and convicted, restitution of the property shall be awarded to the owner or his representative by the court. If, however, the innocent purchaser of the goods in market overt is obliged to make restitution, whatever money has been taken from the thief on his arrest may be applied in reimbursement. This is provided by statute 30 and 31 Vict. ch. 35. The English doctrine of market overt does not prevail in this country. The consequence is, that no person here can in general obtain a valid title to goods purchased, even in good faith and for value, from a thief. The exceptions to this rule are money, commercial paper, and public bonds, railroad bonds, coupons, etc. etc., payable to bearer or endorsed in blank.

George Chase. Revised by T. W. Dwight.

Mark'ham, post-v. of York co., Ontario, Canada, 23 miles N. E. of Toronto, on the Toronto and Nipissing Railway, has 1 weekly newspaper. Pop. in 1881, 6375.

Markham (Clements Robert), C. B., F. R. S., b. at Stillingfleet, near York, England, July 20, 1830; educated at Westminster School; entered the navy as cadet in 1844; served in the Pacific squadron under Admiral Seymour; attained the rank of lieutenant in 1850; participated in an Arctic expedition in search of Sir John Franklin 1850–51, of which he published an account entitled *Franklin's Footsteps* (1852); left the navy in order to undertake a journey of exploration in Peru 1852–54, the results of which were narrated in a volume, *Cuzco and Lima* (1856); became clerk in the board of control 1855; secretary of the Hakluyt Society 1858; visited Peru and India 1860–61 as commissioner to introduce into the latter country the cinchona or quinine tree; published *Travels in Peru and India* (1862) and a *Quichua Grammar and Dictionary* (1863); became secretary of the Royal Geographical Society 1863; visited India and Ceylon 1865–66; became assistant secretary in the India office 1867, in which year he published a work on *Spanish Irrigation;* accompanied the Abyssinian expedition as geographer 1867–68; published a *History of the Abyssinian Expedition* (1869); wrote a *Life of the Great Lord Fairfax* (1870), *Ollanta, a Quichua Drama* (1871), a *Memoir on the Indian Surveys* (1871), a *General Sketch of the History of Persia* (1873), *The Threshold of the Unknown Region* (1874), *Memoir of the Lady Ana Osorio, Countess of Cinchon* (1875), *Missions to Thibet* (1877), *Peruvian Bark* (1880), *Peru* (1880), *The War between Chile and Peru* (1879–81; 3d ed. 1883). Since 1868, Mr. Markham has had charge of the geographical department of the India office; has written valuable annual reports on the *Moral and Material Progress of India* (1871 *seq.*); has edited *Ocean Highways*, a monthly periodical, merged in 1874 into the *Geographical Magazine;* has translated for the Hakluyt Society several Spanish MS. *Reports on the Conquest of Peru;* superintended the other publications of that society, and aided in preparing a manual of Arctic discoveries and desiderata for the use of the magnificent expedition sent out in quest of the North Pole in May, 1875, under the direction of his brother, Commander Albert H. Markham.

Markham (Gervase), b. at Gotham, Nottinghamshire, England, in 1570; was a captain in the army of Charles I., and one of the most voluminous as well as versatile authors of his time, having exercised his pen upon poetry, the drama, agriculture, horsemanship, military tactics, angling, archery, and many other subjects. His works are now much sought by bibliopolists, the best known being a tragedy, *Sir Richard de Grinville* (1591), *The Poem of Poems* (1596), *The English Husbandman* (1613), and *The Whole Art of Angling* (1656). D. about 1655.

Markham (William), a relative of William Penn, deputy governor of Pennsylvania and Delaware 1681–82; in 1684 secretary of the province; deputy governor of Delaware 1691–93; deputy governor of Pennsylvania, under Gov. Benjamin Fletcher, 1693–95; deputy governor, under William Penn, 1695–99.

Markirch [Fr. *Sainte Marie aux Mines*], a town of Upper Alsace, Germany, situated on the Leber [Fr. *Lievrette*], an affluent of the Rhine. At one time the Leber, which runs through the town, formed the dividing line between French and German: on the right bank people spoke German, were Protestants, and lived under the rule of the count of Rappolstein; on the left bank people spoke French, were Roman Catholics, and under the government of the duke of Lorraine. Now the whole region is German. The silver, lead, and copper mines of the neighborhood, once very productive, are not worked any longer, but the town forms the centre of a busy manufacturing district whose wool- and cotton-factories employ about 40,000 hands and produce goods, annual value about £625,000. Pop. 11,524.

Mar'kleeville, cap. of Alpine co., Cal. (see map of California, ref. 3–C, for location of county), 14 miles N. of Silver Mountain. Pop. in 1880, 80.

Marks, Miss. See Appendix.

Marks (Henry Stacy), b. in London Sept. 13, 1829, studied drawing at Leigh's Academy, was admitted as a student to the Royal Academy in 1851, began to exhibit in 1853, and was elected an associate in 1871 and a member in 1878. He is a *genre* painter, and has often chosen his subjects among the quaintnesses of the Middle Ages; as, for instance, *Toothache in the Middle Ages* (1856), *Experimental Gunnery in the Middle Ages* (1868), *St. Francis Preaching to the Birds* (1870), etc. He has also executed some decorative work; as, for instance, the proscenium friezes in the Gaiety Theatre, in London, and the Prince's Theatre, in Manchester.

Marks'ville, cap. of Avoyelles parish, La. (see map of Louisiana, ref. 9–D, for location of parish), is the centre of a thickly-settled prairie, 3 miles from Red River, with which it is connected by Ware's R. R., has a convent and a high school. Pop. in 1870, 473; in 1880, 553.

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[*] Ch. i. 21–45; ii. 1–v. 20 (Gadara, E.); v. 21–vi. 52 (Bethsaida and Julias, N.); vi. 53–viii. 21 (Phœnicia, N.); viii. 22–ix. 50 (Cæsarea Philippi, N.); x. *seq.* (Peræa and Jerusalem).

Marl [Lat. *marga*], a name vaguely applied to those soils and earths which contain a mixture of clay and sand, with a considerable proportion of carbonate of lime. They are frequently useful fertilizers, but not always. The green-sand marl (see GREENSAND) of New Jersey is valuable from the presence of phosphate of lime and potash. The white marls of Canada West (Ontario) are often very useful when applied to land.

Marl'boro', on R. R., Middlesex co., Mass. (see map of Massachusetts, ref. 2–H, for location of county), 25 miles W. of Boston, 15 miles E. of Worcester, has a high school, a public library of about 5000 volumes, a brick town-hall costing $87,000, gas-works, a good fire department, several machine-shops, and about 30 boot and shoe manufactories, one of which is among the largest in the world. It contains a beautiful lake (Williams), covering 160 acres, an elegant soldiers' monument, and is in a fine fruit-section. Pop. of tp. in 1870, 8474; in 1880, 10,127; in 1885, 10,941.

Marlborough (JOHN **Churchill**), DUKE OF, b. at Ashe, Devonshire, England, June 24, 1650, son of Sir Winston Churchill, who obtained for him shortly after the Restoration an appointment as page to the duke of York, afterwards James II. About the same time his sister Arabella was appointed maid-of-honor to Anne Hyde, duchess of York, and soon became mistress to the prince. It was probably to this circumstance that young Churchill was indebted for rapid promotion in the army, which he entered in 1666 as ensign in the guards. In 1672–77 he served with the rank of captain of grenadiers in the corps sent to co-operate with France against Holland, and distinguished himself at the sieges of Nymwegen and Maestricht, attracting the attention of Turenne and of Louis XIV., by whose favor he was promoted to colonel. At the Peace of Nymwegen (1678) he returned to England, received a lucrative position in the household of the duke of York, and increased his influence at court by marriage with Sarah Jennings, maid-of-honor to the duchess, celebrated for her beauty and talent, who had been the most intimate friend of the princess Anne from childhood. He now became the constant and favorite companion of the duke of York, his confidant in his intercourse with Charles II. and with the king of France, to whom he was repeatedly sent on secret missions. He was soon created Baron Churchill of Aymouth in the peerage of Scotland (1682), and was given the command of the only regiment of dragoons then existing in England in the following year, while on the occasion of the marriage of the Princess Anne to Prince George of Denmark (July 28, 1683) Lady Churchill was attached to her household. On the death of Charles II., Churchill was sent as ambassador to Louis XIV. to announce the accession of James (Feb., 1685), as well as to sue for a continuance of his friendship, alliance, and subsidies. On his return from this successful negotiation the powerful favorite was created brigadier-general and Baron Churchill of Sandridge in the English peerage, rendered good service in the suppression of Monmouth's rebellion, and was advanced to major-general. He did not scruple, however, when the follies of James rendered his downfall imminent, to enter into treasonable correspondence with the prince of Orange, nor to desert with many of his officers to the invading army (1688) at the critical moment. He received the reward of his baseness in the earldom of Marlborough (Apr. 9, 1689) and a commission as lieutenant-general; was in command of the English forces in Flanders (1689) and in Ireland (1690), where he captured Cork and Kinsale, but in Jan., 1692, was suddenly dismissed from all his official posts and thrown into the Tower in consequence of the partial discovery of treasonable intrigues with the exiled king. He was soon released from prison, but not restored to favor, and spent the ensuing years of the reign of William in false protestations of loyalty, soliciting military command while carrying on secret correspondence with James, and employing every artifice to strengthen his favor with Anne as the probable successor to the throne. In 1698, William so far restored Marlborough to favor as to appoint him governor to Anne's infant son, the duke of Gloucester. On the accession of Anne (1702), Marlborough, who had recently been employed in military and diplomatic service in Holland, became at once the most influential subject of the new queen, since to his own favor at court was added that of Lady Marlborough, and that of his son-in-law Godolphin, who became prime minister. He was at once entrusted with the chief command of the armies of the formidable alliance then combined against France. His subsequent history for several years is merged in the military annals of England, and may be summarized as consisting of an extraordinary series of victories and a no less remarkable succession of rewards and honors. The capture of Liege (Oct. 23, 1702) brought him the dukedom of Marlborough and the thanks of Parliament; in 1703 other successes were recognized by the grant of the celebrated manor of Woodstock, on which Blenheim Palace was erected at the expense of government. With the aid of Prince Eugene he terminated the campaign of 1704 by the important victory of Blenheim (Aug. 13). In the following years he gained the notable battles of Tirlemont (July 18, 1705), Ramilies (May 23, 1706), Oudenarde (July 11, 1708), Tournay (June 30, 1709), Malplaquet (Sept. 11, 1709), and Bouchain (Aug., 1711); was made a prince of the German empire; was rewarded by a magnificent pension (£5000) by act of Parliament of 1706. Marlborough returned to England in Oct., 1711, but was charged with peculation shortly after, and the duchess having fallen from Anne's favor in the same year, the Tory ministry of Harley succeeded to power. Marlborough was dismissed from all his offices Jan. 1, 1712, and retired to Germany, where he became an energetic partisan of the Hanoverian succession; returned to England at the accession of George I. (1714), by whom he was restored to his offices and honors. He rendered prompt service in the direction of the campaign of 1715 against the Pretender, passed the remainder of his life in quiet enjoyment of his immense wealth, d. at Windsor Lodge June 16, 1722, and was buried in Westminster Abbey. He left no son, but the title has been perpetuated through the descendants of his second daughter. Through the brilliancy of his military genius Marlborough long found apologists as well as admirers among the historians of England, but the bare recital of unquestioned facts convicts him of numerous treasons under aggravated circumstances of ingratitude. Due justice was first meted out to him from this point of view in Lord Macaulay's celebrated *History of England*. His great military and political talents were intuitive, as his education was extremely limited. The duchess of Marlborough survived until Oct. 18, 1744, having lived long enough to discern the rising greatness of the elder Pitt, to whom she bequeathed £10,000. (See Murray's *Letters and Despatches of Marlborough* (5 vols., 1845–46); Coxe's *Memoirs* (3 vols., 1817–19), and Alison's *Life* (2 vols., 1847).) PORTER C. BLISS.

Mar'lin, on R. R., cap. of Falls co., Tex. (see map of Texas, ref. 3–I, for location of county), near the Brazos River, has a high school and a cotton-seed oil-factory. Pop. in 1870, 602; in 1880, not in census.

Marlorat (AUGUSTIN), b. at Bar-le-duc, in Lorraine, 1506, was educated in an Augustine convent, and appointed prior of a monastery at Bourges in 1533, but embraced the Reformation, fled to Geneva, and was in 1560 chosen pastor of the Reformed congregation at Rouen. In April, 1562, the Reformed party took possession of the city, but, being unable to hold it, they were cruelly punished. Marlorat was hanged in front of his own church.

Marlowe (CHRISTOPHER), b. at Canterbury, England, in 1564; studied at King's School, Canterbury, and at Corpus Christi College, Cambridge, where he graduated 1583, and produced upon the stage in 1586 the first part of his tragedy of *Tamburlaine*, which, though filled with extravagant flights, exhibited more poetic genius and better dramatic combination than any previous English play. In 1588 he brought out his *Tragical History of the Life and Death of Dr. Faustus*, a powerful conception of the subject, which in a German version formed the basis of Goethe's *Faust*. A second part of *Tamburlaine* was added in 1590, and he wrote two other plays, *The Jew of Malta* and *Edward II*. Several anonymous dramas are generally attributed to Marlowe, and by many critics he is believed to be the author of the second and third parts of *Henry VI.*, included in Shakspeare's works. He also made translations from Ovid. He d. from a wound received in a quarrel at Deptford June 16, 1593. The best edition of his works is that of Dyce (3 vols., 1850).

Marl'stone [from *marl* and *stone*], a stratum of rock belonging to the Middle Lias. (See LIAS.)

Mar'malade [Port. *marmelada;* Lat. *malum mellatum*, "honeyed apple"], a conserve made of fruit, as the orange, quince, peach, etc., with a large proportion of sugar. Marmalade is also the name of the fruit of *Achras mammosa*, a valued dessert fruit of tropical America, produced by a sapotaceous tree.

Marmande', town of France, in the department of Lot-et-Garonne, on the Garonne. It is an old town, with a spacious and much-frequented harbor, extensive distilleries, large trade in corn, hemp, and white wines, and manufactures of linens, sailcloth, oil, and leather. Pop. in 1881, 9857.

Marmier (XAVIER), b. at Pontarlier, in the department of Doubs, France, June 24, 1809, engaged in journalism and general literary business, and spent a large portion of his time in travelling. He visited Switzerland and Holland in 1830, Germany 1832, the Scandinavian countries 1836–38, Russia 1842, the East 1845, Algeria 1846, and America 1849. In 1846 he was appointed librarian at the library of St. Genevieve, in Paris, and in 1870 he was elected a member of the Academy. Besides translations of dramas by Goethe and Schiller, novels by Hoffmann, Scandinavian folk-lore, etc., he published *Histoire de l'Islande* (1838), *Langue et litterature islandaises* (1838), *Histoire de la litterature en Danemark et en Suede* (1839), *Lettres sur l'Amerique* (1852, 2 vols.), and some novels: *Guzida* (1860), *Les Hazards de la Vie* (1869), etc.

Marmont′, de (Auguste Frédéric Louis Viesse), duke of Ragusa, marshal of France, b. at Chatillon-sur-Seine, in the department of Côte-d'Or, France, July 20, 1774; received a military education; was aide-de-camp to Napoleon in 1796; accompanied him to Egypt; was made general of division after the battle of Marengo, commanded the forces in Dalmatia from 1806 to 1809, and in Portugal in 1811–12, where he lost the battle of Salamanca (July 22, 1812) and was severely wounded; joined the great army the day before the battle of Wagram, and was made a marshal on the battlefield of Znaym. In 1814 he commanded the troops in and around Paris, and compelled Napoleon to abdicate by evacuating the capital and entering into negotiations with the allied powers. For this reason Napoleon exempted him, on his return from Elba, from the general amnesty, and he was compelled to flee, while afterwards Louis XVIII. made him a peer of France and loaded him with honors. He lived mostly in retirement, until in 1830 Charles X. called him to Paris to quell the revolution of July. In this he failed, but so great was the indignation he excited that his name was struck from the lists of the French army. Afterwards he resided mostly in Vienna. D. at Venice Mar. 2, 1852. His *Mémoires* (9 vols., Paris, 1856–57) are important for the history of his time.

Marmontel′ (Jean François), b. July 11, 1723, at Bort, in the department of Corrèzes, France; began to prepare himself for the Church at Toulouse, but went in 1746 to Paris with the purpose of devoting himself to literature; was patronized by Voltaire; wrote tragedies, also opera-texts for Rameau and Pucini; obtained a secretaryship at Versailles in 1753 through the influence of Madame de Pompadour, and for two years the editorship of the *Mercure;* published in 1761 his *Contes Moraux*, which achieved an immense success, and were translated even into Hungarian and Danish; wrote in 1767 his *Belisaire*, which was condemned by the Sorbonne as heretical and blasphemous; collected in 1787 his contributions to the *Encyclopédie* under the title *Eléments de Littérature;* retired during the Revolution to Abloville in Normandy, and d. there Dec. 31, 1799.

Mar′mora, Sea of, separates European from Asiatic Turkey, and communicates with the Black Sea by the Strait of Constantinople and with the Ægean Sea by the Strait of the Dardanelles. It is 135 miles long and 45 miles broad. Among its islands, Marmora or Marmara is famous for the fine marble and alabaster which it contains.

Mar′moset [Fr. *marmouset*], a name applied to various small South American monkeys of the aberrant family Mididæ, and of the genera *Saguinus, Midas*, etc. They are the nearest of all the true monkeys to the Prosimiæ or lemurine Quadrumana. The thumbs are not opposable, nor is the tail prehensile. These creatures are harmless, affectionate, and often very beautiful. They are, however, very delicate, and in cool climates the marmoset soon dies if exposed. The *Saguinus jacchus* is one of the best known species. (See Mididæ.)

Mar′mot [Fr.], a name given to rodent mammals belonging to the squirrel family. Closely akin to the marmots are the prairie dogs (*Cynomys*), which some, indeed, include in the genus *Arctomys*, to which the marmots belong. (See Prairie Dog.) The typical species of marmot is *Arctomys Marmotta*, the European marmot, which is abundant in the Alps. The Old World has several other species. The best known American species is *Arctomys monax*, the woodchuck or ground-hog, which is very abundant E. of the Mississippi. Its flesh is sometimes eaten, but is not good. Its fur is not of much value. The Pacific coast has several species. (See Sciuridæ.)

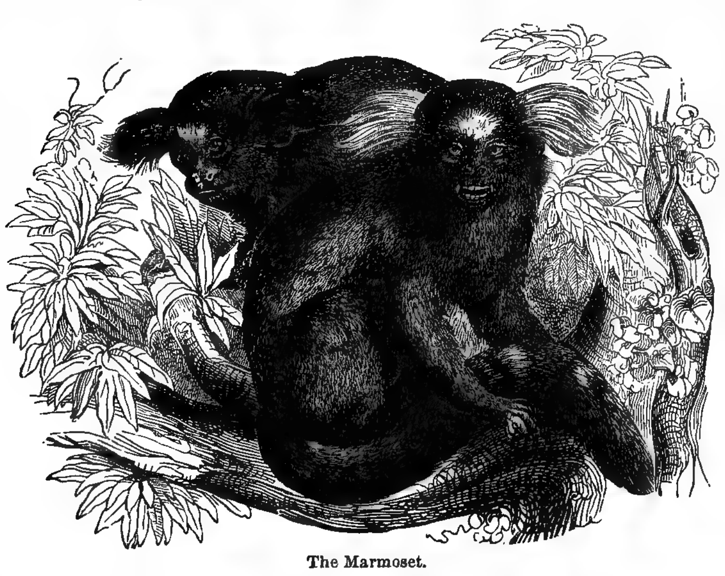
Marne, department of France, along the Seine and the Marne. Area, 3116 square miles. In the southern part the soil is very fertile and much corn is raised; the northern part is chalky and sandy, but produces annually 15,400,000 gallons of excellent wine, among which are several varieties of the famous champagne wine. Sheep of a good breed are reared here, and a great number of millstones are quarried. More than three-fourths of the total area is arable land. The principal manufactures are woollen, in the vicinity of Rheims, and consist of flannels, merinoes, tartans, shawls, etc. Pop. 421,800. Cap. Chalons-sur-Marne.

Marnix, van (Philip), baron of St. Aldegonde, b. at Brussels in 1538; was educated at Geneva, and became a staunch adherent of the Reformed creed. He was among the nobles who protested in 1566 against the introduction of the Inquisition into the Netherlands, and by the prince of Orange was employed in many difficult diplomatic missions to Paris, London, the Diet of Worms, etc. D. at Leyden Dec. 15, 1598, and left a metrical translation of the Psalms and several controversial treatises.

Maro′a, R. R. junction, Macon co., Ill. (see map of Illinois, ref. 6–E, for location of county), 11 miles N. of Decatur, on the Illinois Central R. R., has very fine mills, a grain-elevator, several grain-warehouses, and large trade in grain. Pop. of v. in 1870, 766; in 1880, 870.

Marochet′ti (Carlo), Baron, b. at Turin in 1805, naturalized and educated in France; began his studies under Bosio; visited Italy, and exhibited in 1827 in Paris a group, *A Girl Playing with a Dog*, which attracted much attention. He afterwards was much at the court of Louis Philippe, and after 1848 in the aristocratic circles of London, where he d. in 1867. His principal works are an equestrian statue of Emmanuel Philibert at Turin and a colossal statue of Richard Cœur-de-Lion at London, besides busts and statues of Prince Albert, the queen, etc.

Mar′onites, a Christian people of Syria who take their name from their first monothelitic bishop, John Maro, who d. 701 a. d. Their number is estimated at from 200,000 to 250,000. They live chiefly in the N. part of the Lebanon, but are found also all over the Lebanon and the Anti-Lebanon, with a few in the larger cities of Syria. They are Roman Catholics of the Syrian Rite (which see). They have a patriarch who lives at Canubin, a monastery near the foot of Lebanon, but who bears, in common with five other dignitaries, the title of patriarch of Antioch. They have also metropolitans of Tyre, Damascus, Aleppo, Tripoli, and Cyprus, besides seven bishops. They were anciently monothelites, but having joined in the second crusade against the Saracens, in 1182 renounced their heresy before the Latin patriarch of Antioch, Aimeric III. In 1445 they were more formally united to the Roman Catholic Church. They are hospitable towards all Christians; have since 1840 been deadly enemies of their neighbors, the Druses; speak Arabic or Greek; consider the Syriac their sacred language, and make use of Syro-Chaldæan books, which they do not understand. Their secular



The Marmoset.

clergy may marry before ordination, and the Eucharist is administered under both kinds. They have a great number of celibate monks and nuns, who follow the rule of St. Anthony, take no vows, but fast often, and never eat meat. The Maronites have suffered much from their neighbors, the Druses, who are far inferior to them in numbers, and who were, it appears, the injured party at the origin of the recent bloody feud. R. D. HITCHCOCK.

Maroons′ [Fr. *nègres marrons*, from the Sp. *cimarron*, a "mountaineer"], a name used formerly in Jamaica, and now in Guiana, to designate the runaway slaves and their descendants. The Maroons of Jamaica fought the British government from 1655 to 1795, and were finally conquered by the aid of Cuban bloodhounds, of which the Maroons had a well-founded horror. Some were sent to Africa and some to Nova Scotia, where their descendants still remain. The Maroons of Guiana are mostly from the Dutch colony, and are virtually independent. In 1869 their number in Dutch Guiana was given as about 7500.

Maros′, a river of Europe, rises in Transylvania, near the frontier of Moldavia, flows in a western direction into Hungary, and joins the Theiss opposite to Szegedin, after a course of about 400 miles, for the greater part of which it is navigable.

Maros′-Vasarhely′, town of Austro-Hungary, in Transylvania, on the Maros. It has a large trade in wheat, wine, and tobacco. Pop. 11,217.

Marot′ (CLEMENT), b. in 1495 at Cahors, in the department of Lot, France; was educated as one of the pages of Margaret of Valois, and succeeded his father as poet and *valet de chambre* to Francis I., whom he accompanied also in the field. His *Le Temple de Cupidon* and other light, amorous poetry, as well as his personal qualities, made him a favorite with the ladies, among others with Diana of Poitiers, but this last tender relation ended by her delivering him over to the Inquisition as a heretic. During his imprisonment he wrote a witty satire, *L'Enfer*, on his judges, and gave a new version of the celebrated *Roman de la Rose*. Francis I. procured his liberation, and he now repaired to the court of Margaret of Navarre, where he commenced his translation of the Psalms. When the first 50 psalms were published, they were much applauded by the court and the public in general, but the Sorbonne condemned the translation as heretical, and Marot fled to Geneva. Here he was well received by Calvin, and translated 20 more psalms in connection with Beza, but his frivolous life made it impossible for him to stay here. He returned to the Roman Catholic Church, and wandered for some years in France and Italy. D. at Turin in 1544. His translations from the Psalms contributed much toward the spread of the Reformation in France; they were learned by heart, recited and sung at the court and in the street, while at the same time the prose translations were very coolly received by the public. There is a good edition of his works by Jannet and Héricault (Paris, 1873, 4 vols.). His father and son were also poets, and the works of the three Marots were published at the Hague in 1731, and several times afterward. *Le style marotique*—called thus after him—means something naïf.

Marque [Fr.], **Letters of.** In international law these words denote the consent of a government, expressed in a formal permission, that a certain vessel may act as a privateer when the requisite bonds and formalities have been given or complied with. The words are explained best by the French *lettres de marque*—*i. e.* of stamp, or stamped letters, like *lettres de cachet*, letters of seal, or sealed with the king's signet, but specially giving authority to arrest. They are, then, stamped letters allowing reprisals or private warfare. T. D. WOOLSEY.

Marque′sas (or **Mendaña**) **Islands** consist of two groups of islands situated in the Southern Pacific Ocean, between lat. 7° 30′ and 10° 30′ S., and between 138° and 140° 20′ W. The northern group is generally called Washington Islands. It consists of seven islands, which were first sighted by the American Ingraham in 1791. But the name of Marquesas Islands extends to both of the groups. The southern group consists of five islands—Fatouhiva, or Magdalena; Motane, or San Pedro; Tahouata, or Sta. Christina; Hivaoa, or Dominica; and Fetohougo, or Hood's. They were discovered by Alvaro Mendana in 1595. They are of volcanic origin, high, mountainous, with steep coasts, comprising an area of 500 square miles, and belonging to France. The interior of the islands is generally fertile: the climate hot, but healthy: the sugar-cane, cocoanut tree, and cotton-plant abound. Though the land fauna is very poor, there being few mammals in the islands with the exception of dogs, rats, and pigs, the seas all around swarm with fish, and enormous flocks of sea-birds visit the coasts. But the inhabitants, numbering 5754, form one of the most savage and (to European civilization) most inaccessible tribes of the Polynesian race. Guns and whisky are the only foreign elements which have been able to penetrate into their lives: all missionary and commercial efforts, until quite recently, have for the most part been in vain. In 1842 Capt. du Petit-Thouars formally took possession of the whole group of islands in the name of France, and at that time the population was estimated at about 20,000. Since 1861, however, the French possession is merely nominal.

Mar′quess, or **Marquis,** a British title of nobility, next in rank below that of duke, and next above that of earl. The ancient English title of *lord-marcher* and the German one of *Markgraf* are in some sense equivalent to it. There are at present thirty marquesses in the different classes of the British peerage, besides the dukes who are also marquesses. A marquess is addressed as "the most honorable." The title of his wife is "marchioness," and she is also addressed as "*most* honorable," or as "your ladyship."

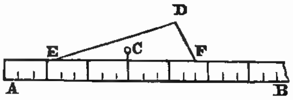
Mar′quetry [Fr. *marqueterie*], the art of inlaying wood with shells, metal, ivory, or pieces of wood of another color. It is carried to great perfection by the cabinet-makers of France, Germany, and Belgium, that of Sorrento, Italy, being perhaps the most elaborate. The process as regards woodwork consists in cutting out with a fine saw a pattern from two or three thicknesses of wood glued together, and then inserting the part cut from one into the cavity of the other, and *vice versâ*, filling up the interstices with sawdust. A variety of this process is called BUHL-WORK (which see.)

Marquette, city, cap. of Marquette co., Mich. (see map of Michigan, ref. 2–F, for location of county), on the Marquette Houghton and Ontonagon R. R., 425 miles N. of Chicago, the principal shipping-port of the great iron-region, has regular communication by steamers with all the lake cities. It is situated upon a low bluff 25 feet above the bay, is supplied with water taken from the lake, and the streets are lighted with gas. It has a fine natural park, several churches, a number of public schools, a public library, a Catholic cathedral and convent, large blast furnaces, a rolling-mill, foundries and machine-shops, brownstone-quarries, and the railroad car-shops. Pop. in 1870, 4000; in 1880, 4690; in 1884, 5612.

Marquette (JACQUES), b. at Laon, France, in 1637; sailed in 1666 as a Jesuit missionary to Canada; founded the mission of Sault Ste. Marie in 1668; went in 1669 from La Pointe (now in Michigan) to Mackinaw, where in 1671 he built a chapel; accompanied Joliet in his expedition of 1673 down the Wisconsin and Mississippi, and returned *viâ* the Illinois River and Green Bay, Wis.; opened in 1675 the mission at Kaskaskia, but finding his strength failing, set out to return to Mackinaw; died on the journey, May 18, 1675, near the mouth of Marquette River, in what is now Michigan. In Shea's *Discovery of the Mississippi Valley* (1852) there are translations of his narrative and journal.

Marquez′ (Gen. LEONARDO), b. in the city of Mexico about 1818; took part in the defence of the valley of Mexico against the American army in 1847; headed a revolutionary movement in Guanajuato in favor of Santa Anna 1849; was advanced to important military commands by Santa Anna during his last presidency (1853–55); maintained a guerilla warfare against Alvarez and Comonfort 1856–57; was one of the most trusted generals of Presidents Zuloaga and Miramon in their struggle against Juarez 1858–60, generally known as the "war of reform," and continued to wage an irregular warfare against Juarez after the downfall of Miramon until the French intervention, which he supported 1861–64. He was sent by the archduke Maximilian as minister to Constantinople, but returned without permission Oct., 1866, when the Mexican "empire" was about to fall; accepted the command of a division, and during the siege of Querétaro defended the city of Mexico against the republican forces under Gen. Porfirio Diaz. On the fall of the city he succeeded in escaping to Havana, where he has since resided. The "massacre of Tacubaya" (see MIRAMON), the execution of his prisoners, Gens. Degollado and Valle and the prime-minister Ocampo, with other deeds of blood, caused a price to be set on his head, and gave him the title of "tiger of Tacubaya," which adheres to him notwithstanding two pamphlets he has published in defence of his "honor" and his military record. He is one of three persons expressly excluded from the Mexican amnesty of 1870.

Marquoi's′ Rulers. A set of rulers devised by an artist named Marquoi to facilitate the operation of plane drawing. The set consists of one triangular ruler, whose hypothenuse is three times as long as the shorter side about the right angle, and of several rectangular rulers graduated according to different scales. Each rectangular ruler bears two scales, the first of which may be any scale of equal parts; each division of the second scale is three times as long as a division of the first. The triangular ruler has an index, C, near the middle of its hypothenuse, which may be brought to coincide with any division of the rectangular scale, as shown in the diagram. The use of the triple scale is to enable the draughtsman to draw a line parallel to a given line, and at a distance from it equal to any number of divisions of the simple scale. If the drawing is to be made on the simple scale A B, the parallel in question may be drawn as follows: The rulers are placed as shown in the figure, and the side E D is made to coincide with the given line; the rectangular ruler is then pressed against the paper, and the triangular ruler is moved along it, keeping its edge E F in close contact. For every division of the triple scale passed over by the index C, the edge D C will advance in the direction D F, that is, it will recede from a given line a distance equal to one of the divisions of the simple scale A B. The object of having several rectangular rulers is to enable the draughtsman to make his drawings to any desired scale. W. G. PECK.



Marra'di, town of Central Italy, in the province of Florence, about 42 miles N. E. of the city of Florence. It is situated in the valley of the Lamone, and is surrounded at a distance of some two miles by forests of oaks and chestnuts. The first knowledge we have of Marradi is in 1025, when it was governed by an abbot. For some centuries afterward it was a subject of contention between the neighboring republics, though generally under the dominion of Florence. Pop. in 1872, 8226.

Mar'riage, and Married Women. The term "marriage" is used in two quite distinct senses. It is applied to the contract by which a man and a woman agree to become husband and wife, and it also denotes the legal status or condition of the parties which they assume and enter upon by means of that contract. It is a grave error to say, with many legal writers, that marriage *is* a contract. Although based upon a contract, it is properly the peculiar condition of the spouses flowing from their mutual act of agreement, with the various capacities and incapacities inhering in them by virtue thereof. The law of marriage now prevailing in Europe and in the U. S. is derived to a great extent from the doctrines which were finally established in the Roman jurisprudence. By the researches of modern scholarship it has been ascertained beyond a doubt that the monogamic principle was adopted among the Aryan races in the earliest stages of their development, and that in the original form of their social institutions marriage itself was a highly religious act. Traces of this conception were preserved among the ancient Romans in the peculiarly sacred mode of solemnizing marriage termed *confarreatio*, which was at first employed by the patricians generally, but which afterward became restricted to the priests. During the earlier periods of the Roman state there were two kinds of marriage: one of these, which was confined to the citizens, brought the wife and children under the marital "power" of the *paterfamilias* (see PATRIA POTESTAS); the other, which was used by those not entitled to full citizenship, did not confer this terrible dominion upon the husband. The former species gradually became infrequent, and finally disappeared under the emperors, while the second more simple and natural mode was made universal. The only essential element of marriage by the Roman law, the single requisite to its validity, was the consent of the contracting parties. As a result of that species of marriage which subjected the wife to the husband's "power," all her property at once passed to and vested in him. When, however, this peculiar method, with all of its consequences, had been abandoned, marriage did not of itself produce any effect upon the property of the spouses; each remained the owner of his or her own, with full power of control and disposition. While no change of proprietorship was wrought by the law, nuptial contracts might produce such an effect; and they were very common. A marriage portion, called the *dos* or dowry, was almost universal. The wife's father generally furnished this dowry, but it was sometimes advanced by the wife herself or by a third person. The husband had the sole possession and management of the *dos* while the marriage continued, and the sole enjoyment of its income and profits, but did not, as a general rule, become its absolute owner. When the marriage was terminated by death or otherwise, except for the wife's adultery, he was obliged to restore the dowry to the wife or to her heirs, or sometimes to the person who had furnished it. The nuptial contract might provide, on the other hand, that if he survived the husband should himself retain the dowry. This dotal system has been adopted with all its substantial features by those continental states of Europe which have taken the Roman jurisprudence as the basis of their own. After the papal supremacy was established the Church of Rome asserted that marriage was purely a religious act, and was therefore within its exclusive jurisdiction. An elaborate code of rules for its regulation was incorporated into the canon law; and since the canon law was generally accepted and followed, prior to the Reformation, throughout Christendom, these rules were recognized in all Christian countries as the foundation of the local legislation and as the guides for the local tribunals. In asserting its exclusive control the Church maintained that its own concurrence, through the presence and the blessing of a priest, was essential to the validity of any marriage. This doctrine was formally announced by a decree of the Council of Trent (Nov., 1563), which declared that after that date all marriages not contracted in the presence of a priest and two or three witnesses should be void. Notwithstanding this position, so vehemently maintained by the Roman Church, the conception of marriage as a purely civil status regulated by the municipal law alone generally prevails in the modern legislation of Europe. In France every marriage must be celebrated before a designated civil officer in the presence of four witnesses, after certain public notices have been given. A religious ceremony may then follow if the parties desire, but is not made requisite; and any clergyman who performs the religious ceremony before the civil form has been consummated is liable to severe punishment. (*Code Civil*, arts. 75, 76, 165; *Code Pénal*, arts. 199, 200.) In order that the marriage of a son under twenty-five years of age and of a daughter under twenty-one may be valid, the consent of the parents or of the surviving parent must first be obtained; if both are dead, the consent of the grandparents; or, in the absence of these relatives, the consent of a "family council." "Civil marriage" in substantially the same form has also been established by the kingdom of Italy, by Austria, and by the German empire. This legislation has been the cause of bitter controversies between the governments of those countries and the Papal See. Passing to England, the same type of statutory enactment is found. It was decided by the House of Lords in 1844 that subsequent to the Council of Trent, and prior to any act of Parliament establishing a different rule, the law of England required the presence of a clergyman of the Established Church in order that a marriage should be valid. The subject is now wholly regulated by statutes, which permit a marriage to be solemnized either with or without a religious ceremony. Since the 6 and 7 Will. IV. (ch. 85) a marriage must either be solemnized in a church—in which case it must be conducted by a clergyman of the Established Church according to its rites, with the presence of two witnesses—or it must be performed, after due public notice and a certificate properly granted, in a licensed dissenting place of worship or in a registrar's office; and in each of these two cases it must be conducted by a civil officer called the registrar, although there may be superadded to the civil contract whatever religious ceremonies the parties see fit to adopt. The archbishop of Canterbury is authorized, however, to grant special licenses to marry at any convenient time and place. In consequence of these statutes, which are now in force, no marriage can be contracted in England by the mere consent of the parties, however clearly it may be expressed. Marriage between persons related to each other within the Levitical degrees is unlawful, and this prohibition embraces relationship by affinity as well as that by consanguinity. A marriage between a man and the sister of his deceased wife is therefore void. Parliament has been frequently urged to abolish this particular restriction, but thus far without success.

In the U. S., by the law which prevails very generally, if not, in fact, universally, throughout the States, marriage is regarded as wholly based upon contract, upon the present mutual consent of the parties, and no special forms are necessary to its validity. If a man and a woman, by words of present import, promise and agree with each other to be husband and wife, the contract and the resulting status of marriage are perfected; solemnization by a clergyman or by a civil magistrate, the presence of witnesses, and all the ceremonies and forms which are customarily used, even those provided for by statute, are nothing more than convenient means of perpetuating the evidence of the contract between the spouses, which itself constitutes the marriage; they are not in the least essential to its efficacy. Whenever certain preliminary steps, such as license, notice, and the like, are prescribed by statute, a failure to comply with these provisions does not impair the marriage which has been contracted without their presence; it simply subjects the delinquent parties to a slight pecuniary penalty. The words of the contract by which the parties signify their intention must be *in præsenti* (of a present force and operation), and they do not need to be followed by a cohabitation, since the status of marriage arises from the mental and not the physical union of the spouses. In this respect the U. S. law of marriage is identical with that which has long prevailed in Scotland, so that the decisions of the Scotch courts furnish valuable precedents which may be followed by our own tribunals. If the words used by the parties in their mutual promise are *in futuro* (of a future force and operation), and are followed by an immediate cohabitation, it is held in New York and in several other States that no marriage arises, while in a few of the States the contrary doctrine, which is also the rule in Scotland, has been established. The doctrine is well settled by judicial decision that, in the absence of more definite proof, the existence of a marriage may be inferred from the acts of the parties—from their cohabitation, from their treatment of each other and holding each other out to the world as husband and wife. This rule is simply one of evidence. From these and other similar acts of the parties juries and courts are permitted to draw the conclusion that at some previous time the man and the woman entered into a contract to become husband and wife, but the fact of such an agreement must always be found as a result of the circumstantial proofs. The prohibition of marriage between persons related within the Levitical degrees does not generally exist in the law of the several States. The restriction is confined to those relationships which would render the union incestuous—that is, to all persons lineally related as ascendants or descendants in whatever degrees, and in the collateral line to brothers and sisters alone. Marriage with a deceased wife's sister is therefore lawful, and is by no means uncommon. In some of the States, however, a few additional disabilities have been created by statute, which consist chiefly in placing relationship by affinity and by consanguinity among the prohibited lineal degrees upon the same footing. Where this legislation exists, a union between a man and his step-daughter, or between a woman and her step-son, and the like, is illegal. Following the English and the canon laws, which had copied that of Rome, the age of consent, or the age at which persons become capable of entering into a valid and binding marriage, is generally fixed at fourteen years for males and twelve years for females. In other words, a boy of fourteen years or more and a girl of twelve or more may contract a marriage as effectually as though they were adults. Consent of parents or guardians is not requisite to the valid marriage of a minor. From the foregoing outline it is evident that the law of the U. S. has left this most important of all contracts and of all social or domestic relations in a condition of absolute freedom, without any of the formal restraints and safeguards which are common in other modern systems of jurisprudence, and which are perhaps demanded by considerations of the highest public policy.

The Effects of Marriage upon the Capacities, Rights, and Duties of a Married Woman.—These effects may be considered (1) as they concern her property rights; (2) as they concern her personal rights and duties.

(1) *Her Rights of Property.*—On the European continent three distinct systems coexist—the "dotal system," borrowed directly from the Roman law, and found in all the nations which have based their jurisprudence upon that law; the "community of goods," which prevails in France, Holland, parts of the German empire, and wherever the *Code Napoléon* has been accepted; and, finally, the system by which each spouse is left the separate owner of his or her own property. The parties are generally permitted to indicate by their nuptial contract which one of the existing modes of regulation they adopt for the disposition and management of their estates. The dotal system has already been described. The fund set apart as the dowry (*dos, dot*) is settled by the marriage contract, and may include the whole or any portion of the wife's property, as the spouses may agree; the husband has its entire management and its rents and profits during the marriage, but when this is dissolved for any cause, he or his heirs must restore the whole fund to the wife or to her heirs. The "community of goods" is a species of partnership between the husband and wife. The property owned by each at the date of their marriage, except their lands, and all that may be subsequently acquired by either of them, except lands inherited or donated, are brought into and constitute the common fund. This fund is chargeable with the debts of each existing at the commencement of the marriage, and with those subsequently contracted by the husband; and he alone possesses the right to its control and management. Upon a dissolution of the marriage by death, divorce, or judicial decree the specific claims of each are first satisfied out of the fund, and the residue is then divided between them in equal shares, or between the survivor and the heirs of the deceased, one-half of the partnership debts being charged against the recipient or recipients of each share. These arrangements may, however, be modified by the stipulations of the nuptial contract. This same partnership system has been adopted by the civil code of Louisiana, and to a partial extent by the statutes of California. The common law of England and of the American States was very harsh in its provisions concerning the property rights of married women. Upon marriage the husband acquired an absolute ownership over all the wife's goods, chattels, and moneys; lands held by her under lease, and all debts and demands due to her, also became his as soon as he reduced them to his possession by collecting the amounts due or taking new securities in his own name, and the like. Lands owned by the wife in fee or for life did not become the husband's absolutely, but he was entitled to their possession and profits during the marriage, and if he survived and a child had been born, this right continued until his death. The wife acquired no corresponding interest in her husband's property during their joint lives, but upon his death she became entitled to dower in his lands; which estate has been preserved, with some modifications, in nearly all the American States. (See DOWER.) A method of evading these unjust rules of the common law was long ago contrived by the courts of equity. By means of marriage settlements land or other property may be conveyed to trustees, and held by them for the sole benefit of a married woman, free from any control of her husband or his creditors; and thus a fund may be set apart for her use and management. These marriage settlements never became common in the U. S., although they are universally employed in Great Britain among the higher classes of society. The stern doctrines of the common law as above described have been practically abolished by the recent legislation in the States of this country. Commencing in New York in 1848, the reform rapidly spread throughout the Union. In its common type it provides that the real and personal property of every married woman which she owns at the time of her marriage, or which she shall acquire thereafter, shall remain her sole and separate property as though she were unmarried, free from any interest of the husband therein and from any claim thereto by his creditors. In several of the States, although this particular provision is wanting in some, she is expressly permitted to convey her property by deed and to bequeath or devise it by will. While this legislation has cut off all interest of the husband in the wife's property, and clothes her with the capacity to enjoy its use and proceeds, it does not enable her to contract, to acquire property by her labor, or to engage in business. In New York and in a few other commonwealths additional and more recent statutes have greatly enlarged her capacity by enabling her to manage her property as though she were single, to make any contracts relating to it, to acquire and hold the earnings of her own labor, to engage in any trade or business and enter into any contracts connected therewith, to sue and to be sued alone in all actions growing out of her property or her contracts, and to sue alone in all actions brought to recover damages for torts to her property, person, or character. This legislation has gone far toward the complete assimilation of the married woman's legal condition with that of the single woman or of the man. By the "homestead" system established in the Western and Southern States the wife acquires a secure and personal interest in the homestead, which, although held jointly or in common with the husband, cannot be affected by his own act. In California and a few other States she may become a "sole trader," and in carrying on her business has the powers and liabilities of a single woman.

(2) *Her Personal Rights and Duties.*—The personal status of the wife, according to the common law, results from the conception of the husband as the single head of the family, and of her legal personality as wholly swallowed up in his own. For this reason her rights were few, and her condition was rather to be described by the duties and incapacities which attended it. Many of these duties, however, were simply moral in their nature, since no legal sanctions were provided for their enforcement. Her personal rights may be summed up in the single notion of support. The family looks alone to the husband for its maintenance; he must furnish a home for the wife, and provide her with necessaries suitable to her situation and to his condition in life; and she possesses, as the general rule, the power to procure such necessaries upon his credit. The recent changes made in the law which enable the wife to hold and enjoy her own property have not abridged this obligation of the husband, or made it her duty to contribute toward her own support or that of the family. It is often said in the textbooks that a married woman owes obedience to her husband, and that he is entitled to her

presence, society, and services in the household. Such a social and moral obligation no doubt exists, but it cannot be called a legal one on her part. The wife's continued cohabitation and residence with the husband are entirely voluntary—at least in this country—and if she chooses to leave his home and to live apart from him, her return cannot be compelled by any legal remedies, but her claim for support will cease. At the same time, the law recognizes this right of the husband to such an extent that if the wife is enticed away from his home, or is seduced, or is personally injured through violence or neglect, he is entitled to such redress from the wrongdoer as a recovery of pecuniary damages will give. And her duty of obedience is also recognized in the rule that if she commit a crime in her husband's presence and by his direction, he alone is liable to punishment, she not being regarded as responsible. At the common law the married woman was incapable of doing any civil act which would presuppose her separate legal personality. She could not sue or be sued in her own name, although a departure from this rule was permitted in courts of equity. She was also incapable of entering into any contracts, and at law her agreements were absolutely void. Equity, however, recognized her contracts when made in reference to her separate estate, and enforced them, not as creating a personal liability, but as creating a charge or lien upon her property. The husband and wife were also prohibited, with certain special exceptions, from being witnesses for or against each other in judicial proceedings. Modern reforms have greatly modified these dogmas. In England and in many of the American States the husband and wife are now admitted as witnesses, except in reference to facts learned in their domestic confidence. The power of the wife to contract, and to sue or be sued in relation to her own property, conferred by recent statutes in the U. S., has been already described. JOHN NORTON POMEROY.

Mar'row [Lat. *medulla*], the substance which fills the central canal of the long bones of the adult, the largest of the Haversian canals, and the hollows in cancellous bone. In the cavities of long bones of the adult it is of the yellow or fatty variety, of which 96 per cent. is fat; in the young subject, and in many of the bones of the adult, it is of the red or watery variety, which is almost without fat. The last form of marrow appears to share the functions of the closed glands in preparing food so as to render it serviceable for nutrition. (See HISTOLOGY.)

REVISED BY WILLARD PARKER.

Mar'ryat (Capt. FREDERICK), b. in London, England, July 10, 1792; entered the British navy in 1812 as a midshipman; took part in many naval engagements with the French, gaining great credit by rescuing drowning shipmates on more than one occasion; served on the American squadron 1812–15; was engaged in action on Lake Pontchartrain in 1814. Having attained the rank of captain and the command of a vessel in the Channel squadron, he commenced in 1829 the publication of a series of nautical romances which proved a brilliant success. The first was *Frank Mildmay; or, The Naval Officer*, followed in the next year by *The King's Own*. He wrote in all twenty-four novels. *Snarley-yow* (1837) is generally considered the best. He was also the author of a *Code of Signals for Vessels employed in the Merchant Service* (1837), of a record of travel in the U. S., *A Diary in America, with Remarks on its Institutions* (1839), and of numerous miscellaneous works. D. at Langham, Norfolk, Aug. 2, 1848. (See his *Life and Correspondence* (2 vols., 1872), by his daughter FLORENCE, now Mrs. ROSS CHURCH, who has also written several successful novels.)

Mars [Lat. *Mavors* or *Mamers*], one of the principal gods among the ancient Italians, was worshipped at Rome under three aspects: First, as *Mars Gradivus* he was the god of battle, early identified with the Greek Ares, son of Zeus and Hera, and more famous as the lover of Venus (Aphrodite) than as a war-god—a character very different from that of the Italian Mars; secondly, as Silvanus he was the god of husbandry and rural life; lastly, as Quirinus he was the father and tutelary divinity of the Roman state, whose founders were his offspring.

Mars. The planet Mars is the fourth in order of distance from the sun, and the nearest of the superior planets. Mars travels at a mean distance of 139,311,000 miles from the sun. But the eccentricity of his orbit is considerable, amounting to 0.093262, so that the greatest and least distances of the planet differ from his mean distance by nearly a tenth part, or by about 13,000,000 miles. His greatest distance amounts to 152,304,000 miles, his least to 126,318,000. When the earth and Mars are in conjunction, and Mars near perihelion, the earth is about 92,500,000 miles from the sun, and therefore the planet is distant from us only 126,318,000 miles, *minus* 92,500,000 miles, or about 33,800,000 miles; whereas, when he is in opposition—that is, Mars and the earth in conjunction, and Mars near aphelion—the earth is only about 90,500,000 miles from the sun, and the planet is therefore distant from us only 152,304,000 miles, *minus* 90,500,000 miles, or about 61,800,000 miles. Thus, at different oppositions of the planet his distance varies between 33,800,000 miles and 61,800,000 miles, the widest relative range of distance of any planet's oppositions. It is on this account that the appearance of Mars when he is most favorably placed for observation during the course of any synodical revolution varies so much more than that of any other planet—a circumstance not unnoted by the ancients. For, if we consider that the apparent brightness of a planet depends conjointly on the apparent size of the planet's disk and on the amount of sunlight received by the planet, we perceive that the brightness of Mars when in opposition ranges between a maximum and a minimum proportioned to each other as $(61,800,000)^2 \times (152,304,000)^2$ to $(33,800,000)^2 \times (126,318,000)^2$, or about as 34 : 7. In other words, at an opposition occurring near perihelion Mars is nearly five times as bright as he is at an opposition occurring near aphelion. At some of these brighter oppositions, which recur at intervals of about thirty-three years, Mars has been mistaken by the ignorant for a new and fiery orb of evil portent to the nations. The perihelion of the orbit of Mars lies in longitude 333½°. His orbit is inclined 1° 51′ to the ecliptic, its rising node being in longitude 48½°. He completes his sidereal revolutions in a mean period of 686.9797 days, and returns to opposition at intervals separated by a mean period of 779.936 days, which is therefore his mean synodical period. But on account of the eccentricity of his orbit and the variability of his rate of motion his successive synodical periods are considerably unequal.

The diameter of Mars has been variously estimated. The value at present regarded as most probable is about 4400 miles. The planet's equator is inclined about 28° to his orbit. Although Mars does not appear so large an object in the telescope as Jupiter, yet he is in reality seen on a much larger scale; not only because of his much greater proximity to us, but because, being also much nearer to the sun, his surface is much more brightly illuminated, so that a much higher telescopic power can be advantageously employed. In fact, there is no planet which can be studied under such favorable circumstances as Mars; for, though Venus in inferior conjunction is nearer to us than Mars in opposition, yet Venus then turns her darkened hemisphere towards the earth. Accordingly, ever since the invention of the telescope Mars has been a favorite object of observation. So far back as 1643, Fontana of Naples detected spots on the surface of Mars, and suspected the planet's rotation. Cassini's more trustworthy observations were commenced in 1666 in Bologna. In about a month he had satisfied himself that the planet rotates on its axis once in 24*h*. 40*m*. Astronomers at Rome, however, assigned a rotation-period of only 13*h*., which Cassini explained by showing that they had mistaken two opposite faces of the planet (not greatly unlike) for one and the same aspect. Cassini again observed Mars in 1670, with results confirming those he had obtained earlier. Hooke in 1666, and Huyghens between 1656 and 1670, made drawings of Mars which are among the most trustworthy obtained in the seventeenth century. In 1704, Maraldi made several observations, and detected a change of shape in some of the spots, easily explained as due to changes in the condition of the planet's atmosphere. Maraldi assigned 24*h*. 39*m*. as the planet's rotation-period at this time, but his observations in 1719, when the planet was exceedingly well placed, resulted in a period of 24*h*. 40*m*. Sir W. Herschel, from a series of observations made between 1777 and 1785, deduced 24*h*. 39*m*. 25*s*. for the planet's rotation-period, but it appears that he had overlooked one complete rotation in a period of about two months, and when correction is made for this mistake the period is reduced about two minutes. Mädler, from observations extending over the years 1830–37, obtained the period 24*h*. 37*m*. 23.8*s*. Kaiser of the Leyden Observatory extended his researches over a much wider period, going back as far as the date of Huyghens' observations, and forward to the years 1864–65. His result gave 24*h*. 37*m*. 22.6*s*. Lastly, the present writer, going back to Hooke's observations and carrying the calculation forward to the year 1867, deduced 24*h*. 37*m*. 22.7*s*., exceeding Kaiser's value by one-tenth of a second. Kaiser re-examined his work (for the difference, small though it is, produces effects too large to be easily explained when multiplied by some 80,000 rotations made by Mars since the days of Hooke and Huyghens). He reasserted the accuracy of his result, and ascribed the difference between the two values to the probable inaccuracy of Hooke's drawing. But when the writer had examined Kaiser's elaborate calculations, he found that an error of two days had crept in, apparently from the years

1700 and 1800 being treated as leap-years. (The case was a singular illustration of the fact that large errors will often escape notice when attention is specially directed to the removal of all the minute causes of error.) Correction made for this mistake, the same rotation-period comes out from Kaiser's calculations as from the writer's—viz. 24*h.* 37*m.* 22.7*s.*, which may be regarded as certainly within a twentieth of a second of the true value.

Amongst the markings of Mars, a whiteness around the S. pole of the planet had been already noticed for sixty years when Maraldi first paid special attention to the peculiarity. He found that the outskirts of this white region were subject to notable variations, and even while his observations were in progress the fainter portion of the spot disappeared. At this time the northern polar regions had not been carefully examined, being, in fact, only brought favorably into view, as regards the position of the polar axis, when Mars is near his aphelion. But Sir W. Herschel, whose powerful telescope enabled him to disregard the planet's changes of opposition-distance, detected a similar whiteness around the northern pole of the planet. He was soon led to ascribe the peculiarity to the probable existence of ice and snow around the polar regions of Mars. "The analogy between Mars and the earth," he wrote, "is perhaps by far the greatest in the whole solar system. Their diurnal motion is nearly the same, the obliquity of their respective ecliptics not very different; of all the superior planets, the distance of Mars from the sun is by far the nearest alike to that of the earth; nor will the length of the Martial year appear very different from what we enjoy when compared to the surprising duration of the years of Jupiter, Saturn, and the Georgium Sidus. If we then find that the globe we inhabit has its polar region frozen and covered with mountains of ice and snow, that only partially melt when alternately exposed to the sun, I may well be permitted to surmise that the same causes may probably have the same effect on the globe of Mars; that the bright polar spots are owing to the vivid reflection of light from frozen regions; and that the reduction of these spots is to be ascribed to their being exposed to the sun."

It would follow from this that there is water upon the planet; and, indeed, the bluish tint of the darker spots confirms this opinion. But in Herschel's day no means existed for ascertaining the condition of the atmosphere of Mars. The spectroscope, however, has enabled the astronomers of our time to demonstrate what in Herschel's day was a mere surmise. It has been found that the atmosphere of the planet is at times heavily laden with aqueous vapor. We have in this an explanation also of a phenomenon noticed by the first observers of Mars—the whiteness of the planet near its edge. This seems very well accounted for when we remember that the edge of the illuminated disk of Mars is the region where either morning has just begun or evening is just approaching, for the morning and evening skies would naturally be vapor-laden. On the whole, it must be admitted that Mars presents features which we are accustomed to associate with the requirements of living beings, though it would be rash to assume that the planet is necessarily inhabited. R. A. PROCTOR.

Mars (ANNE FRANÇOISE HIPPOLYTE BOUTET-MONVEL), b. at Paris Feb. 5, 1779, a daughter of Jacques Monvel, acting at the Théâtre Français, and Mars-Boutet, acting at the theatre of Versailles; entered very early on the stage; made in 1800 a great impression by her representation of the deaf and dumb girl in *Abbé de l'Épée;* was soon acknowledged as the greatest actress ever seen in certain *rôles*, the so-called *grandes coquettes*, Agnès, Célimène, Elmire, etc.; achieved a perfect triumph by her impersonation of Gabrielle de Belle-Isle, a girl of twenty, herself being sixty; retired from the stage in 1841, honored, admired, and rich, and d. Mar. 20, 1847. Her greatest charm was her voice, soft, melodious, and capable of expressing the most complex states of the mind and the most delicate movements of the soul with striking clearness and wonderful grace.

Marsa'la [Arab. *Marsa Alla*, "the port of God"], a maritime town of Sicily, in the province of Trapani, about 19 miles S. S. W. of the port of Trapani, in lat. 27° 47′ N., lon. 30° 05′ E. The back country is fertile, the town itself well built and well fortified, and the public edifices contain many objects of historic and artistic interest. Marsala occupies nearly the site of the old Carthaginian *Lilybæum*, and the archæologist cannot fail to be attracted by the curiously painted sepulchres cut in the solid rock, the ancient Grotto of the Sibyl with its prophetic well, the rare old mosaics, etc., which may be seen outside the western gate. Its splendid harbor was destroyed in the latter part of the sixteenth century in order to prevent it from being occupied by Turkish pirates. The city consequently lost its commercial importance. In the beginning, however, the port was reconstructed, and the city is now rapidly progressing. Its trade consists in grain, oil, salt, etc., but chiefly in marsala wine, which much resembles sherry, and is a favorite wine in England. Of the 30,000 pipes produced annually, about three-fourths are exported. The number of vessels, coasting and others, which enter this port yearly exceeds 1200. Marsala has recently acquired historic interest as the point where Garibaldi, eluding the vigilance of the Neapolitan fleet, landed with his heroic *thousand*, and began the romantic campaign which so ignominiously terminated the kingdom of the Two Sicilies. Pop. 17,666.

Marsch'ner (HEINRICH), b. Aug. 16, 1796, at Zittau in Saxony; studied law for some time at the University of Leipsic, but devoted himself exclusively to music after 1817, when he composed his first opera; became in 1823 musical director of the opera at Dresden; went in 1831 to Hanover as chapel-master to the king, and d. there Dec. 14, 1861. Of his numerous compositions, the two operas *The Vampyre* (1828) and *Hans Heiling* (1833) were received with much applause, and are still often performed in Germany. His music to Mosenthal's drama, *The Goldsmith of Ulm*, is perhaps his most original and impressive composition.

Marscia'no, town of Italy, in the province of Perugia, about 18 miles from the town of Perugia. It is a walled town, tolerably well built; it was founded in the tenth century, and was for the most part a possession of Perugia during the Middle Ages. Pop. 10,600.

Mars'den (SAMUEL), b. in England in 1764, of humble parentage; was educated at the free grammar school at Hull; was at first a tradesman at Leeds and a member of the Wesleyan Methodist Church, but after some years joined the Church of England, prepared for the ministry at St. Joseph's College, Cambridge, and in 1794 went as chaplain to the recently established penal colony at Paramatta, near Sydney, Australia, where he established a model farm and trained the convicts to habits of industry. In 1809 he returned to England to submit projects for the benefit of the convicts to the English government, and also to solicit aid in founding a mission to the Maoris of New Zealand, but failed to secure help from the Church Missionary Society or the services of any clergyman. Three laymen, William Hall, John King, and Thomas Kendall, volunteered for the work. Marsden purchased a small vessel, the Active, at his own expense, and went to New Zealand, where he was well received by the natives, and commenced operations by teaching them the arts of civilization. Marsden continued to reside in Australia, but visited New Zealand at intervals, procuring reinforcements both of the Anglican and the Wesleyan Church for the mission, which made rapid progress, persuaded the natives to adopt a fixed form of government, provided for the preparation of a grammar and dictionary of the Maori language, and lived to see the islanders generally Christianized, and himself to be regarded as the "apostle of New Zealand," to which island he made seven voyages. D. in Australia, May 12, 1838.

Marsden (WILLIAM), D. C. L., b. at Dublin, Ireland, Nov. 16, 1754; entered in 1771 the civil service of the East India Company at Bencoolen, Sumatra; rose to the post of principal secretary to the colonial government; became deeply versed in the Malay language and literature; returned to England in 1779; published a *History of Sumatra* (1782), a *Grammar and Dictionary of the Malay Language* (1812), a translation of *Marco Polo* (1817), and *Numismata Orientalia* (1823–25). In 1795 he became chief secretary to the admiralty; resigned in 1807 on a handsome pension; donated in 1834 his fine collection of coins and medals to the British Museum, and his Oriental library to King's College, London. D. near London Oct. 6, 1836.

Marseilles' [anc. *Massilia*], the principal seaport of France and the capital of the department of Bouches-du-Rhône, is on the north-eastern shore of the Gulf of Lyons, in lat. 43° 18′ N., lon. 5° 22′ E. The old part of the city consists mostly of narrow, crooked, and even dirty streets, with a few spacious squares, and is separated from the new part, with its broad, straight streets and magnificent quays along the harbors, by an elegant avenue running from the Porte d'Aix, a fine triumphal arch at the northern entrance of the city, to the Porte de Rome, which to the S. leads into the Prado, the principal promenade. The most elegant part of the new city is the Cannebière, a street running from the above-mentioned avenue to the old harbor, and containing, besides several public buildings, the most prominent hotels and the most brilliant shops. But the liveliest and most characteristic part of Marseilles is the quays, thronged with people from Algeria, Egypt, Syria, and all parts of Europe. Of the public buildings, none has any great architectural merit; the most remarkable are the cathedral, situated in the old town, on the site of an ancient temple of Diana, and the town-house, the bourse, and the mint in the new town. But the whole city presents a picturesque aspect, rising amphitheatrically around the bay, and surrounded with hills covered with olive-groves, vineyards, and elegant villas. The educational and benevolent institutions are numerous and good. There are a library of 75,000 volumes, several active scientific societies, a hydrographic institution, a botanical garden, an observatory, a lyceum, an excellent medical school, several free industrial and commercial schools, an academy of Oriental languages, etc. The manufacturing industry is very flourishing, especially of soap, leather, glass, porcelain, liqueurs, etc. But its principal importance the city derives from its commerce, extending to all ports of the Mediterranean Sea. The old harbor comprises a basin 1000 yards long, 330 yards broad, from 18 to 24 feet deep, covering an area of 70 acres, and capable of accommodating about 1200 merchant vessels; it is defended by Fort St. Nicolas and Fort St. Jean. The new harbor, La Jolliette, formed by a breakwater 1300 yards long, was opened in 1855. Still more recently the basin called Dieu-Donné, admitting the largest men-of-war, was formed between the islands of Ratonneau and Pomègue, both fortified. Four lighthouses show the way into the harbors. About 5000 French vessels, of 1,300,000 tons burden, annually enter the port, and about 3700 foreign, of 908,000 tons. The average value of the imports, consisting of cotton, sugar, precious metals, timber, cork, etc., is estimated at 964,000,000 francs, and that of the exports, consisting of wine, salt, manufactured goods, etc., at 732,000,000 francs.

Marseilles was founded in the sixth century B. C. by Phocæans from Asia Minor. In the fourth century B. C. it sent its traders into the Baltic (see PYTHEAS) and had founded a number of ports on the Mediterranean Sea. In 49 B. C. it was conquered by Cæsar and united to the Roman republic; Cicero calls it at this time the Athens of Gaul. In the ninth century of our era it belonged to Burgundy, in the thirteenth to Provence; in 1481 it was united to France. During the Revolution it suffered frightfully from Fréron's atrocities, but it rose rapidly after the Restoration, and the conquest by the French of Algeria gave its commerce a powerful impulse. Pop. 360,099.

Marseilles', La Salle co., Ill. (see map of Illinois, ref. 3-E, for location of county), 77 miles S. W. of Chicago, on the N. bank of Illinois River, and upon Chicago Rock Island and Pacific R. R., has a fine water-power, several grain-elevators, paper and grist mills, agricultural, plough, and other factories. Pop. in 1870, 758; in 1880, 1882.

Marseillaise', the grand anthem of the French Revolution, composed, both words and music, in 1792, in a single night, by Rouget de Lisle, an officer of artillery at Strasbourg. It was called the war-song of the army of the Rhine. The name *Marseillaise* was given it at Paris from the incorrect report that it had originated at Marseilles.

Marsh (ANNE **Caldwell**), b. at Lindley Wood, Staffordshire, England, about 1798; married in 1820 Mr. Arthur C. Marsh, a London banker (d. 1849), and began in 1834 the publication of a long series of novels, some of which acquired considerable popularity, and were republished in the U. S. The best known is *Emilia Wyndham* (1846). In 1858, on the death of a brother, she succeeded to his estate, and assumed the name of MARSH-CALDWELL of Lindley Wood. The wives of William Roscoe and of Sir Henry Holland were her sisters. D. at Lindley Wood Oct., 1874.

Marsh (CHARLES), LL.D., b. at Lebanon, Conn., July 10, 1765; graduated at Dartmouth 1786; commenced the practice of law at Woodstock, Vt., 1788; was U. S. district attorney for Vermont during Washington's presidency; member of Congress 1815–17; was one of the founders of the American Colonization Society, and a liberal benefactor of the missionary and Bible societies. D. at Woodstock, Vt., Jan. 11, 1849.

Marsh (GEORGE PERKINS), LL.D., b. at Woodstock, Vt., Mar. 15, 1801; graduated at Dartmouth College in 1820; studied law at Burlington, Vt., and practised at the bar; was elected in 1835 a member of the supreme executive council of the State; studied comparative philology, and printed privately a translation of Rask's *Icelandic Grammar* (1838); was a member of Congress from 1842 to 1849, when he was appointed minister resident at Constantinople; went on a special mission to Greece in 1852; travelled extensively in Europe; returned to the U. S. in 1854; published in 1856 *The Camel, his Organization, Habits, and Uses, considered with Reference to his Introduction into the U. S.;* served as railroad commissioner in Vermont 1857–59; delivered in 1859 a course of thirty *Lectures on the English Language* (published 1861) at Columbia College, N. Y., and in the winter of 1860–61 a second course on the same subject before the Lowell Institute at Boston, *The Origin and History of the English Language* (published in 1862); published in 1861 a largely annotated edition of the first volume of Wedgwood's *Etymology.* He also wrote *Man and Nature* (1864), which was reissued with important additions in 1874, with the title *The Earth as Modified by Human Action.* Mr. Marsh was appointed in 1861 minister to Italy, a post he retained till his death, July 24, 1882. A revised edition of his complete works was published in 1885.—His second wife, CAROLINE CRANE, b. at Berkeley, Mass., Dec. 1, 1816, published in 1857 *The Hallig, or the Sheepfold in the Waters*, translated from the German of Biernatzki, with a biographical sketch of the author, and in 1860 a volume entitled *Wolfe of the Knoll, and Other Poems.*

Marsh (HERBERT), D. D., b. in London, England, in 1756; educated at St. John's College, Cambridge; studied theology at the universities of Göttingen and Leipsic; published a number of pamphlets in German in defence of the war-policy of England, which obtained him a pension from Pitt; returned to Cambridge in 1792, and published a translation of Michaelis' *Introduction to the New Testament* (4 vols., 1792–1801), accompanied by an extended commentary —a work which first made known in England the results of the biblical researches of the founders of the modern school of German criticism, and which accordingly excited discussion and provoked opposition from conservative English theologians. In 1807, Marsh became Lady Margaret professor of divinity at Cambridge, and published an extended *Course of Lectures on the Criticism and Interpretation of the Bible* (7 parts, 1809–23), consisting chiefly of a popularization of the views of German scholars. In 1812 he published a *History of the Translations of the Scriptures;* in 1813 *Horæ Pelasgicæ;* became bishop of Llandaff 1816, of Peterborough 1819; wrote numerous minor treatises on theology, politics, and classical topics. D. at Peterborough May 1, 1839. Bishop Marsh was the most learned and acute English theologian of his time, and excelled in polemics, chiefly against Calvinistic views and the Church of Rome.

Marsh (JAMES), M. D., b. in England in 1789; studied medicine, and practised for many years as a physician at Dublin; was the discoverer of a method of detecting arsenic in a liquid by means of an apparatus called by his name. (See ARSENIOUS OXIDE.) The method was described by him in the *Edinburgh Philosophical Journal* for Oct., 1836, and has come into general use in Europe in cases of suspected poisoning. Dr. Marsh d. at Woolwich June 21, 1846.

Marsh (JAMES), D. D., b. at Hartford, Vt., July 19, 1794; graduated at Dartmouth in 1817; was a tutor there 1818–20; graduated at Andover Seminary 1822; was ordained to the Congregational ministry in 1824; professor of languages in Hampden-Sidney College, Va., 1824–26; was president of the University of Vermont 1826–33; professor of moral and intellectual philosophy 1833–42. D. at Colchester, Vt., July 3, 1842. Dr. Marsh was author of many able reviews and contributions to periodical literature, chiefly philosophical and theological. He also made some translations from the German. He was the father of what may be called American Coleridgeism. (See his *Remains*, with memoir, by Dr. Joseph Torrey, 1843.)

Marsh (JOHN), D. D., b. at Wethersfield, Conn., Apr. 2, 1788; graduated at Yale in 1804; was 1818–33 pastor of the First Congregational church in Haddam, Conn., and afterwards devoted himself to the temperance cause, which he effectively served as a writer and public speaker. He was (1836–66) editor of a temperance journal in New York. Among his works is *Temperance Recollections* (1866). D. at Brooklyn, N. Y., Aug. 4, 1868.

Marsh (OTHNIEL CHARLES), F. G. S., b. at Lockport, N. Y., Oct. 29, 1831; prepared for college at Phillips Academy, Andover, Mass.; graduated at Yale College 1860, and at Yale Scientific School 1862; prosecuted scientific studies at the universities of Berlin, Heidelberg, and Breslau 1862–65, and was appointed professor of palæontology in Yale College 1866. He has written largely upon that science in the *American Journal of Science* and elsewhere. For the last few years he has been investigating the extinct animals of the Rocky Mountain region in North America, discovering more than 200 fossil animals before unknown, most of which he has described. He was elected president of National Academy of Sciences in 1883.

Mar'shal [Old High Ger. *Marah-scalc*, "horse-servant"], originally the person who had charge of the king's horses. When chivalry became the only important secular pursuit, and nearly all offices about the royal courts were filled by noblemen, the marshal's position became one of great importance, and finally in England there was appointed an earl-marshal, who at present has only a ceremonial dignity except as the head of the College of Heralds. The office is hereditary with the dukes of Norfolk. In Scotland there was an hereditary earl-marischal of the Keith family, but the office is now in abeyance. There are also knight-marshals. The highest military title in most European armies is marshal (field-marshal, *maréchal de camp, Feld-marschall, Feldzeugmeister*). This title is of direct descent from feudal times, when the marshal was the king's esquire and commanded the advance-guard. The gradual increase of his authority in the army after a time led to the creation of a distinct military office of this name. In the U. S. a marshal is an officer of the U. S. courts, whose duties correspond to those of the sheriff of the State governments. There is one U. S. marshal in each judicial district.

Marshall, cap. of Searcy co., Ark. (see map of Arkansas, ref. 2–C, for location of county), 60 miles W. N. W. of Batesville. Pop. in 1880, 160.

Marshall, R. R. junction, cap. of Clark co., Ill. (see map of Illinois, ref. 7–G, for location of county), has good schools, several flouring-mills, and a woollen mill. Pop. in 1880, 1885.

Marshall, city, cap. of Calhoun co., Mich. (see map of Michigan, ref. 8–I, for location of county), on the Michigan Central R. R., has an excellent system of graded schools. Pop. of city in 1870, 4925; in 1880, 3795; in 1884, 4081.

Marshall, cap. of Lyon co., Minn. (see map of Minnesota, ref. 10–B, for location of county), on the Chicago and North-western R. R., has a flouring-mill. Pop. in 1880, 961; in 1885, 954.

Marshall, on R. R., cap. of Saline co., Mo. (see map of Missouri, ref. 3–F, for location of county), 85 miles N. W. of Jefferson City and 16 miles W. of the Missouri River, has abundance of stone-coal, and is surrounded by a fine agricultural region. Pop. in 1880, 2701.

Marshall, on R. R., cap. of Madison co., N. C. (see map of North Carolina, ref. 2–C, for location of county), near the French Broad River. Pop. in 1880, 175.

Marshall, R. R. centre, cap. of Harrison co., Tex. (see map of Texas, ref. 2–K, for location of county), on the Texas and Pacific R. R., has two institutes, county fair association and grounds, and several mills. Pop. in 1870, 1920; in 1880, 5624.

Marshall (HUMPHREY), a relative of Chief-Justice Marshall, emigrated to Kentucky in 1780; was a prominent man in State affairs; U. S. Senator 1795–1801, and published a *History of Kentucky* (1 vol., 1812; 2 vols., 1824). D. at Lexington, Ky., July 1, 1841.

Marshall (HUMPHREY), b. Jan. 13, 1812, in Frankfort co., Ky., grandson of Humphrey Marshall, author of the first published history of Kentucky, and son of Judge John J. Marshall; graduated from the U. S. Military Academy in 1832, and entered the army as brevet third lieutenant of mounted rangers; transferred to the 1st Dragoons as brevet second lieutenant in the following year, and resigned from the army Apr. 30, 1833; studied law, and was admitted to the bar, practising his profession first at Frankfort till 1834, then at Louisville till the outbreak of the war with Mexico, when he led the 1st Kentucky Cavalry to the seat of war as its colonel, and was engaged at the battle of Buena Vista. On the disbandment of his regiment he returned to his native State and settled on a farm in Henry co. In 1849 he was chosen Representative to Congress, and re-elected in 1851; in 1852, Pres. Fillmore appointed him commissioner of the U. S. to the empire of China, which was at once raised to a first-class mission; recalled in 1853, and practised law in Washington; elected to Congress from Kentucky in 1855, and re-elected in 1857. Although opposed to secession, he espoused the Confederate cause in Sept., 1861, and was appointed brigadier-general; resigned his commission shortly after, and was elected to the Confederate Congress; practised law in Richmond, Va., for a time, subsequently returning to Louisville, Ky., where he enjoyed an extended and lucrative practice. D. at Louisville, Ky., Mar. 28, 1872. G. C. SIMMONS.

Marshall (JOHN), LL.D., b. at Germantown, Fauquier co., Va., Sept. 24, 1755, the eldest of the fifteen children of Col. Thomas Marshall, a small planter, who served with the greatest honor as an officer of the Revolution. The son, whose early education was imperfect, was himself an officer in active service from 1775 to 1779, distinguishing himself alike in the field and in courts-martial, where he often acted as judge-advocate. In 1779, while on detached service in Virginia, he attended Mr. Wythe's law-lectures at William and Mary College, and was licensed to practise. In 1781 he resigned his commission and entered upon the practice of law. In 1783 he married and returned to Richmond; distinguished himself in the Virginia convention for ratifying the U. S. Constitution and in the State legislature; declined the U. S. attorney-generalship, a seat on the bench of the Supreme Court, and other important positions; went in 1798 as envoy to France; entered Congress in 1799, where he was one of the ablest Federalists in the House; was appointed in 1800 secretary of war, and soon after secretary of state; and in 1801, having been nominated chief-justice of the U. S. by President Adams, was confirmed by the Senate without a dissenting vote. Mr. Marshall held this office for many years with the greatest honor and benefit to his country. The influence of his legal decisions was great and permanent, and his fame as a solid reasoner, a just judge, and a profound jurist is world-wide. In constitutional, commercial, and prize law his decisions are of paramount importance. His *Life of Washington* (5 vols., 1805; abridged and improved, 1 vol., 1832) and his *History of the Colonies* are more valuable to the historian than to the general reader. Chief-Justice Marshall was a man greater in wisdom than in learning, a sincere Christian and a true philanthropist. He was tall, ungraceful, and even awkward in manner, but most genial and kindly in private life. D. at Philadelphia July 6, 1835.

Marshall (JOHN JAMES), b. in Woodford co., Ky., Aug. 4, 1785; graduated at Princeton in 1806; was for many years an able lawyer and active politician of Kentucky; was 1836–46 a judge of the State circuit court, and published 7 vols. of law reports. In the financial crash of 1837 he lost his property through the generous support he gave to his friends. D. at Louisville June, 1846.

Marshall (NELLIE), daughter of Gen. Humphrey Marshall, b. in Kentucky in 1847; began to write for the press in 1863; is author of *Gleanings from Fireside Fancies* (1866) and *As by Fire*, a novel of merit and power (1869).

Marshall (THOMAS ALEXANDER), LL.D., son of Humphrey Marshall the historian, b. in Woodford co., Ky., Jan. 15, 1794; graduated at Yale in 1815; began law-practice in Frankfort in 1817; removed to Paris, Ky., in 1819; was a member of Congress 1831–35; a judge in the court of appeals 1835–56; professor of law in Transylvania University 1836–49; and chief-justice of the court of appeals 1866. D. at Louisville, Ky., Apr. 17, 1871.

Marshall (THOMAS FRANCIS), b. in Frankfort, Ky., June 7, 1801, was a nephew of Chief-Justice Marshall. He began law-practice when young; removed in 1831 to Louisville; became a prominent political orator and a judge of the State circuit court; was a member of Congress 1841–43, and won distinction by his brilliant talents. D. near Versailles, Woodford co., Ky., Sept. 22, 1864. A collection of his writings and speeches has been edited by W. L. Barre (Cincinnati, 1858).

Marshall (WILLIAM CALDER), R. A., b. at Edinburgh, Scotland, in 1813; studied sculpture in London under Chantrey and Bailey; visited Rome in 1836; took up his permanent residence in London in 1839, and devoted himself chiefly to the poetic or ideal element in sculpture, in which branch he achieved success, his most notable works being *The Broken Pitcher, Rebecca, The First Whisper of Love, The Dancing-Girl Reposing*, and *Sabrina*. Marshall was one of the three sculptors employed for the decoration of the new houses of Parliament, for which he executed statues of Lord Clarendon and Lord Somers. He designed the statue of Sir Robert Peel at Manchester, that of Jenner now in Kensington Gardens, that of Campbell in Westminster Abbey, that of Sir George Grey at Cape Town, and those of Crompton and of James, seventh earl of Derby, at Bolton, the national monument to the duke of Wellington, and is now (1875) executing in marble a series of bassi-relievi for the Wellington chapel in St. Paul's cathedral.

Marshall (WILLIAM R.). See APPENDIX.

Mar'shalltown, city and R. R. centre, cap. of Marshall co., Ia. (see map of Iowa, ref. 4–H, for location of county), in the centre of a fine agricultural region, has a public library, a furniture and a soap factory, an oil-mill, a foundry, flouring-mills, breweries, and grain-elevators. Pop. in 1870, 3218; in 1880, 6240; in 1885, 8298.

Mar'shalsea Prison in Southwark, London, was built in the twelfth century, and placed under the control of the king's marshal of the household. It was opened by the Gordon rioters in 1780. It was long a king's bench prison, but finally, like the Fleet, became a poor debtors' prison. It was abolished, with the ancient Marshalsea and Palace courts, in 1849, and has since been pulled down.

Marshfield, cap. of Webster co., Mo. (see map of Missouri, ref. 7–F, for location of county), on the St. Louis and San Francisco R. R., 218 miles from St. Louis. Pop. in 1870, 809; in 1880, 655.

Marsh-Gas [Ger. *Sumpfgas, Grubengas;* Fr. *gaz de marais*], *light carburetted hydrogen, methane, formene* (Berthelot), *hydruret of methyle, fire-damp.* Chemical composition, CH_4. That compound of carbon and hydrogen, or hydrocarbon, which contains what is believed to be the maximum proportion of hydrogen possible, called by Berthelot a "saturated hydrocarbon." It is a highly important gas in nature, being one of the principal and invariable products of the decomposition of organic matter in the absence of air in excess, at ordinary temperatures, as well as at the high temperatures of the gas-retort, coal-gas containing 40 to 45 per cent. or more of it. Volta seems to have been the first chemist who examined the gas from stagnant water and marshes; Priestley was among its earliest subsequent investigators. Locally, marsh-gas must occur as a constant constituent of the atmosphere—namely, in districts where it is constantly emitted from the earth in enormous volume, which is the case in a great number of countries. As it has not been detected, however, as a normal constituent of the air, it is no doubt duly destroyed therein by oxidation. It is found in a number of ancient geological strata in a highly compressed form, exuding constantly from fissures in their outcrops, or far more copiously when holes are bored into these rocks where they lie at a depth below the surface. Such are gas-wells, which are to play an important and valuable part in the future of some large sections of the U. S., and possibly of other countries on the earth. (See *Gas-Wells* under the head of GAS-LIGHTING, by PROF. CHANDLER.) A view of the mode of production of marsh-gas in these formations, offered in 1871 by the present writer, is as follows: Marsh-gas, being that hydrocarbon which contains the most hydrogen and the least carbon, is the natural and necessary residuum of the abstraction of the carbon from organic matter by some oxidizing agency at low temperatures in the presence of water. The rocks which furnish the gas of the gas-wells were the highly organic mud of ancient shallow seas or lagoons. They always contain iron sulphide and carbonate. The carbonic acid formed, by reason of its solubility in water has been partly removed, though the marsh-gas of the wells is usually found still to retain more or less of carbonic acid. This acid remains in the rocks in part also, no doubt, in the forms of carbonates of iron, lime, and magnesia. HENRY WURTZ.

Marsh'-Hawk, or **Harrier,** of the U. S., the *Circus Hudsonius*, a large and rapacious bird found in all parts of North America. The marsh-hawk of Europe and Africa is *Circus rufus*.

Marsh'-Hen, a name applied to the clapper rail, called also salt-water marsh-hen (*Rallus crepitans*), and to the *Rallus elegans* (fresh-water marsh-hen, king-rail), game-birds of the U. S., rarely seen except by sportsmen and naturalists. (See RAIL.)

Marsh'mallow, the *Althæa officinalis*, an herb of the mallow family, a native of the Old World, but naturalized in the U. S., principally in salt-marshes. The plant is remarkably mucilaginous, and is used chiefly in domestic practice as a demulcent in coughs and diseases of the bowels and kidneys. It appears to have mild diuretic virtues. It is in some countries used as a potherb.

Marsh'man (JOHN CLARK), son of Joshua, b. at Serampore, India, about 1810; was educated by his father, and spent his life until 1856 in the civil service of the East India Company in Bengal. He wrote a valuable *History of India* (1867), *The Life and Times of Carey, Marshman, and Ward, embracing the History of the Serampore Mission* (1859), and a *Life of Sir Henry Havelock* (1860). Gen. Havelock married a sister of Mr. Marshman.

Marshman (JOSHUA), D. D., b. at Westbury-Leigh, Wiltshire, England, in 1767; went to India in 1799 as a Baptist missionary; resided chiefly at Serampore; gained a competent knowledge of Bengalee, Sanskrit, and Chinese; prepared Chinese translations of Genesis, the four Gospels, and the Epistles to the Romans and the Corinthians; published a *Dissertation on the Characters and Sounds of the Chinese Language* (1809), *The Works of Confucius, containing the Original Text, with a Translation* (1811), *Clavis Sinica, Elements of Chinese Grammar* (1814), and a *Defence of the Deity and Atonement of Jesus Christ* (1822), in reply to Rammohun Roy. He aided Dr. Carey in the preparation of his *Sanskrit Grammar* and *Bengalee and English Dictionary*. D. at Serampore Dec. 5, 1837.

Marsh-Marigold. See CALTHA.

Marsh'-Rosemary, or **Sea-Lavender,** the *Statice Limonium*, a salt-marsh plant, common along the Atlantic shores of the U. S., Canada, and Europe. There are many varieties, by some botanists regarded as one species. Its root abounds in tannic acid, of which it contains nearly 12.5 per cent. It is used in medicine, especially as a remedy for sore mouth and sore throat, and is best prepared by infusion.

Marsh's Test, a test for arsenic, especially applicable in cases of supposed poisoning. It has been described by Prof. Chandler under the head of ARSENIOUS OXIDE (which see).

Mar'si, an ancient and warlike Italian people, early allies of the Romans, but fought against them with the greatest valor in the Social war. They dwelt in an inland and mountainous district around the basin of the Fucine Lake, and were famous for their skill as magicians and diviners. Their chief city was Marruvium.

Mar'siconuo'vo, town of Southern Italy, in the province of Potenza, about 22 miles S. W. of the town of Potenza. It stands on a hill, and is subject to furious winds. Pop. in 1874, 8611.

Marsipobran'chia [Gr. *μάρσιπος*, "purse," and *βράγχια*, "gill"], a class of vertebrates generally confounded with the fishes, but distinguished by many remarkable peculiarities. The skeleton is of a very inferior type, the notochord or embryonal vertebral column being persistent. The skull is in a most rudimentary condition, and represented by a small brain-case and capsules for the organs of sense (auditory and olfactory), as well as by an ethmovomerine plate; the inferior appendages are developed as elements designated as (1) the subocular arch, with a metapterygoid or "superior quadrate," and an "inferior quadrate" portion; (2) a "palato-pterygoid" element; and (3) a "stylohyal process;" labial cartilages form also a prominent feature of the skull; bones or cartilages representing the upper as well as lower jaws are entirely wanting; the branchial apparatus is sustained by a basket-like skeleton; no limbs are developed, and consequently no scapular arch or pelvic girdle. The brain, though small, is distinctly developed, and differentiated into the brain proper and medulla oblongata; the former is composed, as in the higher forms, of the "mesencephalon," "thalamencephalon," "prosencephalon," and "rhinencephalon;" the latter is small, with a fourth ventricle conspicuous from above; and the "cerebellum" very rudimentary. The auditory apparatus is quite simple, being represented by a single membranous tube without any differentiation into canals and vestibules, as in the Hyperotreta, or, at most, as in the Hyperoartii, with two semicircular canals and a sacculated vestibule. The olfactory apparatus consists of a median sac, which is provided with but a single external aperture. The heart is distinctly developed, and is divided into an auricle and ventricle, the former having in front a venous sinus; and the whole is enclosed in a "pericardium," which connects with the peritoneal cavity. The intestinal canal is simple, the liver specialized as such, and the kidneys well developed, and with ureters opening behind into the rectum. The organs of generation have no ducts, but discharge into the abdomen, from which they depart by an abdominal pore.

The class thus distinguished is represented by very few species, but these exhibit two radically distinct types of structure, and have been differentiated into two orders—(1) Hyperoartii, in which the tube terminates in a blind sac at its posterior end; and (2) Hyperotreti, in which the narial canal perforates the pharyngeal roof and connects with the pharynx. These two orders differ very decidedly from each other in the skeleton, armature of the mouth, ovulation, etc. (Further details will be found under the respective titles.)

A remarkable metamorphosis is undergone by the representatives of the order Hyperoartii (*i. e.* the Petromyzontids or lampreys), but the transformations of the Hyperotreti (*i. e.* Myxinæ or hags) are unknown; and this is a gap most desirable to be filled, as no general characters can be specified respecting the embryology of the class until these are made known. It has been suggested that the remarkable *Branchiostoma* or *Amphioxus* represents the immature condition of Myxinæ, but this idea is evidently erroneous.

The species of the class are found both in fresh and salt waters, the Petromyzontids having members in the fresh and salt waters of all temperate and sub-temperate countries; while the Myxinoids are represented in the cold waters of the northern hemisphere by Myxinæ, as well as along the shores of a considerable portion of the Pacific—*e. g.* in the Japanese and Chinese seas, California, Chili, and Australia.

Although no representatives of the class have been found in a fossil condition, their absence in the older strata is undoubtedly due rather to the difficulty connected with the preservation of the readily destructible cartilaginous skeleton than to their actual absence. It is indeed probable that the order was extensively represented in past times, and that it was more abundantly developed than any other type. THEO. GILL.

Mars la Tour, a v. on the road from Metz to Verdun, 10 miles to the W. of Metz, is noted for the battle which took place here Aug. 16, 1870, and which is often called after this place, though generally after Vionville, a village situated farther to the E., and nearer the centre of the battle. AUGUST NIEMANN.

Mars′ton (Gilman), b. in Orford, N. H., in 1811; graduated at Dartmouth College in 1837, and at the Law School, Cambridge, Mass., in 1840; settled in 1841 at Exeter, N. H.; was a member of Congress 1859–63 and 1865–67; served with distinction through the war of 1861–65, at first as colonel of the 2d New Hampshire, and afterwards as a brigadier-general of volunteers.

Marston (John), b. in England about 1570; was educated at Corpus Christi College, Oxford; became lecturer at the Middle Temple, London, in 1593, and was author of eight dramas and two volumes of poems which were edited by J. O. Halliwell (1856, 3 vols.). Very little is known of the life of Marston. He aided Ben Jonson and George Chapman in writing the comedy of *Eastward Ho!* (1605), which caused the imprisonment of the three writers on account of its satires upon the Scotch. The best of his dramas is *The Malcontent* (1604), a tragi-comedy, originally written by John Webster, but recast by Marston and dedicated to Ben Jonson. D. about 1634.

Marston (Westland), LL.D., b. at Boston, Lincolnshire, England, Jan. 30, 1820; studied law in London, but devoted himself to literature as a profession, and has produced a large number of popular plays, tragedies, and comedies, besides occasional poems and tales.

Marston Moor, an open plain, 8 miles from York, England, memorable as the scene of the victory gained (July 2, 1644) by the allied Parliamentary and Scotch armies, commanded respectively by Lord Fairfax and the earl of Leven, over the royal forces under Prince Rupert. York was then held by the royalists, and had been besieged by Fairfax. When Prince Rupert advanced to its relief, Fairfax drew off to Marston Moor. Each army consisted of about 25,000 men. The battle commenced by a cannonade on both sides with little effect. Rupert charged with his cavalry towards evening, and dispersed the left wing of the Parliamentary forces, the commanders of which fled, but the fortunes of the day were retrieved by Leslie's Scotch regiments and Cromwell's brigade of "Ironsides," who captured the enemy's artillery, taking 1500 prisoners and 100 colors. The losses on each side were about 2000. The result was the surrender of York to Lord Fairfax a few days later, which rendered the Parliamentary cause triumphant throughout the N. of England.

Mar′strand (Wilhelm), b. at Copenhagen Dec. 24, 1810; studied in his native city, at Munich, and at Rome; became professor in 1848 at the Academy of Copenhagen, and d. there Mar. 25, 1873. His masterpieces are his historical paintings in the chapel of Christian IV. in the cathedral of Roeskilde, but he became most widely known as a genre painter. His pictures treating subjects of the comedies of Holberg show a very remarkable power of characterization and a dry, massive humor truly Danish.

Marsupia′lia [Lat. *marsupium*, a "pouch"], the only generally recognized order of the mammalian sub-class Didelphia, and comprising the opossums, kangaroos, wombats, and related types. The characters which differentiate the group as a sub-class will be found in the article Mammals, and the common ordinal characters will alone be given here. The skull is of a low type, and the nasal chamber much larger than the cerebral. The degree of difference, however, depends on the size of the animal and other considerations. The bones retain their distinctness for a considerable period, and sometimes throughout life, the basi-occipital, exo-occipital, and supra-occipital elements being long or permanently separated from each other, as are also the periotic, squamosal, and tympanic elements of the temporal bone. The pituitary fossa and clinoid processes are obsolete or wanting; distinct paroccipital processes are almost always developed; the basisphenoid is perforated by an internal periotic artery; the alisphenoids are dilated, and form the anterior wall of the tympanic cavity; the pterygoids are small and lamelliform; the bony palate has generally two or more vacuities (sometimes confounded in one) near its posterior margin; the mesethmoid is extensively ossified, and its anterior termination is abrupt and nearly vertical; the nasal bones are large; the ascending process of the premaxillaries more or less remote from the frontals; the zygoma complete: the orbit without a posterior process; "the periotic sends backward a distinct mastoid, which appears as a narrow strip of bone of considerable vertical extent between the squamosal and occipital on the side of the occipital region of the skull;" the tympanic bones are always free; the lachrymal with its perforation upon, or external to, the anterior margin of the orbit; the malar large and extending far forward as well as backward; the mandible has always, except in Tarsipedidæ, an inverted margin to the angle, and its condyles are more or less transverse; the hyoid apparatus is quite peculiar, the basihyal being rhomboidal, the ceratohyals very broad, and near or quite in contact anteriorly, and the rest of the anterior cornua cartilaginous, while the thyrohyals are stout and compressed. There are always nineteen thoracico-lumbar vertebræ, and almost always thirteen pairs of ribs (rarely, as in Phascolarctos, eleven, or, as in *Phascolomys vombatus*, fifteen). The scapula has a long acromion and a small coracoid; in all, save Peramelidæ, clavicles are developed. The fore limbs have both radius and ulna well developed and distinct, allowing of rotation; the carpal bones seven or (by the suppression of the lunar) six; five digits are developed in all except *Chœropus*. The pelvis has, in all except *Thylacinus*, two long bones ("marsupial") articulated with the anterior margin of the pubis, resulting from the ossification of the inner tendons of the external oblique muscles. The hind limb has the bones of the second segment always well developed and distinct, and sometimes capable of rotation: the carpus has always seven bones, and the astragalus is comparatively small; the first or inner toe is generally absent or thumb-like, the second and third often united, and the fourth usually much the largest.

The muscles of the hind limbs in most (the saltatorial types being excepted) present a peculiar modification in that the *flexor longus digitorum pedis* "is inserted fleshy into the fibula, and the knee and ankle joints are so modified as, through the action of the muscle so inserted, to admit of rotary movements of the hind foot."

The brain is lowly developed, and the cerebellum, as well as olfactory lobes, and often the optic lobes, are exposed above; the cerebrum is also peculiar, according to Flower, in (1) the arrangement of the folding of the inner wall of the cerebral hemisphere, a deep fissure, with a corresponding projection within, being continued forward from the hippocampal fissure along the whole of the inner wall (the *hippocampus major* extending thus into the body of the lateral ventricle, and constituting its inner wall); (2) the altered relation (consequent upon this disposition of the inner wall) and the very small development of the corpus callosum; and (3) the great increase in amount (and probably in function) of the anterior commissure.

The teeth are peculiar in that there is only one perfect set, none having deciduous predecessors except one on each side of each jaw, the hindmost (and indicated as such by its development) of the premolars; in other respects the teeth vary greatly; they frequently, however, are peculiar in the great number (5 × 2) of upper incisors, and in the number of true molars (4 × 2) in each jaw.

The heart is peculiar in the absence of a *fossa ovalis* and *annulus ovalis* in the right auricle; and in all it receives the two *venæ cavæ superiores* by two separate inlets.

The living marsupials are divisible into nine families, in addition to which there are several represented by forms no longer living. These nine families exhibit two quite distinct types of structure in the hind feet. In some, as in the opossums and thylacines, all the toes are free and unconnected with each other; in others, as kangaroos, wombats, etc., the second and third toes are much reduced in size, and closely connected together in a common integument, which leaves only the claws visible, and gives the impression of a single toe with two claws.

The chorisodactylous marsupials are represented by three very distinct families, two of which (Dasyuridæ and Myrmecobiidæ) are confined to Australia, and one (Didelphididæ) to America, one species advancing far up into the U. S.

The syndactylous marsupials exhibit in their dentition two very decided types. In one the incisors are permanently rooted, and in the lower jaw are either two large incisor teeth opposed to six in the upper, or six in the lower opposed to eight or ten in the upper. All these are inserted by roots. To this group belong the Phascolarctidæ, Phalangistidæ, Tarsipedidæ, and Macropidæ. In the other in both jaws the incisor teeth are like those of rodents, there being two in each jaw, continually reproduced, and growing in a subcircular direction. To this group belongs the single family Phascolomyidæ.

The marsupial pouch is developed in all the living representatives of the order except *Thilomys dorsigera* (the opossum of South America), which derives its name from carrying its young upon its back, with their tails swung around their mothers. This pouch is formed, according to William S. Barnard, "by the infolding of the skin. Its concavity opens on the median line of the abdomen, and extends backward and laterally, forming a kind of double bag, in the bottom of which the milk-glands open through long papillæ."

The genital organs, as to their superior modifications, have been noticed under Mammals; in this connection it may be added that the uteri form a nearly continuous track with the vaginal canals, and that those canals are generally connected at their proximal ends, and develop there a *cul de sac*, but sometimes, as in *Didelphis dorsigera*, etc., they are distinct, and debouch into the urogenital canal without any function. The young, instead of being nourished in the womb until it has attained a considerable size and a certain maturity of development, as in ordinary mammals, has no organic connection with the mother, but is born or expelled from the uterus in a very immature condition. The interval between the impregnation of the mother and birth of her young in the opossum is about twenty-four to twenty-eight days. The young one is extremely small, about half an inch long, and weighing only a few grains, even in the largest species; the organs are in a very undeveloped condition, and the animal is naked, blind, and perfectly helpless; its fore limbs are more developed than the hind ones. It seems to be, sometimes at least, dropped directly on the ground, according to the observations of E. S. Hill (1867), in the kangaroo, but it is possible that it is occasionally received by the mother with the mouth from the vagina; at any rate, the newly-born animal is taken by the mother with her lips and transferred to the pouch; the parent thrusts her head into this pouch, and the young instinctively grasps with the sharp claws of its fore feet and clings to the teat to which it is presented, and, the corners of the mouth growing around it, the animal remains clinging to the teat for several weeks, and until it has attained a considerable size and the adult characters have been in a large degree assumed. Although it is thus capable of grasping and clinging to the nipple, it is, however, at first incapable of directly sucking, and the milk is furnished by the mother through the compression of the gland by a muscle analogous to the cremaster. To guard against suffocation of the young a peculiar modification of the laryngeal apparatus is provided; "the epiglottis and arytenoid cartilages are elongated and approximated, and the rimaglottidis is thus situated at the apex of a cone-shaped larynx, which projects, as in the Cetacea, into the posterior nares, where it is closely embraced by the muscles of the soft palate. The air-passage is thus completely separated from the fauces, and the injected milk passes in a divided stream on either side of the larynx to the œsophagus." Thus sustained and nourished by the mother, the little marsupial develops and increases in size, and after a greater or less length of time, according to the species, it assumes the characters of approximate maturity, and leaves the teat and the pouch itself, but for some time after resorts to the latter in case of danger, to be conveyed by the mother.

Although the marsupials are now confined to Australasia and South America (exclusive of a few emigrants beyond those borders), they were formerly the predominant mammal types of every part of the globe palæontologically known, and remains of representatives of the class recovered from the Liassic and Oolitic formations have been referred to this order. In the Eocene they are developed in several types, both in North America and in Europe, and among these were representatives of genera closely related to the opossums of the present age. Although none of the marsupials of the present epoch can vie with the largest placental mammals, in former times and as recently, perhaps, as the advent of man, species of gigantic size existed, the Diprotodontids of Australasia having been nearly as large as our elephants. THEODORE GILL.

Mar'supites [from *marsupium*, a "pouch"], or **Tortoise Encrinite,** a genus of the Crinoidea occurring in the Cretaceous rocks of Europe, remarkable for having no stem or attachment; its pelvis thus resembles a plated pouch surrounded by a circle of arms.

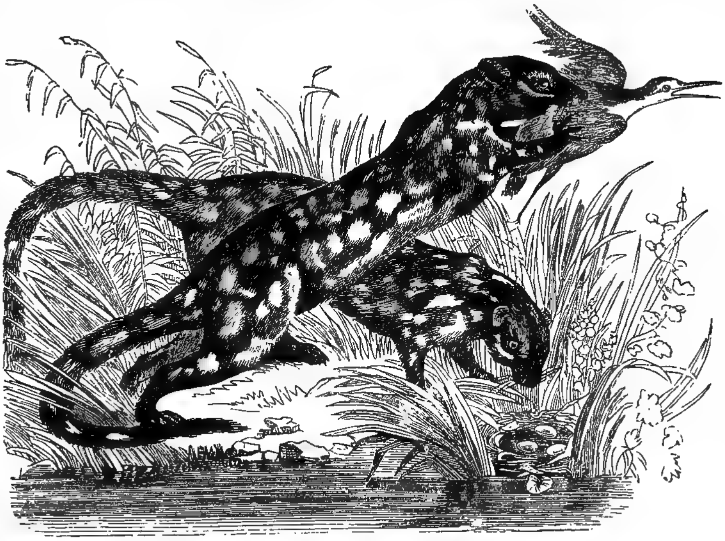
Mar'syas, in Greek mythology, a satyr who picked up the flute which Athene had thrown away and cursed when she saw how distorted her features became by playing it; challenged Apollo, who played the lyre, to a musical contest, with the Muses for judges. Marsyas was defeated, bound to a tree, and flayed alive by the god. Some mythologists see behind this myth a contest between the citharœdic style of music prevalent in Greece, and the aulœdic prevalent in Phrygia, the native country of Marsyas, but no historical facts are proffered in support of the theory.

Martel (CHARLES). See CHARLES MARTEL.

Martel'lo Tower, according to Webster and others originally *watch* (or bell) towers (*martello*, "hammer"), erected on the coasts of Sicily and Sardinia against the Barbary pirates. According to Col. Pasley, the name of martello tower was adopted in consequence of the good defence made by a small round tower in the Bay of Martello, in Corsica, in the year 1794, which, although armed with one gun only, beat off one or two British ships of war without sustaining any material injury from their fire. This construction gave such towers a prestige which caused the erection of numbers along the sea-coasts of England for defence against maritime invasion, and bearing the generic name as above. These towers were of masonry, and round, their height about 30 feet, their upper platform vaulted and bombproof. One or two heavy guns of the period were usually served, through "embrasures," from the main floor. The basement contained magazine stores, etc. Towers of various kinds have been introduced as parts of sea-coast defences and intrenched camps (*e. g.* the Maximilian towers of Lintz), all of which have somewhat indiscriminately been called martello towers. Those on the coasts of England and her colonies have generally been superseded by more efficient works. They have never been erected in the U. S., if we except (for special purposes) the somewhat analogous structures of Tower Dupré, La., and Tybee Island, Ga.

Mar'ten (*Mustela*), the common name of several carnivorous fur-bearing animals of the family Mustelidæ. In North America we have the Hudson's Bay sable or pine marten (*Mustela Americana*), which produces a very valuable fur, inferior in value to that of the Russian sable only. The latter animal (*M. zibellina*) is caught in Siberia. The pine marten of Europe (*M. martes*) and the stone marten or common European marten (*M. foina*) produce great quantities of cheap and useful fur. The FISHER (which see) belongs also to this genus. They are all lithe, active creatures, with long bodies and very short legs.

Marten, Spotted, or **Long-tailed Dasyure** (*Dasyurus viverrinus* or *macrurus*), a small but fierce carnivorous marsupial mammal of Australia, having a chestnut-colored fur spotted with white. It is some eighteen inches long, exclusive of the tail. It inhabits marshy places, and is nocturnal in its habits, nesting by day in a hollow tree. It is a marsupial representative of the martens.



The Spotted Marten.

Mar'tensen (HANS LASSEN), D. D., b. at Flensborg, Denmark, Aug. 19, 1808; studied theology at the University of Copenhagen. In 1832 he visited Berlin, Vienna, Munich, and Paris; in 1836 he took the degree of doctor in divinity, and in 1840 was appointed professor at the university, first in philosophy, afterwards in theology. His first book, *Mester Eckart*, which appeared in 1840, is an essay on the mysticism of the Middle Ages, and made a great sensation, both in Denmark and Germany, on account of the wonderful intuition and singular eloquence with which the old mystic was interpreted and represented. In 1841 followed *Outline of a System of Ethics*, and in 1849 *Christian Dogmatics*, which last book found many admirers in Denmark, Germany, Sweden, Holland, and Scotland. As a disciple of Hegel, Martensen here undertakes to reconcile faith and reason, revelation and science, but, deeply impregnated by the Christian ideas as he is, he defines this process, with respect to the Bible, as "a reckoning of an account whose balance has been struck elsewhere; if we bring out another figure, we have reckoned wrong." The problem is solved, as far as it is solved, with great acuteness and ingenuity. In 1845 he was appointed preacher to the court, and in 1853 bishop of Sealand, the highest dignity of the Danish Church. As such he took a very active part in the religious movements going on in the Danish community, and by the repose of his character, the superiority of his intelligence, and his sympathy with all that is genuine he exercised a great and beneficial influence. He published several collections of sermons, and in 1872 a *System of Christian Ethics*, second part, treating of the *State* (1878). D. Feb. 4, 1884. CLEMENS PETERSEN.

Mar'tha's Vineyard, the principal island of Dukes co., Mass., in the Atlantic, is 19 miles long, and averages 5 miles in breadth. It is rather level, and in part has a very productive soil. It contains the towns of Edgartown, Chilmark, Tisbury, Gay Head, and Cottage City. The latter is a noted camp-meeting ground and watering-place on the N. E. shore of the island.

Martialis (MARCUS VALERIUS), b. at Bilbilis, in Spain, Mar. 1, 43 A. D.; went during the reign of Nero (in 66) to Rome, where he resided for thirty-five years, and achieved a great literary fame, and returned in 100 to his native city, where he seems to have d. a few years afterwards. Of his works, fourteen books, containing about 1500 small poems, *epigrammata*, are still extant, all distinguished by cutting wit, an elegant and pointed form, a high degree of felicity of expression, and very interesting for the moral study of the time to which they belong, but sometimes revealing an offensive sensuality and a talent for flattery of a very doubtful character. There is a good edition of his works by Schneidewin (2 vols., Grimma, 1842), a complete translation into French by E. T. Simon (1819), and numerous translations of single parts in English and German.

Mar'tial Law. As defined by a recent English writer, "Martial law is the suspension of all law but the will of the military commanders entrusted with its execution, to be exercised according to their judgment, the exigencies of the moment, and the usages of the service, with no fixed or settled rules or laws, no definite practice, and not bound even by the rules of the military law." It differs widely from "military law" and from "military government," with each of which it is often confounded. "Military law" is the code of rules for the regulation of the army and navy alone, either in war or in peace; it is a department of the municipal law applicable to a particular class of persons; and in the U. S. it is enacted by Congress in the same manner and with the same force and effect as any other legislation, and civilians are expressly exempted from its operation. "Military government" is the authority by which the commander of an invading army governs for the time being a district conquered from the enemy, in which the local institutions have been temporarily overthrown as the result of a successful invasion. Martial law, on the other hand, if permitted at all, may be applied to civilians as well as to the military, and its operation is not necessarily confined to the enemy's territory nor to districts technically hostile. On the contrary, it is established, if at all, within the limits of the country whose officials invoke its aid, and is enforced against the citizens of that country as ancillary to the operations of actual warfare. An able American jurist in describing its nature regards its exercise as controlled by some limitations. "Martial law," he says, "is that military rule which exists in time of war in relation to persons and things under and within the scope of active military operations in carrying on the war, and which extinguishes and suspends civil rights and the remedies founded upon them for the time being, so far as it may appear to be necessary in order to the full accomplishment of the purposes of the war; the party who exercises it being liable for any abuse of the authority thus conferred." Experience shows, however, that when resorted to, this species of military rule is actually exercised without limitation or restraint other than "the will of the commander entrusted with its execution." It is an interesting question whether martial law as thus described is compatible with civil liberty, and can be proclaimed in a free and constitutional country. This question has recently received a judicial answer both in the U. S. and in Great Britain. In the celebrated case of Milligan, growing out of the late civil war, the Supreme Court denied the lawfulness of martial law within the U. S. except in districts actually occupied by the opposing forces, which are the very theatre of hostilities, and in which the civil courts are for the time being completely displaced. Lord Chief-Justice Cockburn also, by a most able judgment pronounced in 1867, declared that the Crown has no authority to enforce martial law in any part of the British realm where the laws of England prevail; but he admits that Parliament, by virtue of its unlimited power, may call it into operation. JOHN NORTON POMEROY.

Martigues', town of France, department of Bouches-du-Rhône, stands on the lagoon of Berre, is divided into three different quarters by broad canals, with numerous bridges, and has a good harbor 10 acres in extent, workshops for marine constructions, an iron foundry, large distilleries, and manufactures of salt, oil, and chemicals, but its principal industry consists in the preparation of *boutargue*, which is obtained from the roes of the gray mullet caught in the lagoons, and rivals the Russian caviare. Pop. in 1881, 6483.

Mar'tin [Fr. *martinet*], a name given to several birds of the swallow family (Hirundinidæ). The purple martin of the U. S. (*Progne purpurea*) is one of the finest of our native swallows. It often inhabits boxes put up near houses, and is a popular favorite, being regarded as a bird of good omen. It ranges from the frontier of Patagonia to within the Arctic circle, but its numbers are in certain years and certain localities subject to sudden diminutions which have never been satisfactorily accounted for. The house-martin of Europe (*Chelidon urbica*) frequently attaches its nest to the walls of houses even in towns. The nests are extremely variable in shape and size, no two being exactly alike in both respects. Generally the form is cup-shaped, with the rim closely pressed against the wall, and having a small semicircular aperture cut out of the edge in order to permit the ingress and egress of the birds. Sometimes, however, the nest is supported on a kind of solid pedestal, also composed of mud, and often containing nearly as much material as would have made an ordinary nest. The sand-martin is smaller, of a dull color, and builds its nest at the end of a long horizontal gallery, which it bores in some natural or artificial escarpment. Although its small beak and slender claws would seem at first sight to be utterly inadequate for the performance of miner's work, the sand-martin is as good a tunnel-driver as the mole or the rat, and can manage to dig a burrow of considerable length (from 2 to 8 feet), and in soil which is by no means easy to excavate. The sand-martin hatches several broods during the year and is very gregarious, sometimes making its burrows so near together as to honeycomb the bank in which they are situated.

Martin, bishop of Tours and a saint of the Roman Catholic Church, b. in 316 at Sabaria, in Pannonia, the present Stein in Lower Hungary, of pagan parents; visited the school of Pavia, but entered the army in his sixteenth year, his father being a military tribune, and served under Constantine and Julian the Apostate. Having left the army, he became a disciple of Hilary, bishop of Poitiers; returned to Pannonia; converted his mother to Christianity, but suffered much from the persecutions of the Arian party, which finally expelled him from the country. Once more he went to Gaul; was made bishop of Tours in 375, and founded the monastery of Marmontiers, where he d. about 400. His life has been described by a contemporary of his, Sulpicius Severus, adorned with many miracles and wonderful stories; and by the Roman Catholic Church he was made a saint, and his festival appointed on his birthday, Nov. 11. In Scotland this day marks the winter term (*Martinmas*), and was formerly celebrated with feasting and drinking. The French expressions, *martiner, faire la St. Martin,* and *mal de St. Martin,* show that the same custom has existed in France. It arose from an old story, that at a great festival the emperor Maximinus offered the drinking-cup first to the bishop, in order that he might receive it from his hand. The treatise *Professio Fidei de Trinitate,* ascribed to Martin, is considered spurious by many scholars.

Martin I., POPE and SAINT, received the tiara in 640, succeeding Theodore I.; called in 649 the first Lateran Council, and was consequently banished by the emperor Constans II. to Naxos 653, to Constantinople 654, and to the Thracian Chersonese 655. D., after great sufferings, Sept. 16, 655.—MARTIN II. (or MARINUS I.), b. at Montefiascone; became pope in 881, and d. Feb. 14, 884.—MARTIN III. (or MARINUS II.) succeeded Stephen VIII. in 942, d. 946; a man of learning and noble character.—MARTIN IV. (*Simon de la Brie*), b. in Touraine of very humble parentage; became a Franciscan at Tours; was patronized by St. Louis; became a cardinal in 1262; was long papal legate at Paris; became pope in 1281. The Sicilian Vespers soon followed (1282), and he excommunicated the enemies of the French, thereby greatly weakening his own cause in Italy. D. Mar. 28, 1285.—MARTIN V. (*Otto Colonna*), b. of noble stock at Rome; became auditor of the rota 1394; cardinal-deacon 1405; was chosen pope by the Council of Constance 1417; fulminated a bull against the Hussites 1418; and soon proved himself one of the ablest and boldest of the popes. His policy overcame the reform movements begun at the

Council of Florence. He healed the divisions of the Church, restored the diminished splendors of Rome, pacificated Europe, and advanced the cause of learning. D. at Rome Feb. 20, 1431.

Martin (Alexander), LL.D., b. in New Jersey of Irish parentage about 1740; graduated at Princeton in 1756; removed to Guilford co., N. C., 1772; was a colonel of Continental troops in the Revolution; served often in the North Carolina senate, of which he was for a time president; acting governor of North Carolina 1781; governor 1782–85 and 1789–92; member of the U. S. constitutional convention 1787; and U. S. Senator 1793–99. He had some literary ability, and occasionally wrote poetry in the periodicals. D. at Danbury, N. C., in Nov., 1807.

Martin (Benjamin Nicholas), D. D., b. at Mount Holly, N. J., Oct. 20, 1816; graduated at Yale 1837; studied theology at New Haven 1837–40; Congregational pastor at Hadley, Mass., 1843–47; pastor of the Fourth Presbyterian church, Albany, N. Y., 1848–49; became in 1852 professor of rhetoric and intellectual philosophy in the University of the City of New York. D. Dec. 26, 1883.

Martin (Bon Louis Henri), b. at St. Quentin, France, Feb. 20, 1810; commenced his literary career by writing historical novels and dramas, but turned soon to a more serious and thoroughgoing treatment of history. Of his *Histoire de France* there are three different editions: one in 15 vols. (1833–36); one in 19 vols. (1837–54), parts of which, such as vols. x. and xi., narrating the religious wars, and vols. xiv.–xvi., describing the age of Louis XIV., made a great sensation and were crowned by the Academy; and one in 16 vols. (1855–60), embodying the latest researches in Celtic antiquities, mediæval society, etc. The most prominent of his other writings are *De la France, de son Génie et de ses Destinées* (1847), which gives the ideal view on which his narrative of the history of France is based; *L' Unité Italienne* (1865), *La Russie d'Europe* (1866), etc.; was senator of France. D. Dec. 11, 1883.

Martin (Félix), S. J., b. in Normandy, France, Oct. 4, 1804; entered the order of Jesuits in 1823; was sent to Canada in 1842, founded St. Mary's College at Montreal, and spent much time at Quebec in the collection and arrangement of materials for the early history of Canada. Owing to impaired eyesight he was compelled to return to France, but has since published *Mission du Canada, Relations inédites* (1861), *De Montcalm en Canada* (1867), and *Le R. R. Isaac Jogues* (1873), besides aiding in the preparation of Carayon's great work on the Jesuit missions.

Martin (François Xavier), LL.D., b. at Marseilles, France, Mar. 17, 1762; came in 1782 to the U. S., and became a French teacher, printer, and journalist at New Berne, N. C. In 1789 he was admitted to the bar, and soon won distinction. Jefferson made him a judge in Mississippi, where in 1813 he was chosen attorney-general. In 1815 he was appointed a judge of the supreme court of Louisiana, and was its chief-justice 1837–45. He published valuable histories of Louisiana (1818) and North Carolina (1829), besides several volumes of legal reports, digests, and other works. He was a sound and able jurist. D. at New Orleans Dec. 10, 1846.

Martin (George), b. at Middlebury, Vt., in 1815; settled in 1836 at Grand Rapids, Mich., and became a county judge. In 1851 he became a judge of the State supreme court, and was its chief-justice 1857–67. D. Dec. 15, 1867.

Martin (Sir James Ranald), C. B., F. R. S., b. at Kilmuir, Skye, about 1800; entered the medical staff of the Bengal army 1818; was appointed sanitary commissioner in England 1841; was knighted in 1860, and became examining physician to the secretary of state for India, and inspector-general of hospitals, etc. D. Nov. 27, 1874. His work *On the Influence of Tropical Climates* (1855) is a standard treatise and has won him much distinction.

Martin (John), an English painter and engraver, b. near Hexham July 19, 1789; d. in Douglas, Isle of Man, Feb. 9, 1854; was called the painter of "architectural dreams." Thirty years ago mezzotint engravings of his pictures, done by the artist, were common in the U. S., and three of his masterpieces, *The Day of Judgment, The Day of Wrath, The Plains of Heaven*, exhibited here, were admired by the lovers of the tremendous in art. Aside from these three, his best-known works were *The Seventh Plague, Joshua commanding the Sun to stand still, The Fall of Nineveh, Belshazzar's Feast, Satan summoning his Legions, Sadak seeking the Waters of Oblivion.* He had his period of success and glory, but is now forgotten. In the latter years of his life he was devoted to schemes for improving the city of London.

O. B. Frothingham.

Martin (John A.). See Appendix.

Martin (Joshua L.), removed in early life to the N. of Alabama; was a judge of a State circuit court 1831–35; a Democratic member of Congress 1835–39; governor of Alabama 1845–47, chosen as an independent Democrat, but supported by the Whigs in a most exciting canvass. Gov. Martin had previously been chancellor of Alabama. D. at Tuscaloosa Nov. 2, 1856.

Martin (Josiah), b. in Virginia Apr. 23, 1737; entered the British army as ensign in 1756, and in 1769 had risen to the rank of lieutenant-colonel. He became in 1771 governor of North Carolina; took refuge on board a British man-of-war Apr. 24, 1775; was with the fleet of Sir Peter Parker before Charleston 1776, and with Cornwallis at the battle of Camden 1780. He withdrew to Long Island 1781, and thence to England, and d. in London in July, 1786.

Martin (Luther), LL.D., b. in New Brunswick, N. J., in 1744; graduated at Princeton in 1766; became a prominent lawyer of the Eastern Shore of Virginia and Maryland; was in Congress 1784–85; attorney-general of Maryland 1778 and 1818; was a member of the convention which drew up the Constitution of the U. S., which he bitterly opposed. In 1814 he became judge of oyer and terminer for Baltimore. D. in New York July 10, 1826. He was a zealous friend of Aaron Burr, whom he defended on his trial for treason. Author of a *Defence of Capt. Cresap.*

Martin (Robert Montgomery), b. in England about 1805; author of a series of valuable geographical and statistical works, *The Colonies of the British Empire* (1834–38), *The British Colonial Library* (1836–37), *The History, Antiquities, Topography, and Statistics of Eastern India* (1838), *Ireland before and after the Union* (1843), *China, Political, Commercial, and Social* (1847), *The Hudson's Bay Territories* (1848), *The Indian Empire* (1858–61), and *Progress and Present State of British India* (1862). Mr. Martin edited the *Colonial Magazine* for some years, superintended the issue of *The Illustrated Atlas and Modern History of the World*, and arranged for publication the papers of the duke of Wellington.

Martin (Robert M.), b. in Worcester co., Md., in 1798; graduated at Princeton; was a member of Congress 1825–27; chief judge on the western circuit of Maryland 1845–51; judge of the superior court of Baltimore 1856–67; a professor in the law school 1867–70. D. at Saratoga, N. Y., July 20, 1870.

Martin (Theodore), LL.D., b. at Edinburgh, Scotland, in 1816; settled in London as a solicitor in 1846; wrote verses for the magazines over the signature of "Bon Gaultier;" published *The Book of Ballads* in conjunction with Prof. Aytoun; translations of the *Poems and Ballads of Goethe* (1858), of several Danish dramas by H. Hartz and Oehlenschläger (1854–57), of the *Odes of Horace* (1860), of the *Poems of Catullus* (1861), of Dante's *Vita Nuova* (1862), and of Goethe's *Faust*, and printed for private circulation translations of various miscellaneous poems by Goethe, Schiller, and Uhland. He also wrote a biography of Prof. W. E. Aytoun (1868) and *The Life of the Prince Consort* (vol. i., 1874) from materials furnished by Queen Victoria.

Martin (William D.), b. at Martintown, S. C., Oct. 20, 1789; studied in the law school at Litchfield, Conn.; became one of the ablest jurists and most prominent legislators of South Carolina; was made a judge of the State circuit court in 1830, and d. at Charleston Nov. 16, 1833. He belonged to the extreme State rights school.

Marti'na Fran'ca, town of Southern Italy, in the province of Lecce, about 17 miles N. of Taranto. This beautiful little city is built on a hill near the sources of the Tara. The churches and other buildings, private and public, are handsome; the ducal palace—the architecture of which resembles the Pamfili of the Piazza Navona, Rome—is one of the most magnificent in the Neapolitan territory. Martina Franca was the feudal possession of the Caraccioli, and is not a very old town. Pop. 18,102.

Mar'tindale (John H.), b. at Sandy Hill, N. Y., Mar. 20, 1815; graduated at the U. S. Military Academy, and was appointed in the dragoons, but resigned 1836, and became a railroad engineer. In 1838 he located at Batavia, N. Y., and practised law until 1851, when he removed to Rochester. In Aug., 1861, he was appointed a brigadier-general of volunteers, and commanded a brigade in Porter's corps in the Virginia Peninsular campaign of 1862; was military governor of the District of Columbia from Nov., 1862, until the opening of the final campaign, when he joined (May, 1864) the 18th corps (Army of the James), which, united with the Army of the Potomac, fought the battles of Cold Harbor June 1–3, 1864, and was engaged in the siege of Petersburg. Gen. Martindale succeeded to the temporary command of the 18th corps July 7–22, and resigned, owing to impaired health, Sept. 13, 1864. Elected attorney-general of the State of New York in 1866. D. Dec. 13, 1881.

Martin de Moussy (Jean Antoine Victor), M. D., b. at Moussy-le-Vieux, France, June 26, 1810; studied medicine at Paris; practised in the military hospitals, and in 1841 went to Montevideo, S. A., where he resided for twelve years as a physician, keeping a constant meteorological register. During the nine years' siege of Montevideo he was director of the medical service to the French and Italian legions (the latter commanded by Garibaldi). On the downfall of the Argentine dictator, Rosas, in 1852, Dr. Martin de Moussy was engaged by the government of Pres. Urquiza to prepare a geographical description of the republic, and spent four years in constant travels, visiting Paraguay, the Gran Chaco, portions of Chili and Bolivia, and all the Argentine provinces in detail. The result was his valuable and accurate work, *Description, géographique et statistique, de la Conféderation Argentine* (3 vols., Paris, 1860–64, with atlas), which is considered the best source of information, not only upon the subjects embraced in its title, but also upon the ethnography and geology of the Rio de la Plata. Dr. Martin de Moussy was one of the writers of the *Encyclopédie des Connaissances utiles* and of the *Dictionnaire Politique*. D. at Paris about 1870.

Mar'tineau (Harriet), sister of James, b. at Norwich, England, June 12, 1802, of a family descended from Huguenot exiles; was educated under the auspices of her uncle, a distinguished surgeon; entered upon literary life in 1823, and published a very great number of works, including many tales, of which those illustrating the principles of political economy, the operation of the poor-laws, and kindred subjects are especially noteworthy. She visited the U. S. in 1834, and travelled in Palestine and the East in 1846. Among her other important works are *Society in America* (1837), *A Retrospect of Western Travel* (1838), *Eastern Life, Past and Present* (1848), *British India* (1851), a condensed translation of Comte's *Positive Philosophy* (1853), *History of England during the Thirty Years' Peace* (1849–50), *The Factory Controversy* (1855), and *Biographical Sketches* (1869). A Unitarian Christian in early life, she gradually assumed in her writings more and more radical religious opinions. Of late years she was a frequent writer in the editorial columns of the *Daily News*. D. at Ambleside, England, June 27, 1876.

Martineau (James), LL.D., b. in Norwich, England, Apr. 21, 1805, of French extraction. His father was a manufacturer of bombazines, in humble circumstances. Mr. Martineau studied in the Unitarian college at York, and was minister of societies first in Dublin, and afterwards at Liverpool in Hope chapel. While in Liverpool in 1839 he took part, in connection with J. H. Thom and Henry Giles, in a controversy with thirteen clergymen of the Church of England on questions of Christian theology. Mr. Martineau's themes were—*The Bible, The Deity of Christ, Vicarious Redemption, The Christian View of Moral Evil*, and *Christianity without Priest and without Ritual*. All the lectures were published. *The Rationale of Religious Inquiry* and *Endeavors after the Christian Life*, two volumes of very remarkable sermons, appeared in 1843–47; a volume of *Miscellanies*, edited by T. Starr King, was printed in Boston in 1852; in 1858, another volume, entitled *Studies of Christianity*, was collected by W. R. Alger, and published by the American Unitarian Association; two volumes of *Essays, Theological and Philosophical*, were issued by W. V. Spencer in Boston, 1866 and 1868, comprising significant papers from various English periodicals. The *Westminster, Prospective*, and *National* reviews contained his most elaborate essays. In 1853, Mr. Martineau was called to the chair of moral and metaphysical philosophy in Manchester New College, London, whither he went to live, and in 1858 assumed joint pastorship with J. J. Tayler of the Unitarian chapel in Little Portland street, of which, on the death of Mr. Tayler, he became sole incumbent. A fine scholar, a penetrating thinker, a rich, massive, luminous mind, Mr. Martineau easily holds the front rank among English Unitarians. His position is that of the boldest thinker within the Christian limits. Better than any other he reconciles the claims of reason and faith in religion. Of late years he has been distinguished as the defender of spiritual faith against the different schools of atheism, materialism, and skepticism, taking sharp issue with the negative tendencies of science and philosophy, not in the interest of any dogma, creed, or Church, but in the interest of the moral and spiritual nature of man. (See his *Religion and Modern Materialism*, New York, 1874.) Thackeray called him the greatest theologian in England. Ill-health has lately compelled Mr. Martineau to desist from preaching, but he continues to write. The Boston magazine *Old and New* (1874) contained able articles in criticism from his pen. The splendor of his style makes the profoundest of his discussions engaging, and the loftiness of his reason lifts every question into light. O. B. Frothingham.

Marti'nez, on R. R., cap. of Contra Costa co., Cal. (see map of California, ref. 4–B, for location of county), 30 miles N. E. of San Francisco. In the vicinity is Mount Diablo, an isolated peak rising to the height of about 4000 feet and commanding one of the most extensive views on the globe. A fine road enables the tourist to reach the summit with ease. Pop. in 1870, 560; in 1880, not in census.

Martinez Campas (Arsenio), b. in 1834, was educated in the staff-school in Madrid, made his first campaign in Morocco under O'Donnell, and was promoted to the rank of major. From 1864 to 1870 he fought with great distinction in Cuba, and on his return to Spain he was made a brigadier-general and placed in command of a division of the army engaged in suppressing the Carlist rebellion. After the abdication of King Amadeo he openly avowed his dislike to the republican form of government, and he was even for a short time imprisoned as a conspirator. Having been restored to his command in the army, it was the *pronunciamento* made by him and Gen. Jovellar which actually paved the way for Alfonso XII. to the Spanish throne, and it was his decisive victory at Pena de Plata (1876) which finally put down the Carlist insurrection. King Alfonso made him a captain-general, the highest dignity in the Spanish army, and commander-in-chief of the army in Cuba; and the pacification of that island was chiefly due to his victories. From Mar. to Dec., 1879, and from 1881 to 1883, he held the portfolio of minister of war.

Martinez de la Rosa (Francisco), b. Mar. 10, 1789, at Granada; was appointed professor of philosophy in his native city in 1808; participated with great enthusiasm in the war of independence and the political movements after the war, but was imprisoned on account of his liberal ideas, and exiled. After the establishment of the constitution in 1820 he was recalled and appointed minister of foreign affairs, but left the country after the subversion of the constitution in 1823 by French intervention; lived in Italy and Paris; returned to Spain in 1833, and became again minister of foreign affairs in 1834, as one of the leaders of the moderate party; was ambassador to France during the government of Espartero; president of the senate in 1860, and d. at Madrid Feb. 7, 1862. He was a prolific and talented writer of fiction; several of his dramas and his lyrical poems were received with great applause.

Martinique' [called by the Indians *Madiana*], one of the Lesser Antilles, in the West Indies, belonging to France, which colonized it in 1635. Area, 380 square miles. Pop. in 1878, 162,861, of which the great mass consisted of Creoles of various grades, from those who had only one drop of Caucasian blood to those who had only one drop of negro blood in their veins. It is of volcanic origin, high, mountainous, with deeply indented coasts, which afford good harbors, and very fertile. Its climate is moist and hot, but not absolutely unhealthy; hurricanes and earthquakes are frequent. Sugar is the principal product. Of the total area (244,090 acres), 83,990 acres are under cultivation, 83,843 in forest and savanna, and 68,837 lie fallow. On an average, 47,440 acres are occupied by the sugar crop, 1290 are devoted to coffee, 640 to cotton, and 1660 to cocoa. Of the births, 66 per cent. are illegitimate. Principal towns, St. Pierre and Fort Royal, between which a railroad has been built.

Martinsburg, Blair co., Pa. (see map of Pennsylvania, ref. 5–D, for location of county), 21 miles S. of Altoona, on a branch of the Pennsylvania R. R., has a seminary. Pop. in 1870, 536; in 1880, 567.

Martinsburg, R. R. centre, cap. of Berkeley co., West Va. (see map of West Virginia, ref. 3–G, for location of county), 80 miles W. of Washington, on the Baltimore and Ohio and the Cumberland Valley R. Rs., has private seminaries, railroad repair-shops, and flouring-mills. Pop. in 1870, 4863; in 1880, 6335.

Martin's Ferry, Belmont co., O. (see map of Ohio, ref. 5–I, for location of county), on the Cleveland and Pittsburg R. R., has a capital of $2,000,000 invested in the manufacture of glass, iron, and mill-machinery. It is also called Martinsville. Pop. in 1870, 1835; in 1880, 3819.

Mar'tinsville, R. R. junction, Clark co., Ill. (see map of Illinois, ref. 7–G, for location of county), has a college, large grain-warehouses, and a flouring-mill. Pop. in 1880, 663.

Martinsville, R. R. junction, cap. of Morgan co., Ind. (see map of Indiana, ref. 7–D, for location of county), on the White River, 31 miles S. W. of Indianapolis, has a high school, foundry and machine-shop, planing-mill, woollen-factory, pork-house, flouring-mill, and saw-mills. Its principal business is in pork, grain, and lumber. Pop. in 1870, 1131; in 1880, 943.

Martinsville, on R. R., cap. of Henry co., Va. (see map of Virginia, ref. 7–E, for location of county), 25 miles W. by N. of Danville. Pop. in 1880, 289.

Mar'tius, von (KARL FRIEDRICH PHILIPP), b. at Erlangen, Bavaria, Apr. 17, 1794; studied medicine at the university of his native city, and participated in the great scientific expedition to Brazil (1817–20), which was sent out by the Austrian and Bavarian governments. On his return he was appointed professor of botany and director of the botanical garden of Munich, from which offices he retired in 1864, and d. Dec. 13, 1868. Besides his *Reise nach Brasilien* (3 vols., 1824–31) he published *Nova Genera et Species Plantarum* (3 vols., 1824–32); *Genera et Species Palmarum* (1828–34), giving 582 species to Humboldt's 99 and Linnæus's 15; and *Flora Brasiliensis*, with much new information and magnificent illustrations. His researches concerning South American ethnography and languages, which he communicated in 1867, are valuable.

Martius Yellow. See NAPHTHALENE COLORS.

Mar'tos, town of Spain, province of Jaen, celebrated for its cold mineral springs, which are much used for bathing, and much resorted to in cases of cutaneous diseases, is located 16 miles W. S. W. of Jaen. The streets of Martos are crooked, steep, and narrow, and its public buildings are commonplace. The surrounding districts produce an excellent oil, which forms the principal article of the commerce of the town. Pop. 14,654.

Mar'tyn (HENRY), B. D., b. at Truro, Cornwall, Feb. 18, 1781; graduated as senior wrangler at St. John's College, Cambridge, in 1801; became a fellow in 1802; was ordained deacon of the Anglican Church 1803; priest in 1805, and went to Madras 1806 as a missionary; was subsequently stationed at Dinapore and Cawnpore (1809); set out to return to England on account of his broken health in 1810, but remained more than two years in Persia, laboring for his faith. D. at Tokat, Asia Minor, Oct. 16, 1812, among strangers. A monument was erected there in 1856. Martyn translated the New Testament and liturgy into Hindostanee, the New Testament and Psalms into Persian, and the New Testament into Arabic. He was author of *Controversial Tracts* (1824), *Sermons* (1822), *Journals and Letters* (1837). (See *Memoir*, by Rev. John Sargent (1819), often reprinted.)

Mar'tyr [Ger. *Märtyrer;* Fr. *martyr*, in Old French sometimes changed to *martre* (whence *Montmartre*, the "Martyr's Hill"); Sp. *martir;* It. *martire*—all forms of the Greek *μάρτυρ*, a "witness"], one who dies for his religion. In our New Testament the Greek word is generally rendered by its English translation, *witness*, "martyr" occurring but in three places—Acts xxii. 20; Rev. ii. 13; xvii. 6. The number of martyrs during the first three centuries has been variously estimated. H. Dodwell (the elder), in his *Dissertationes Cyprianicæ*, declares it to have been inconsiderable; and this opinion is shared by Gibbon (*D. and F.*, ch. xvi.), who cites Origen as his authority. Monkish enthusiasts, on the other hand, exaggerated both the strength of the "noble army of martyrs" and the sufferings of those who composed it; while the Roman Catholic writers Ruinart and Pagi take a middle view.

It was natural that all Christians should greatly reverence those who gave up all for Christ. Confessors (those whose lives were spared) were much respected, but far higher honor was paid to martyrs. If they died unbaptized, their death was regarded as a nobler baptism, and they were believed to at once enter Paradise (Matt. v. 10, 12; x. 39). Each anniversary of a martyr's death, called *natales* or *natatalia* ("birthday"), because on it he was born to eternal life, was commemorated at his grave, and by degrees it became usual to build over such honored tombs churches called *martyrii* or *memoriæ*, each named after the saint buried beneath it. There his festival was kept yearly, his "acts" were read, prayers were offered, the Eucharist was celebrated, and *agapæ* or love-feasts were held. The zeal, the love, the patiently-borne sufferings of martyrs made many converts. "Their blood," truly declared Tertullian, "was the seed of the Church" —*Semen est sanguis Christianorum.* (*Apol.*, c. 50.) Orations, some of which are preserved in the "Fathers," were spoken in their honor; poems were written to celebrate them; their deeds and words were cited as models for all men for ever. As the days of martyrdom were left farther behind the martyrs received higher honor. Heathen converts adored them as they had adored the heroes of paganism. Their remains were disinterred and laid under the altars of churches. Every relic of theirs became a sacred treasure. Their intercession was deemed all-powerful with God. Martyrs formerly unheard of announced themselves in visions and told the place of their graves. Nay, Christian martyrs not being enough, many Old Testament sufferers—the Maccabees, for instance—were honored as such. "If they endured so much, not knowing the Lord," said enthusiasts, "what would they not have done for his sake had they known him?" The Innocents, having in a sense died for Christ, were included among his martyrs, and one Sunday in the year was set apart to commemorate all who had borne witness to the faith.

All religions and forms of religion have had their martyrs. Jews have been scorned, oppressed, and murdered for holding fast to their ancient belief; Mohammedans have died calmly for their Prophet; Booddhist missionaries have fallen victims to their zeal; Roman Catholics have burned Protestants, who, when their day of power came, retaliated, although it must in all fairness be admitted that Protestants never carried persecution to such an extent as Romanists, and have long since given up the theory and practice. The word *martyr* is often applied to those who lose life or wealth in scientific research. It is used to denote innocent sufferers from almost any cause, and has also been affixed to the names of kings who underwent the last penalty for misgovernment; *e. g.* Charles I. and Louis XVI. (See Ruinart, *Acta Martyrum* (Paris, 1682); Mosheim, *Eccles. Hist.;* Bingham, *Antiq. of the Christian Church;* Foxe, *Book of Martyrs.*) JANET TUCKEY.

Martyr (PETER), Italian historian. See ANGHIERA.

Martyr (PETER), Protestant Reformer. See VERMIGLI.

Martyrology [Lat. *Acta Martyrum* or *Martyrologium;* Gr. Μενολόγιον]. Etymologically, this term would denote any work devoted to an account of the (Christian) martyrs, but in the early Church it acquired the secondary meaning of a calendar of the martyrs and other saints arranged in chronological order, representing the dates of martyrdom, or, when these were unknown, the dates conventionally assigned for the commemoration of the death of the individual martyrs. This practice doubtless sprung from a very natural and laudable sentiment among those who had been witnesses of the edifying comportment of the genuine martyrs; but when Christianity had become the dominant religion it degenerated into a superstition. The martyrs were gradually transformed into *saints* (in the technical sense), to whom worship was paid, and the dishonest zeal of priests was employed in ransacking catacombs and cemeteries, whence they brought out relics by the thousand, for each of which they invented a name and a legend. The martyrology thus constructed became excessive in size; the few genuine accounts transmitted from an earlier age became the models for a wholesale fabrication of *Lives of the Saints*, which on a greater or lesser scale has been continued to the present day. Not only Gibbon and Lecky, but writers of undeniable Christian sentiment, have pronounced that the authentic materials now remaining concerning the martyrdoms of the first three centuries are few and far between, and that the vast majority of the accounts which have obtained currency and been generally believed until a recent period were forged after the time of Constantine. By a careful comparison of the testimony of the earlier Fathers it results that the "ten persecutions" of Roman tradition may be resolved into only two persecutions having anything like a general character—namely, those of Decius and Diocletian. The official Roman martyrology is that of Baronius, published by authority of Pope Gregory XIII. in 1586; the oldest now extant is that of St. Jerome. PORTER C. BLISS.

Mar'vell (ANDREW), b. at Winestead, Yorkshire, England, Mar. 2, 1621; was educated at Cambridge and on the Continent; became the friend and assistant of Milton in the Latin secretaryship; was the constant friend of liberty both under the Commonwealth and after the Restoration; from his well-known probity was called the "British Aristides;" refused to be moved by the bribes of Charles II. or the persecutions of royalists, who frequently threatened his life. His political writings, if often too vehement and coarse, are full of noble and generous thoughts, and much of his verse is very sweet and beautiful. D. in London Aug. 17, 1678.

Marvin (ENOCH M.), D. D., bishop of the Methodist Episcopal Church, South, b. in Warren co., Mo., June 12, 1823. In 1841 he entered the itinerant ministry in the Missouri conference. He filled important stations in the Missouri and St. Louis conferences, and during the war, in Marshall, Tex. He was elected to the episcopate by the General Conference in New Orleans in 1866. He was a very zealous and successful preacher. He published several works, among which is a valuable treatise on *The Work of Christ.* D. at St. Louis, Mo., Nov. 26, 1877. T. O. SUMMERS.

Mar'vin (JOSEPH D.), b. in Ohio Oct. 2, 1839; graduated at the Naval Academy in 1860; became a master in 1861, a lieutenant in 1862, a lieutenant-commander in 1866, a commander in 1873; served as executive officer of the Mohican at both attacks upon Fort Fisher, and was distinguished for his coolness and the skill which he displayed in superintending the fire of the Mohican's battery; was associated with Com. Simpson in 1870 in his mission to Europe, "to inspect its principal foundries, ordnance establishments, dockyards, powder-magazines, etc.," and in 1871 placed in command of a battery at Annapolis, Md. D. in command of the Alert at Yokohama, Apr. 10, 1877.

Marx (Karl), b. at Treves in 1818; studied at Berlin and Bonn, and became in 1842 editor of the *Rheinische Zeitung*, published in Cologne, which formed a most decided opposition to the Prussian government, but which was suppressed in 1843. Having settled in Paris, he continued his attacks on Prussia; was expelled from France in 1846; returned in 1848 to Cologne; founded the *Neue Rheinische Zeitung*, but was expelled in 1849 on account of his connection with the revolutionary party of Baden. In 1850 he settled in London, where he devoted his services to the International (which see). The principal of his writings, which all reveal a strongly developed tendency towards Socialism, are *Kritik der politischen Œconomie* (1859) and *Das Kapital* (1867). D. Mar. 15, 1883.

Mary, The Blessed Virgin, and **Mariolatry.** Of Mary—the highest of God's creatures, from whom, by her submissive act, the Son of God took upon him the nature of man, whom Jesus loved as mother, and who therefore is, on the part of all who love him, the object of tenderest affection and deepest reverence, checked only by fear of evil—Holy Scripture tells us all that we know with certainty. And in Scripture her life is hid with Christ. She is mentioned only in connection with her Divine Son. And so is it in the writings of the first ages in the Church. Little is said, as though little were known, and even the titles connected with her name are given with reference to maintaining the honor of her Saviour whom she bore, not to magnifying the handmaid of the Lord. And yet there are volumes called *Histories of the Blessed Virgin*, in which we may read fullest details from her immaculate conception to her bodily assumption. All of which, as is granted, "is founded on writings wholly apocryphal and full of fables." The devotion to the Blessed Virgin which culminated in the addition to the Creed by the present pope, Pius IX., the glory of one part of Christendom and the amazement of the other, is of gradual growth. What began among heretics has been developed in the Church through a spirit, common enough, which leads men to add to truths which they have received the suggestions of their own sense of what ought to be. An illustration of this tendency may be found in the spiritual exercises of St. Ignatius Loyola. It is plainly said in Scripture, "He appeared first to Mary Magdalene." But the sainted founder of the Society of Jesus feeling what was due to the mother rather than the tenderness of the Lord toward the sinner out of whom he had cast seven devils, writes: "Jesus Christ appears first to his Blessed Mother after his resurrection. The Gospel leads us to think so by saying that Jesus Christ appeared to several persons; if we do not find in this general expression a sufficiently sure proof, we deserve that reproach of our Saviour to his disciples, Are ye still without understanding?"

Modern devotion to the Blessed Virgin is called by opponents Mariolatry—a term of which her votaries may rightly complain. Worship is a relative term; its force depends upon the object to which it is addressed. Not long ago it expressed the mere reverence rendered to any honored person. Reverence is due to the saints; the worship rendered them is called in theological language *dulia*. To the highest of saints, "the Mother of God," a higher reverence, or *hyperdulia*, is offered. That reverence or worship which is shown only to God is *latria*. Mariolatry, then, is the giving to Mary the honor due to God only. No man can assent to the charge that he renders to any creature what belongs only to the Creator. And yet what is the difference between hyperdulia and Mariolatria? A candid Roman Catholic has said that a Protestant cannot appreciate the difference. The question, then, naturally rises, Does not a large body of the ignorant and superstitious faithful also fail to perceive the difference? And is not their error justly attributable to the Church that sanctions what may so readily mislead in so vital a matter as worship? By this modern hyperdulia, to all who receive it, the character of Christ's religion is changed. The loving-kindness of the Lord is blotted out. It is forgotten that "God so loved the world;" Christ, the merciful Redeemer, is looked upon only as the exacting Judge; while love and mercy are relegated to Our Lady. Books are written—*e. g.* that of the late eloquent Padre Ventura of Rome—to show that as in the natural family children are loved by the father because of the mother, who in her tenderness is a shield to the children against the stern justice of the father (a strange conception of a family), so is it in all respects in the spiritual family. And to our Mother we can fly for protection against the else inevitable justice of our Father. There are pointedly two religions—the religion of loving confidence, that of Mary; and the religion of stern law, causing fear, that of Jesus. From the foot of the cross, it is said, these two religions went out into the world. For an unprejudiced, even tender, exhibition of the wrong thus done to Christ's holy religion, the reader is referred to the writings of Dr. Pusey on this subject. If he would see how what is now prevalent was long ago common, though resisted, he may seek proof in the works of the canonized Bonaventura. Besides a wonderful number of sermons in praise of the Blessed Virgin, he may find prophecies, psalms, canticles, gospel statements, and creeds of the Church travestied in supposed honor of Mary. The whole book of the Psalms—not every sentence of any one psalm—is so changed as to give the place of Our Lord to Our Lady.—*e. g.* Ps. ii.: "Venite ad eam qui laboratis et tribulati estis; et dabit refrigerium animabus vestris;" x.: "In Domina confido;" xvii.: "Diligam te, Domina cœli et terræ;" xxvi.: "Domina, illuminatio mea;" xlvi.: "Ipsa est porta vitæ, janua salutis et via nostræ reconciliationis;" lxx.: "In te, Domina, speravi. Non confundar in æternum." Grant, what is claimed, that all such expressions are to be taken in a Catholic sense, and so Mariolatry is excluded, yet by what peculiar words can we then express our faith and trust in God? (See Immaculate Conception.) W. F. Brand.

Ma'ry I., queen of England from 1553 to 1558, b. at Greenwich Castle Feb. 18, 1516, a daughter of Henry VIII. by his first wife, Catharine of Aragon; educated entirely in Spanish fashion, a fanatic Roman Catholic. During her infancy the king seems to have loved her very much, and she had a splendid court at Ludlow Castle. In 1522 she was betrothed to the emperor, Charles V., but after the divorce of Henry VIII. from Queen Catharine the emperor broke the contract, and other marriage negotiations with Francis I. and his second son, the duke of Orleans, failed. Meanwhile, her strong adhesion to her mother's cause diverted her father's feelings from her. Later she came naturally to be considered as the head of the Roman Catholic party, which made her suspected in the king's eyes; and after the birth of Elizabeth her position became really perilous. James V. of Scotland asked her in marriage, but the proposition was refused on account of the consequences which such a union might have for the children of Anne Boleyn. She was even compelled to sign articles acknowledging that her mother's marriage was illegal and her own birth illegitimate, which involved a renunciation of her right to the succession. In the last years of the reign of Henry VIII. her position became better, however; she lived on a good footing with Catharine Parr, and her right to the succession was restored to her. During the reign of her half-brother, Edward VI., she lived in retirement and took no part in politics; the different suitors to her hand were not accepted. On the death of Edward VI. (July 6, 1553) she succeeded to the throne after a short struggle with the party supporting the claims of Lady Jane Gray; and a reaction immediately took place in the government, headed by Gardiner, who was made lord chancellor Aug. 23, 1553, and Bonner. Nevertheless, the first period of her reign was rather mild, and it was not until after her marriage with Philip II. of Spain, which took place July 25, 1554, that those persecutions against the Protestants commenced which have made her name so odious in the history of England. She experienced great disappointments in her marriage from the coldness of her husband and from her childlessness; a mistake she made on the occasion of an attack of dropsy even subjected her to great mortifications. Her character, by nature cheerless, sullen, and singularly mixed, seemed to change for the worse under these influences, and she yielded willingly to the counsels of Philip and Gardiner. On Nov. 30, 1554, Cardinal Pole declared England and Rome reconciled, and on Feb. 4, 1555, John Rogers was burnt at the stake. Cranmer, Latimer, and Ridley shared the same fate, and were followed by 200 or 300 more, and the ruin of the country seemed impending, when in the summer of 1558 the queen was attacked by an intermittent fever, from which she d. at St. James's Palace Nov. 17, 1558. Tennyson, in his drama *Queen Mary* (1875), calls her "unhappiest of queens and wives and women." Her reign was a total failure in politics and religion.

Mary II., queen of Great Britain, b. Apr. 30, 1662, daughter of James II. by Anne Hyde, was educated in the Protestant faith, and on Nov. 4, 1677, married her cousin, the prince of Orange (King William III.), with whom she was declared joint sovereign in 1689. She d. of small-pox Dec. 28, 1694. (For details of the reign see William III.)

Mary, Brothers of, a Roman Catholic community whose work is that of instruction, founded at Bordeaux in 1817 by G. J. Cheminade, a priest; confirmed in 1839 by the pope: introduced in 1849 into the U. S., where they have (1875) twenty-three houses.

Mary, Society of, a congregation of Roman Catholic priests, established in 1815 at Lyons, France, by J. C. M. Colin; received papal approbation in 1831, 1836, and 1873; introduced in 1862 into the U. S. Theological and other instruction and domestic and foreign missions are the principal objects of their attention.

Mary Stuart, queen of Scots, daughter of James V. by Mary of Guise, and great-granddaughter of King Henry VII. of England through his daughter, Margaret of Tudor, b. at Linlithgow Dec. 8, 1542. Her father died a few days after her birth, and on Sept. 9, 1543, she was crowned queen of Scotland, the earl of Arran, and afterwards her mother, conducting the government. In 1548 she was affianced to Francis, dauphin of France, son of Henry II. and Catharine de' Medici, and in the same year she was brought to France to be educated at the French court. Buchanan and Ronsard were among her teachers, and when she grew up she added to a striking and fascinating personal beauty all the accomplishments and charms which a perfect education can give. Her marriage with the dauphin was celebrated Apr. 24, 1558, in the church of Notre Dame, and when Mary I. of England died in the same year (Nov. 17) she had her arms quartered with those of England, though she put forth no direct claim to the English throne. On July 10, 1559, Henry II. died, and was succeeded by Francis II. Mary thus became queen of France, but Francis died Dec. 5, 1560; she was childless, and Catharine de' Medici, who now grasped the reins of the government, treated her rather coldly. In the same year her mother died, and she then returned to Scotland, landing at Leith Aug. 14, 1561. Coming from a gay court resounding with merry dances and amorous madrigals, she was met on the Scottish shores by the austere hymns of the adherents of Knox. An ardent Roman Catholic, she had come to rule a Protestant people whose predominant passion was hatred to her own religion. Terrible feuds among the powerful families, violence and murder, surrounded her on all sides, and encaged in this chaos she nourished many fantastic plans of her own. All the kings and princes of Christendom wished to marry her, partly on account of her beauty, partly on account of her prospects of inheriting the crown of England. No other person made such a stir in European politics, and she liked it. Nevertheless, the first period of her reign gave satisfaction. James, her half-brother, whom she created earl of Murray, was her councillor. But soon she was caught by a sudden fascination. On July 29, 1565, she married Henry Darnley, a grandson of the earl of Angus and of Margaret Tudor, the widow of James IV., and thus related both to Elizabeth and to herself. Murray and his party among the nobility were opposed to this marriage, and revolted; but, although she succeeded in suppressing the revolution, a sore disappointment overtook her. Darnley was profligate and jealous, weak and treacherous. On Mar. 9, 1566, he burst with Ruthven, Morton, and others into her chamber, dragged Rizzio, an Italian adventurer who had become her councillor after the breach with Murray, out into the corridor, and stabbed him. The horror of this night Mary never forgot or forgave; the son she bore three months afterwards (June 19), James VI. of Scotland and James I. of England, could never see a drawn sword without trembling. She detached Darnley from the other conspirators, fled with him to Dunbar, became reconciled with Murray, entered into an intimate alliance with the earl of Bothwell, and thus strengthened began to persecute the murderers of Rizzio without mercy. On Feb. 9, 1567, the house in which Darnley lay sick was blown up by gunpowder, and his mangled corpse was found at a distance. Bothwell's connection with this murder was apparent; his trial was a mere mockery; and when Mary married him, three months after the death of her husband (May 15), a general rising took place. In the battle of Carberry Hill (June 15) Bothwell was defeated and fled, and Mary was confined in Lochleven Castle and compelled to abdicate. She escaped, however, from Lochleven May 2, 1568, and rallied a new force, but was defeated at Langside May 13, and fled to England. Here she was immediately imprisoned—first at Carlisle, afterwards in different other places, and at last in Fotheringay Castle. After several years' imprisonment she was tried on a charge of complicity in conspiracies against the life of Elizabeth, and on Oct. 25, 1586, a sentence of death was pronounced against her. On Feb. 1, 1587, Elizabeth signed the warrant of execution, and the next day Mary Queen of Scots was beheaded. She was buried at Peterborough, whence in 1612 she was removed to Henry VII.'s chapel at Westminster. That her life was not one of unmingled innocence and virtue is abundantly evident, but the exact measure of her guilt or the exact degree of her complicity in the crimes committed for her sake and in her name has not been made out. And still more obscure and entangled seem those ideas and passions from which such guilt sprung. There are two brilliant dramatical delineations of her character by Schiller and by Björnstjerne Björnson, and among the numerous prose works relating to her history the most interesting is perhaps Labanoff de Rostov's *Lettres, Instructions et Mémoires de Marie Stuart* (7 vols., 1844). CLEMENS PETERSEN.

Ma'ryland, a central Atlantic State, one of the original thirteen (see map of Del. and Md., in article DELAWARE), between 37° 53′ and 39° 44′ N. lat., and 75° 2′ and 79° 30′ W. lon. It is bounded on the N. by Pa., on the E. by Del. and the Atlantic Ocean, on the S., S. W., and W. by Va. and West Va., and on the N. W. by West Va.; extreme length from E. to W., 198 miles, and its width varies from 3 or 4 miles at the narrowest portion to 120 at the widest; area, 12,210 square miles, or 7,814,400 acres.

Seal of Maryland.

Maryland, by census of 1880, ranked 23 among the States in population, 26 in value of agricultural products, and 13 in value of manufactures.

Face of the Country.—The Eastern Shore, lying between Chesapeake and Delaware bays and the Atlantic, is mostly level, and in portions low and swampy. Toward the neck of the peninsula at the N. it is more rocky and broken. The Western Shore, lying between the Potomac River and the Chesapeake Bay, with its principal affluent, the Susquehanna, is, as far N. as the Great Falls of the Potomac, level and sandy, and in some places marshy; above that point it rises in terraces, and soon in broken and rugged hills; and in the region above Rockville it is decidedly mountainous. The Blue Ridge, Laurel Ridge, and the other main ranges of the Alleghanies, five or six in number, pass through the narrow N. W. portion of the State. Washington co., lying between South Mountain and Tuscarora Mountain, is a part of the Cumberland Valley and abounds in beautiful scenery, while its soil is very rich and productive. The mountains in the extreme W. of the State, in Garrett co., are the highest, but none of them exceed 2500 feet in height.

Coast, Bays, Rivers, Lakes, etc.—The Atlantic coast proper is only 33 miles in extent and has no good harbors, but Chesapeake Bay furnishes a coast-line of more than 500 miles. Chesapeake Bay is navigable throughout its whole extent and has numerous excellent harbors. The principal river of the State is the Potomac, which rises in the mountains of West Virginia and flows N. E., E., and S. E. for a distance of about 450 miles, of which nearly 200 are navigable. The other rivers of the State are—on the Western Shore, the Wicomico, Patuxent, South, Severn, Patapsco, Bush, and Susquehanna: on the Eastern Shore, the Pocomoke, Manokin, Nanticoke, Choptank, St. Michael's, Wye, Chester, Sassafras, Elk. To these also belong the so-called Fishing, Honga, and Hudson rivers. Chincoteague Bay, Sinepuxent Bay, and St. Martin's Bay are sounds lying between the Eastern Shore and the island reefs and barriers which receive the Atlantic surf. Pocomoke Sound, Tangier Sound, and Eastern Bay are portions of Chesapeake Bay. There are numerous islands in the bay, the largest of which are Kent, Bloodworth's, Holland's, Smith's, Tangier, Halfmoon, and Assateague.

Mineralogy.—Copper, hematitic iron, chrome iron, and other ores, including galena, manganese, and barytes, are found in the centre of the State; bituminous coal in great quantities in the N. W.: bog-iron ores in the E.; breccia and other marbles and building limestones and sandstones in the central portion of the State. There are also marls, magnesia, honestone, and traces of gold, nickel, and cobalt have been discovered.

Zoology.—The fox, raccoon, and opossum are not uncommon, and bears are found in W. counties; a few deer are left in the mountains, and smaller game is abundant; but the most characteristic of the fauna of Maryland are its birds, fishes, and mollusks. The Baltimore oriole is one of the most brilliant-hued of song-birds; the rice-bird (the Northern bobolink) and many other of the finches and tanagers have their homes for at least a part of the year in Maryland. The number of species of wild-ducks, brant, and teal found in its bays and estuaries is very large, and pigeons, partridges, snipe, quail, etc. are found in the eastern part of the State in immense numbers. Fish are abundant and of excellent quality; the oysters of Chesapeake Bay have the highest reputation for both size and flavor.

Soil and Vegetation.—Among the forest-trees, the gum, cypress, cedar, juniper, dogwood, magnolia, holly, elm, cherry, locust, persimmon, beech, sycamore, poplar, sassafras, red maple, etc. are most abundant in the lowlands, while several species of oak, maple, walnut, hickory, ash, birch, chestnut, pine, and spruce are found in large forests in the mountainous districts. The soil in the E. part of the State is a light sandy loam easily tilled and with a good supply of fertilizers yielding good crops. It is well adapted to peach-culture and to market-garden products. The soil of the valleys of the middle and N. counties is very rich and fertile and yields immense crops of tobacco, wheat, and Indian corn. The mountain-slopes are clothed with forest-trees, and some of them hardly repay cultivation.

Climate.—The climate of Maryland is equable, removed alike from the intense cold of the North and the protracted heat of the South. It is generally healthy, except along the low and marshy lands which border the bay and the lower Potomac, where miasmatic influences are prevalent, and congestive, bilious, intermittent, and remittent fevers occur. Average mean temperature of year, 54.64°. Rainfall, total for year, 48.11 inches (Baltimore).

Agricultural Productions.—The principal crop in Maryland is Indian corn—15,968,533 bushels by census of 1880. Of wheat, 8,004,864 bushels were raised; oats, 1,794,872 bushels; tobacco, 26,082,147 pounds; wool raised, 850,084 pounds.

Farm Animals.—The census of 1880 showed 117,796 horses, 262,540 cattle, 171,184 sheep, and 335,408 swine.

Manufactures.—Extensive manufactures of wood, metals, leather, etc. are established in Maryland. In 1880 the iron and steel manufactures employed 2763 hands, with capital of $4,962,125; wages paid, $905,090; value of product, $4,470,050. Baltimore has heavy packing establishments for canned fruits and vegetables. The coal mined in 1881 was 2,300,000 tons; pig iron produced in 1880, 61,437 tons. Maryland in 1880 had in all manufacturing industries 6787 establishments, employing 74,945 hands; wages paid, $18,904,965: capital invested, $58,742,384; aggregate products, $106,780,563.

Railroads, etc.—Maryland had in operation in 1881, 1012 miles of railway, the principal of which is the great trunk line of the Baltimore and Ohio. The cost of all R. Rs. was $78,627,467; net earnings, $6,008,921, of which $4,548,508 was paid in interest and dividends. The commerce by water is quite large, Baltimore importing, in 1881, commodities to the value of $16,197,404, and exporting $72,444,413, this port ranking third in the country in point of exports. Baltimore receives and ships about 35,000,000 bushels of wheat and 22,000,000 bushels of corn annually. The Chesapeake and Ohio Canal, 184 miles, runs from Cumberland to Georgetown, D. C.

Finances.—The assessed value of property in 1880 was $459,187,408, real and personal; State tax, 18¾ cents on $100, producing $938,463 for State purposes; total taxation, local and State. $5,437.462: State debt, exclusive of sinking fund, $7,243,410; total indebtedness, State and local, $10,896,006.

Banks, etc.—In Oct., 1881, there were 38 national banks in Maryland, with capital of $13,603,030; circulation, $8,605,433; bonds to secure circulation, $9,608,650: deposits, $26,341,596. Of State banks and trust companies there were 14, with $22,904,628 capital and $28.905,215 deposits: savings banks, 15, with deposits of $23,419,173: private bankers, 21, with deposits of $2,432,774. The fire and marine insurance companies paid losses in 1880 of $865,293, and received in premiums $1,395,057.

Churches.—Maryland has about 1800 churches, of which 775 are Methodist Episcopal, with 75,995 members; 168 Protestant Episcopal, with 22,022 members: 131 Roman Catholic, with about 180,000 parishioners; 222 Protestant Methodist, with 13,200 members; 119 Lutheran, with 14,500 members: 51 Baptist, with 9970 members; 43 Presbyterian, with 7375 members; and 24 other sects, having from 50 churches down to 1 each.

Education, etc.—Number of children of school-age (five to twenty years) was 276,120 in 1870; children enrolled in public schools, 1880, 162,431; with average daily attendance of 85,449. Amount expended for public schools, 1880, $1,395,284, of which teachers' salaries absorbed $1,117,145. Of colleges and universities Maryland has 9 (6 of which are Roman Catholic), with 126 instructors and 1436 students, paying tuition fees in 1880 of $13,572. Maryland had, in 1882, 139 newspapers and periodicals, 12 of which were daily.

Population.—In 1860, 687,049: 1870, 780,894; 1880, 934,943 (white 724,693, colored 210,250, including 5 Chinese and 15 Indians).

Principal Cities and Towns, Pop. 1880.—Baltimore, 332,313; Cumberland, 10,693; Frederick, 8659; Annapolis (cap.), 6642; Hagerstown, 6627; Easton, 3005; Havre de Grace, 2816; Salisbury, 2581; Westminster, 2507; Chestertown, 2359; Port Deposit, 1950; Ellicott City, 1784; Elkton, 1752.

COUNTIES.	* Ref.	Pop. 1870.	Pop. 1880.	COUNTY TOWNS.	Pop. 1880.
Allegany	1–B	38,536	38,012	Cumberland	10,693
Anne Arundel	3–F	24,457	28,526	Annapolis	6,642
Baltimore City	2–F	267,354	332,313	Baltimore	332,313
Baltimore Co	1–F	63,387	83,636	Towson	1,316
Calvert	4–F	9,865	10,538	Pr. Frederick T.	
Caroline	3–G	12,101	13,766	Denton	469
Carroll	1–E	28,619	30,992	Westminster	2,507
Cecil	1–G	25,874	27,108	Elkton	1,752
Charles	4–E	15,738	18,548	Port Tobacco	202
Dorchester	4–F	19,458	23,110	Cambridge	2,262
Frederick	2–D	47,572	50,482	Frederick	8,659
Garrett	1–A	......	12,175	Oakland	910
Harford	1–F	22,605	28,042	Bel Air†	6,586
Howard	2–E	14,150	16,140	Ellicott City	1,784
Kent	2–G	17.102	17,605	Chestertown	2,359
Montgomery	2–D	20,563	24,759	Rockville	[illegible]
Prince George's	3–E	21,138	26,451	Up. Marlborough	541
Queen Anne	2–G	16,171	19,257	Centreville	1,196
Saint Mary's	4–E	14,944	16,934	Leonardtown	465
Somerset	5–G	18,190	21,668	Princess Anne	751
Talbot	3–G	16,137	19,065	Easton	3,005
Washington	1–C	34,712	38,561	Hagerstown	6,627
Wicomico	4–G	15,802	18,016	Salisbury	2,581
Worcester	5–H	16,419	19,539	Snow Hill	1,276
Total		780,894	934,943		

History.—The first white settlement was that of William Clayborne, an adventurer from Virginia, who with a party of his followers landed upon Kent Island in Chesapeake Bay in 1631. In 1632 a charter was granted to Cecilius Calvert, second Lord Baltimore; in 1634 he sent out his brother, Leonard Calvert, as governor of the colony, with 200 emigrants. The colonists landed at St. Mary's, and named the colony Maryland, in honor of the queen. Lord Baltimore in organizing his colony had proclaimed religious toleration. In consequence, many who had suffered from religious persecution flocked thither. In 1642 an Indian war commenced. In 1645 there was a rebellion which had its origin in Kent Island; this extended to St. Mary's, and Gov. Calvert was obliged to escape to Virginia. For the next twelve or thirteen years there was constant trouble. A large colony of Puritans, driven out of Virginia, had settled in Maryland, and sought to wrest the colony from its rightful proprietor. In 1649 the assembly passed a law defining religious toleration, which prohibited atheism and all bitter reviling of one sect by another. The Puritans still proved turbulent, but the governor sought to conciliate them by granting them additional land. They increased rapidly in numbers; and when the power in England had passed into the hands of the Commonwealth and the Protector, they insisted on the immediate proclamation of the new order of things. The Calverts objected, but the Puritans were found to be a majority: and in 1652 commissioners from England fully established the authority of the Commonwealth. A civil contest ensued, and the proprietary party led a force against Providence (Annapolis), but were defeated and their whole force killed or captured. This was in Mar., 1655. In 1658, Lord Baltimore regained his proprietary rights, and his brother, Philip Calvert, was appointed governor. The colony began again to thrive. In 1689, King William avowed his intention of assuming the government of the province, and sent over, in 1691–92, Sir Lionel Copley as governor. The capital was removed in 1693 or 1694 from St. Mary's to Providence, which then received the name of Annapolis. In 1714, Benedict Charles Calvert, fourth Lord Baltimore, succeeded to his father's proprietary rights. The colony thenceforward grew rapidly; Baltimore was founded in 1729, Frederick in 1745, and the first newspaper issued in the colony the same year; Georgetown was laid out in 1751. In 1750 the boundary-line between Pennsylvania and Maryland was run by the commissioners, Mason and Dixon. In the two French wars Maryland bore a prominent part: Gen. Braddock's unfortunate expedition was organized in the colony, and from 1754 to 1758 Western Maryland was kept in constant terror by Indian raids. Maryland entered heart and soul into the Revolution of 1776. The constitution adopted by the State Aug. 14, 1776, was retained until 1851. Maryland ratified the Constitution of the U. S. Apr. 28, 1778, by a vote of 63 to 11. In the war of 1812 the State suffered severely. Maryland has been largely engaged in works of internal improvement. The slackwater navigation of the Potomac, the Chesapeake and Ohio Canal, the Baltimore and Ohio Railway, have all been measures in which she has taken a large pecuniary interest. In the late civil war Maryland was peculiarly situated; a slaveholding State, and with large interests in the South, she had also warm and strong attachments to the Union, and was, moreover, the highway to the national capital. At first, like Kentucky, she proposed to take a neutral position, but the attack upon the Massachusetts regiment at Baltimore (Apr. 19, 1861) and the destruction of the R. R. from Annapolis to Washington led to the occupation of Baltimore by Federal troops, and to the suppression of manifestations of sympathy with the South. Very many citizens of Maryland left their homes and joined the Confederate armies, but of those who remained at home a majority were loyal to the Union. One of the greatest battles of the war (that of Antietam, Sept. 17, 1862) was fought on her territory, and several other minor but important engagements, as South Mountain, Monocacy, etc., were also on her soil. Since the war the State has been laboring zealously to recover its commercial prestige and become more firmly bound to the great West. In 1851 its constitution was revised and largely remodelled, and in 1864, and again in 1867, constitutional conventions were held and changes made in its organic law.

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* Reference for location of counties. See map of Md., in DEL.
† Township.

Lords Proprietary and Governors.

Lords Proprietary.

Cecilius Calvert, second Lord Baltimore	1632–75
Charles Calvert, third Lord Baltimore	1675–1715
Benedict Leon. Calvert, fourth Lord Baltimore	1715
Charles Calvert, fifth Lord Baltimore	1715–51
Frederick Calvert, sixth Lord Baltimore	1751–71
Sir H. Harford, last proprietary	1771–76

Governors appointed by the Lords Proprietary.

Leonard Calvert	1633-47
Thomas Greene	1647–49
William Stone	1649–54
Commis. under Parl	1654–58
Josiah Fendall	1658–61
Philip Calvert	1661–62
Charles Calvert	1662–67
Charles, third Lord Balt.	1667–78
Thomas Notley	1678–81
Charles, third Lord Balt.	1681–85
Wm. Joseph, president of Deputies	1685–89
Conven. of Prot. Asso	1689–92

Royal Governors.

Sir Lionel Copley	1692–93
Sir Edmond Andros	1693–94
Francis Nicholson	1694–99
Nath. Blackistone.	1699–1703
Thomas Tench, pres	1703–04
John Seymour	1704–09
Edward Lloyd, pres	1709–14
John Hart	1714–15

Proprietary Government.

John Hart	1715–20
Charles Calvert	1720–27
Benedict Leon. Calvert	1727–32
Samuel Ogle	1732–33
Charles, fifth Lord Balt.	1733–35
Samuel Ogle	1735–42
Thomas Bladen	1742–47
Samuel Ogle	1747–52
Benjamin Tasker, pres.	1752–53
Horatio Sharpe	1753–69
Robert Eden	1769–74

The Revolution.

The Convention and Council of Safety	1774–76

State Government (1777–1838), Annual Elections.

Thomas Johnson	1777–79
Thomas Sim Lee	1779–82
William Paca	1782–85
William Smallwood	1785–88
John Eager Howard	1788–91
George Plater	1791–92
Thomas Sim Lee	1792–94
John H. Stone	1794–97
John Henry	1797–98
Benjamin Ogle.	1798–1801
John Francis Mercer	1801–03
Robert Bowie	1803–06
Robert Wright	1806–09
Edward Lloyd	1809–11
Robert Bowie	1811–12
Levin Winder	1812–15
C. Ridgely of Hampton	1815–18
Charles Goldsborough	1818–19
Samuel Sprigg	1819–22
Samuel Stevens, Jr	1822–25
Joseph Kent	1825–28
Daniel Martin	1828–29
Thomas King Carroll	1829–30
Daniel Martin	1830–31
George Howard (acting)	1831–32
George Howard	1832–33
James Thomas	1833–35
Thomas W. Veazey	1835–38

Const of 1838, Three-year Terms.

William Grayson	1838–41
Francis Thomas	1841–44
Thomas G. Pratt	1844-47
Philip F. Thomas	1847–50
Enoch Lewis Lowe	1850–53

Const. of 1851, Four-year Terms.

Thomas Watkins Ligon	1853–57
Thos. Holliday Hicks	1857–61
Augustus W. Bradford	1861–65

Const. of 1864, Four-year Terms.

Thomas Swann	1865–69

Const. of 1867, Four-year Terms.

Oden Bowie	1869–72
Wm. Pinckney White	1872–75
J. B. Groome	Mar. 1875–Jan. 1876
John Lee Carroll	1876–80
Wm. T. Hamilton	1880–84
Robert M. McLane	1884–85
Henry Lloyd (acting)	1885–86

HENRY STOCKBRIDGE. REVISED BY A. R. SPOFFORD.

Maryland and Delaware Canal. See SHIP-CANALS.

Ma′rysville, city and R. R. centre, cap. of Yuba co., Cal. (see map of California, ref. 3–B, for location of county), at the junction of the Feather and Yuba rivers, and on the Oregon division of the Central Pacific R. R., 52 miles N. of Sacramento, was incorporated in 1851; is well laid out, supplied with gas and water, has several graded public and private schools and academies, a high school, a foundry and machine-shop, flouring-mills, woollen, carriage, and other factories. Pop. of city in 1870, 4738; in 1880, 4321.

Marysville, Marion co., Ia. (see map of Iowa, ref. 6–H, for location of county), has a large woollen-mill. Vast beds of coal underlie this place, and many also are found throughout the county, having veins from 5 to 8 feet in thickness. Pop. in 1870, 266; in 1880, 340.

Marysville, city and R. R. junction, cap. of Marshall co., Kan. (see map of Kansas, ref. 4–H, for location of county), on the E. bank of the Big Blue River, here crossed by a fine bridge. A stone dam has been built, utilizing for mills the fine water-power of the river. Pop. in 1870, 300; in 1880, 1249.

Marysville, city and R. R. junction, cap. of Union co., O. (see map of Ohio, ref. 4–E, for location of county), 28 m. N. W. of Columbus. Pop. in 1870, 1441; in 1880, 2061.

Maryville, city and R. R. junction, cap. of Nodaway co., Mo. (see map of Missouri, ref. 1–D, for location of county), 45 miles N. of St. Joseph. Principal business, farming and stock-raising. Pop. in 1870, 1682; in 1880, 3485.

Maryville, on R. R., cap. of Blount co., Tenn. (see map of Tennessee, ref. 6–I, for location of county), is the seat of Maryville College (Presbyterian). Pop. in 1870, 811; in 1880, 1098.

Masac′cio [true name TOMMASO GUIDI; nicknamed *Tommasacchio* or "Hulking Tom," shortened to MASACCIO], b. at Castel S. Giovanni in 1402: said to have d. in Rome in 1429. Of his personal life little or nothing is known, but his genius left its mark on the work of the greatest masters. In regard to the pieces that may safely be attributed to him there has been much dispute. The frescoes in the Brancacci chapel at Florence are with most confidence traced to his hands. They represent the story of Eden, the fall and expulsion of Adam and Eve, and scenes in the life of St. Peter. Masolino was formerly credited with a considerable portion of those pictures, but it is doubtful whether he had any part in them at all. Less doubtful is the share of Filippino Lippi; to him belongs, for instance, the figure of St. Paul in the representation of Peter and Paul in prison. In the cloister of S. Maria del Carmine at Florence there is a remarkable fresco by Masaccio. Others are at San Clemente. The paintings in the Uffizi at Florence and in other European galleries are of doubtful genuineness. The few specimens of Masaccio's art that remain show him to have been a man of genius, a student of nature and life, a strong draughtsman and colorist, a thoughtful, poetic mind. In the development of art Masaccio holds a distinguished place. He came closer to nature than any of his contemporaries, both in the representation of the nude form and in the rendering of a landscape. Indeed, his *Expulsion from the Garden of Eden*, in the Brancacci chapel, made such an impression upon Raphael that he adopted as his own and employed it with very slight modifications in one of the Loggie of the Vatican.

Masada, a fortified town of Palestine, on the western shore of the Dead Sea, S. of Engedi, was built by Jonathan Maccabæus, and so much strengthened by Herod the Great that it was considered impregnable. In the Jewish war, however, it was taken by the Romans under Flavius Silva; but before the enemy entered the city the whole garrison, including women and children, and comprising about a thousand persons, had killed themselves. (See the stirring account of Josephus, *Jewish War*.)

Masaniel′lo (TOMMASO **Aniello**), a fisherman of Sorrento, who in 1647 excited a popular insurrection in Naples against the duke of Arcos, the Spanish viceroy. Some state that the immediate cause of the tumult was the imposition of a new and oppressive tax; others, an attempt to establish the Inquisition as a means of extirpating the Reformed religion, then in great favor in this city. It is certain that the previous forty years of Spanish misrule had exasperated all classes, and though the duke of Arcos had pursued in some respects a wiser policy than his predecessors, yet the Neapolitans, crushed by taxes and maddened by famine, only waited for an occasion and a leader. This leader was found in Masaniello, who (stung to fury by indignities offered his wife for attempting to smuggle a few handfuls of flour) at the moment when the authorities were fixing on the doors of the duomo the detested inquisitorial brief tore it down amidst the applause of the bystanders, and soon after raised the cry, *Morte al mal governo!* In an instant the whole population, even to the women and children, were in arms; the Spanish authorities were maltreated, the soldiers successfully resisted, and after great loss of life among the Spaniards the insurgents obtained from the terrified viceroy the revocation of the order for the Inquisition, the abolition of many cruel taxes, and a full pardon for all who had taken part in the rebellion. Whether Masaniello was really frenzied by his great success, or whether his enemies were crafty enough to magnify his excesses into insane crimes, it is now difficult to say; but, at any rate, the populace itself rose against him soon after his triumph, and he was assassinated on July 17, 1647.

Masay'a, town of Nicaragua, Central America, beautifully situated near the lake and the volcano of the same name, is well built, with broad, airy streets planted with trees. The surrounding district is very fertile and well cultivated. The last eruption of the volcano took place in 1670, but since 1860 it has begun to emit smoke. Pop. 15,000, most of whom are Indians.

Masca'li, town of Sicily, province of Catania, lying in a fold of Etna about 2½ miles from the sea. The soil of the neighborhood is altogether volcanic and extremely fertile. Pop. in 1874, 5047.

Mascalonge, or **Muskinunge** [believed to be the Fr. *masque allongé*, "long face"], the largest, finest, and best-flavored fish of the pike family, the *Esox nobilior* of the St. Lawrence basin, but now introduced by canals and the hands of man into several other streams. It is sometimes more than four feet long, and has been known to weigh sixty pounds. It is an extremely bold and vigorous biter, and is caught by the hook or the net. (See also PIKE.)

Mascara', town of Algeria, province of Oran, occupies the site of an old Roman colony on the slope of the Atlas Mountains, among fertile and well-cultivated surroundings. Pop. 9240.

Mascarene' (JEAN PAUL), b. at Castres, France, in 1684, of a Huguenot family; was educated at Geneva; naturalized in England 1706; entering the army as lieutenant, came with the English troops to Nova Scotia in 1711, and remained there nearly fifty years, becoming a member of the council 1720; was associated with the governors of Massachusetts and New Hampshire in negotiating the celebrated treaty of 1725 with the eastern Indians; was acting governor of Nova Scotia 1740–49; defended the province against the French 1744; became major-general 1758, and d. at Boston, Mass., Jan. 22, 1760.

Mascarene Isles, the collective name comprising the islands of BOURBON, RODRIGUES, and MAURITIUS (which see) in the Indian Ocean. The name is derived from Garcia Mascarentas, a Portuguese navigator who discovered the islands in 1505. Mauritius and Rodriques belong to Great Britain; Bourbon belongs to France.

Mascaron (JULES), b. at Aix in Mar., 1634, was by his father, who was an advocate, destined for the bar, but preferred the Church, entered the order of the Oratorians, and very early acquired a great name as a preacher. By François de Harley, archbishop of Rouen, before whom he delivered a funeral *oraison* on the queen-mother, Anne of Austria, which afterward became very famous, he was introduced to the court. He pleased Louis XIV., and was appointed Lent preacher at Versailles, afterward bishop of Tulle in 1671. and in 1678 bishop of Agen, where he d. Nov. 20, 1703. His eloquence belongs to a somewhat older school than that of Bossuet. It is sometimes stronger, but often, also, coarser. A collection of *Oraisons funèbres* was published in Paris (1704).

Mascou'tins, a tribe of Indians of the Algonkin family, who were in the seventeenth century among the most prominent in the region of the upper lakes. They were allies of the Miamis, Foxes, and Kickapoos, and enemies of the Ottawas, the "Neutral Nation," and the French. In 1669 they lived on Wisconsin River, but afterward settled on the Ohio, within the present limits of Indiana. They attacked Col. Croghan on the Wabash in 1765 and Col. Clarke in 1777. They have not since been known by name to the government of the U. S., and it is uncertain which of the numerous petty tribes now removed to Kansas are the representatives of the ancient Mascoutins. If, as is stated by some writers, Mascoutin means "prairie," the name ceases to be a tribal designation, and their disappearance from notice cannot be surprising.

Maseres (FRANCIS). See MAZERES.

Mashe'na, town of Central Africa, in Bornoo, is built on a fine slope, in lat. 13° 3′ N., lon. 10° 2′ E., and surrounded with clay walls. Pop. about 12,000.

Masinissa, or **Massinissa,** king of the Massylians, one of the most powerful Numidian tribes, b. about 240 B. C., a son of Gala. Hasdrubal having promised to give him his daughter Sophonisba in marriage, he attacked the Massæsylians, another powerful Numidian tribe, which in the struggle between Rome and Carthage sided with Rome; defeated their king, Syphax, in 213; crossed over to Spain and fought with success against Cneius and Publius Scipio. But when Hasdrubal broke his promise and gave his daughter to Syphax in order to win him over from the Romans, Masinissa turned around and attacked Carthage. In the beginning he was very unsuccessful, but when (in 204) Scipio landed in Africa, Masinissa entered into a firm alliance with him, routed the Massæsylians, fought with great distinction in the battle of Zama, and received by the peace of 201 the territories of Syphax. Sophonisba, who in the course of the war had become his prisoner, he now married, but Scipio, fearing her influence on her husband, demanded her as a Roman captive, and Masinissa, not venturing to refuse, sent her a cup of poison, which she drank. Steadily extending his dominions at the expense of Carthage, he occasioned the Third Punic war, but d. before its close, 148 B. C. Numidia was then divided between his three sons, of whom the youngest, Mastanabal, was the father of Jugurtha.

Mask [Med. Lat. *masca*]. Masks were used by the Greeks from the remotest times at their festivals in honor of Bacchus; and as the Greek drama, both tragedy and comedy, was a direct development of these festivals, masks became a constant part of the Greek actor's costume. They were made of bark, paper, leather, and wood, formed so as to express the different tragical or comical characters, provided in the mouth-openings with a metallic contrivance for the purpose of strengthening the voice of the actor, and covered not only the face, but the whole head. The peculiar character of the Greek drama, far behind the modern with respect to individualization, made the use of masks less inappropriate, and it became almost necessary on account of the enormous size of the theatres. Masks were used also in the Roman *atellanæ*, and from these they were transferred through the Roman theatre down to the Middle Ages, during which they were used not only in popular merry-making and in *commedia dell' arte*, but also in solemn processions and by the performers of the mysteries; at some places—for instance, at Venice—they became of common usage even in ordinary life, like gloves in our days. A peculiar species of literary production called *masques*, consisting of dialogues, songs, dances, processions, and gorgeous decorations, and performed by the court itself, became very fashionable in France under Louis XIV. and in England under James I.; Molière and Ben Jonson have written many masques. (See Donaldson, *The Theatre of the Greeks;* Flögel, *Geschichte des Komischen;* and Sand, *Masques et Bouffons.*)

Mask, Iron. See IRON MASK.

Maskell (WILLIAM), b. at Bath, England, in 1814, was educated at University College, Oxford, took orders in 1837, and was instituted to the rectory of Carscombe, Dorset, in 1842. In 1846 he resigned that position, and in the following year he was appointed chaplain to the bishop of Exeter and instituted to the vicarage of St. Mary's church, Devon. When the "Gorham case," in which Mr. Maskell took an active and prominent part, was decided by the judicial committee of the privy council, early in 1850, he resigned all his preferments and was received into the Roman Catholic Church. He has written *The Ancient Liturgy of the Church of England* (1844), *The History of the Martin Marprelate Controversy* (1845), *Monumenta Ritualia Ecclesiæ Anglicanæ* (1846–47), *A Dissertation on Holy Baptism* and *An Inquiry into the Doctrine of the Church of England upon Absolution* (1848), *Letters on the Position of the High-Church Party in the Church of England* (1850), etc. After his conversion to Romanism he published *Odds and Ends*, a collection of short stories (1872), *A Dissertation on Ancient and Mediæval Ivories*, and *What is the Meaning of the Infallibility of the Pope?* His excellent collection of English rituals and service-books, and also his ancient and mediæval carvings in ivory, were purchased by the British Museum.

Mas'kelyne (NEVIL), D. D., b. in London, England, Oct. 6, 1732; graduated at Cambridge 1754; took orders in the Church of England; became a fellow of the Royal Society in 1758; was sent to St. Helena in 1761 to observe the transit of Venus, and to Barbadoes in 1762 to experiment with and report upon Harrison's chronometers; succeeded Nathaniel Bliss as astronomer-royal 1765, which post he retained through life, never absenting himself from the Greenwich Observatory except once in 1772, when he went to Scotland to experiment upon the aberrations of the plumb-line as affecting the mean density of the earth. He published *The British Mariner's Guide* (1763), the *Nautical Almanac and Astronomical Ephemeris* (46 vols., annual 1767–1811), a *Standard Catalogue of Stars, Astronomical Observations made at Greenwich from 1765 to 1810* (4 vols.), and many papers in the *Philosophical Transactions*. D. at Greenwich Feb. 9, 1811.

Masolino da Panicale, a famous fresco-painter, was born at or near Florence, Italy, in 1383. About 1423 he entered the service of Filippo Scolari, who was a Florentine born, obergespan of Temeswar, Hungary. Masolino returned to Italy about 1427. He is said to have been a pupil of Starnina, though his style was mainly influenced by Antonio Veneziano, and he probably became the teacher of the famous painter Masaccio. Among Masolino's paintings is a series of frescoes in the church of Castiglione d'Olona, near Milan, the subject of which is taken from the lives of the Virgin and of Sts. Lawrence and Stephen. He also painted frescoes in the adjoining baptistery of the above church, illustrating the life and death of St. John the Baptist. Masolino d. about 1440.

Mason, city, on R. R., cap. of Ingham co., Mich. (see map of Michigan, ref. 7–J, for location of county), 12 miles S. of Lansing, has several large mills, etc. Pop. in 1870, 1212; in 1880, 1809; in 1884, 1882.

Mason, cap. of Mason co., Tex. (see map of Texas, ref. 4–G, for location of county), 95 miles W. N. W. of Austin. Pop. in 1870, 296; in 1880, 575.

Mason, Mason co., W. Va. (see map of West Virginia, ref. 4–B, for location of county), opposite Pomeroy, O., on the S. bank of the Ohio River, has manufactures of nails, and of salt from the waters of artesian wells. Coal is mined and shipped. Pop. in 1870, 1182; in 1880, 1186.

Mason (Gen. Armistead Thomson), son of S. T. Mason, b. in Loudoun co., Va., in 1787; graduated at William and Mary College 1807; served as colonel of a cavalry regiment in the second war with England; distinguished himself in the defence of Norfolk; was subsequently brigadier-general of Virginia militia; served some years in the Virginia legislature; was chosen U. S. Senator in 1815 as a Democrat; served until 1818, when he resigned to become a candidate for the House of Representatives against the eminent Federalist, Charles Fenton Mercer; was defeated by a few votes in a contest of great personal bitterness, which led to several duels, in one of which, fought with muskets at Bladensburg, Md., with his cousin, Col. John Mason McCarty, he was killed, Feb. 6, 1819.

Mason (Charles), F. R. S., b. in England about 1730; was assistant for several years at Greenwich Observatory to the celebrated astronomer-royal, Dr. James Bradley, and afterwards to his successors, Dr. Nathaniel Bliss and Dr. Nevil Maskelyne; and with Mr. Jeremiah Dixon was sent to the Cape of Good Hope to observe the transit of Venus of June 6, 1761, while Dr. Maskelyne proceeded with them to St. Helena for the same purpose. In 1763, Messrs. Mason and Dixon were commissioned by the proprietors of Pennsylvania and Maryland to survey the boundary-line between their American possessions; arrived at Philadelphia Nov. 13, and were engaged upon this task until Dec. 26, 1767. (See Mason and Dixon's Line.) On Oct. 24, 1765, the council of the Royal Society resolved "that the precise measure of a degree of latitude in America, in the neighborhood of Pennsylvania, appears to the council and to the astronomer-royal, who was pleased to assist on this occasion, to be a work of great use and importance; and that the known abilities of Messrs. Mason and Dixon, the excellence of the instruments with which they are furnished, the favorable level of the country, and their having assistants well practised in measuring, do all concur in giving good ground for hope that this business may now be executed with greater precision than has ever yet been done, etc.;" and consequently granted those gentlemen the sum of £200 for that purpose, requesting the astronomer-royal (Dr. Maskelyne) to draw up instructions, and the proprietors of Maryland and Pennsylvania to allow the use of their instruments. These gentlemen cheerfully complied with the request, and Messrs. Mason and Dixon employed a month in the following year in executing the measurement in question, the particulars of which are printed in vol. lviii. of the *Transactions* of the Royal Society. In the same volume are found some *Astronomical Observations made at the Forks of the Brandywine*, made for the purpose of "determining the going of a clock sent thither by the Royal Society in order to find the difference of gravity between the observatory at Greenwich and the spot where the clock was set up in Pennsylvania." To this is added an *Observation of the End of the Eclipse of the Moon* and *Some Immersions of Jupiter's First Satellite*, observed at the same place.

Charles Mason was a trained scientific observer, and recorded in his private journal, interspersed with the original field-notes of the survey, not only the adventures, haps, and mishaps of each day's proceedings, with the name of every halting-place and that of every person whose hospitality he shared, but frequent accounts of the flora and fauna, the geological structure, and the agricultural capabilities of the country traversed, as well as interesting notices of the Mohawk, Seneca, Delaware, and other Indians who served as his escort or with whom he met on his route. He dwells with enthusiasm upon the beauties of the scenery as viewed from the Alleghany Mountains, and gives a tolerably correct account of the Mississippi Valley as obtained from "Prince Prisquetoom," who was eighty-six years of age, and a brother of the "king of the Delawares." Messrs. Mason and Dixon embarked at New York for Falmouth Sept. 9, 1768. Dixon d. at Durham, England, in 1777. Mason observed the transit of Venus of June 3, 1769, at Cavan, Ireland, and published his observations in the *Philosophical Transactions* for 1770; was employed by the bureau of longitudes to verify the celebrated *Lunar Tables* of Tobias Mayer, in which he made some changes and corrections, and they were published after his death by Dr. Maskelyne under the title *Mayer's Lunar Tables, improved by Charles Mason* (London, 1787). Mason returned to America, but at what date is unknown, and d. at Philadelphia in Feb., 1787. His MS. journal and field-notes, from which the preceding account is chiefly drawn, was found at Halifax, N. S., in 1860, among a pile of waste paper flung into the cellar of the government house, whence it was rescued by a gentleman of that city. A brief notice of its contents was published by the writer of this article in the *Historical Magazine* for July, 1861.

Porter C. Bliss.

Mason (Charles), b. in New York about 1808; graduated from the U. S. Military Academy in 1829, but retained as assistant professor of engineering until 1831, when he resigned from the army and commenced the practice of law at Newburg, N. Y., removing to New York City in 1834, where for a time he had the editorial management of the *Post*. In 1837 he removed to Wisconsin Territory, and in 1838 was appointed chief-justice of the supreme court of Iowa, which he held until the admission of Iowa into the Union, when for several years he was State attorney to settle the question of boundary-lines, and one of the commissioners which drew up the code of laws adopted by the State in 1851; was commissioner of patents during the administration of Pres. Pierce: Democratic candidate for governor of Iowa in 1867. D. Feb. 25, 1882.

Mason (Ebenezer Porter), b. at Washington, Conn., Dec. 7, 1819; graduated at Yale College 1839, distinguishing himself as a mathematician and astronomer; was engaged in the summer of 1840 as a member of the commission for determining the boundary between Maine and Canada, and published soon afterwards a paper entitled *Observations on Nebulæ*, which was highly commended by Sir John Herschel. This precocious astronomical genius d. at Richmond, Va., Dec. 24, 1840, a few days after attaining the age of twenty-one. (See his *Life and Writings*, by Prof. Denison Olmsted.)

Mason (Erskine), D. D., youngest child of Dr. John M. Mason, b. in New York City Apr. 16, 1805; graduated at Dickinson College in 1823; joined Princeton Seminary in 1824; was pastor of the Presbyterian church in Schenectady from 1827 to 1830, and of the Bleecker street church in New York from 1830 till his death, May 14, 1851. From 1836 to 1842 he discharged the duties of professor of ecclesiastical history in Union Theological Seminary. He was an argumentative preacher of great power. A posthumous volume of his sermons, with a brief memoir of the author by Dr. William Adams, was published in 1853.

R. D. Hitchcock.

Mason (Francis), D. D., b. in York, England, Apr. 2, 1799; came to the U. S. in 1818; worked as a shoemaker in several towns of Massachusetts; became connected with the Baptist church at Canton, Mass., about 1825; married there; studied ancient languages under the guidance of his minister; entered Newton Theological Seminary in 1827, and was sent in 1830 as a missionary to Burmah. He devoted himself chiefly to the Karens, among which tribe he had wonderful success, and with the aid of other missionaries made many thousands of converts among that wild but simple-hearted tribe. He translated the Bible into two Karen dialects, as well as numerous other religious books, educated many native preachers, prepared a work on the natural productions of Burmah (1852) which contained a very valuable addition to the then existing scientific data on the subject, published a grammar, chrestomathy, and vocabulary of the Pali language, a *Life of Ko-Thah-Byu, the Karen Apostle*, a memoir of his wife, Mrs. Helen M. Mason (1847), a *Memoir of San Quala*, another Karen convert (1850), *Burmah, its People and Natural Productions* (1860), being a revised edition of his earlier work on the same subject, and an autobiography, *The Story of a Workingman's Life, with Sketches of Travel* (1870). D. at Rangoon, Burmah, Mar. 3, 1874.

Mason (George), a celebrated Virginian patriot of the American Revolution, descended from Col. George Mason, a member of Parliament in the reign of Charles I., and officer in the army of Charles II. at the battle of Worcester, after which he escaped to Virginia in disguise, losing all his estate in England. His great-grandson, also called George, married Anne Thomson, a niece of Sir William Temple, by whom he had two sons who attained distinction, George and Thomson. The former, b. at Doeg's Neck, Stafford (now Fairfax) co., Va., in 1726, settled after his marriage in Truro parish (which includes Mount Vernon), built Gunston Hall on the banks of the Potomac, and became the intimate friend of Washington, his neighbor and fellow-parishioner at Pohick church. Possessing considerable historical knowledge and legal attainments, as well as liberal sentiments, fine powers of reasoning, and a sound judgment, Mason was a valuable adviser to the future leader of the Revolution, for whom he drafted the "non-importation resolutions" which the latter presented to the Virginia assembly, and procured their adoption 1769. One of these resolutions pledged the Virginia planters to purchase no slaves imported after Nov. 1 of that year. In support of the political rights of the "Old Dominion," Mason printed a pamphlet entitled *Extracts from the Virginia Charters, with Some Remarks upon them*, and at a meeting of the people of Fairfax, July 18, 1774, he presented a series of twenty-four resolutions on the questions at issue between Great Britain and the colonies, which were sanctioned by the Virginia convention in August, and substantially reaffirmed by the Continental Congress in October of the same year. In 1775 he was a member of the Virginia convention, declined an election to the Continental Congress, which was pressed upon him, nominated Francis Lightfoot Lee in his place, and reluctantly consented to serve as a member of the committee of safety. In May, 1776, he drafted the celebrated "Declaration of Rights" and the "Plan of Government," which were adopted June 12 and 29. In the revision of the statutes of Virginia his liberal sentiments were conspicuous, and his talents in debate elicited universal admiration. He was a member of the Continental Congress 1777, and of the convention for framing the Federal Constitution 1787. In the latter body Mason took a conspicuous part, proposing that the election for President should be direct, and for a single term of seven years, opposing the postponement of the repeal of the slave-trade, the counting of slaves as a basis for representation, and the establishment of a property basis for suffrage. Despite his efforts, several features which he considered dangerous were incorporated in the Constitution, which he consequently refused to sign; and having been elected to the Virginia convention to consider that instrument, he united with Patrick Henry in demanding its rejection unless some twenty amendments should be made. Several of these were subsequently adopted by the States and incorporated into the Constitution. He was chosen one of the first Senators from Virginia, but declined the post, and spent the remainder of his life in retirement, occupied in hunting, fishing, and congenial studies. D. at Gunston Hall Oct. 7, 1792. His statue is one of the group which surrounds that of Washington in front of the State Capitol at Richmond, Va.

PORTER C. BLISS.

Mason (Col. JAMES L.), b. at Providence, R. I., 1817; graduated at West Point, and appointed brevet second lieutenant of engineers July, 1836, first lieutenant 1838, captain 1847; engaged in the usual routine duty of an engineer officer till 1846, when he was assigned to duty with the army under Scott, which captured Vera Cruz and marched to the city of Mexico, gaining the brevet of major for Churubusco and lieutenant-colonel for Molino del Rey, receiving severe wounds in the latter fight which disabled him from active service until 1850, at which date he resumed duty with his corps in building the St. Augustine sea-wall, repairing Fort Marion, Florida, and at the time of his death was engaged in the construction of the defences of San Francisco. D. Sept. 5, 1853, at San Francisco, Cal. Author of *An Analytical Investigation of the Resistance of Piles to Superincumbent Pressure*, and other professional papers.

Mason (JAMES MURRAY), grandson of George, b. at Analosta Island, Fairfax co., Va., Nov. 3, 1798; graduated at the University of Pennsylvania in 1818; studied law at William and Mary College; began practice in 1820; was prominent in the State legislature; a member of Congress 1837–39; U. S. Senator 1846–61, and was the author of the Fugitive Slave law; entered in 1861 the Confederate Congress, and was sent with John Slidell as a commissioner to England and France; was taken off the British steamer Trent by Capt. Wilkes Nov. 8, 1861, and confined in Fort Warren, near Boston, Mass.; released on the demand of the British government Jan. 2, 1862, and proceeded upon his mission to Europe. D. near Alexandria, Va., Apr. 28, 1871.

Mason (JEREMIAH), LL.D., b. at Lebanon, Conn., Apr. 27, 1768; graduated in 1788 at Yale College; was admitted in 1791 to the Vermont bar; practised law at Westmoreland, N. H., until 1794; at Walpole, N. H., 1794–97; at Portsmouth, N. H., 1797–1832; after which he resided in Boston. He was for many years one of the ablest lawyers of New England. In 1802 he became attorney-general of New Hampshire; several times elected to the legislature, and U. S. Senator 1813–17. D. at Boston Oct. 14, 1848.

Mason (Capt. JOHN), founder of the colony of New Hampshire, b. at Lynn Regis, Norfolk, England; served in 1610 in the navy against an insurrection in the Hebrides; went in 1616 as governor to Newfoundland, of which he published a description (1620) and a map (1626); explored in 1617 the New England coasts; obtained in 1622 a grant of a region called Mariana, now the N. E. part of Massachusetts; procured in 1622, with Sir Ferdinando Gorges, a patent for the province of Maine; sent in 1623 a colony to the Piscataqua River. Mason was 1624–29 treasurer and paymaster of the royal armies in the Spanish war. In 1629 he took a patent for the New Hampshire colony, and with Gorges took another patent for Laconia, a tract including Lake Champlain. Capt. Mason held various important positions in England. In 1635 he was a judge in Hampshire, and was appointed vice-admiral of New England. D. in London in Dec., 1635. Mason's rights in New Hampshire were sold to Gov. Samuel Allen in 1691, and proved a fruitful source of litigation to that gentleman and his heirs.—JOHN TUFTON MASON, one of John Mason's heirs, in 1746 sold his own rights to a Portsmouth company called the Masonian proprietors.

Mason (JOHN), b. in England about 1600; served in the Netherlands under Sir Thomas Fairfax; was one of the first settlers of Dorchester, Mass., 1630, and one of the founders of Windsor, Conn., 1635; was commissioned in 1637 to command an expedition against the Pequot Indians, who had massacred several settlers at Wethersfield, and with a party of 90 English, 70 friendly Mohegans under Uncas, and several hundred Narragansett warriors under Miantonomoh, he surprised one of the Pequot forts on Mystic River, between Groton and Stonington, before daybreak May 26, 1637, and destroyed more than 500 Indians, either by the sword or by the burning of the fort, his own loss being 2 killed and 20 wounded. Soon afterwards he killed or captured most of the remaining members of the tribe in another expedition in Western Connecticut. Mason was appointed major of the Connecticut forces, retaining that office through life; settled first at Saybrook, and in 1659 at Norwich; was for many years a magistrate, and was deputy governor 1660–70. At the request of the general court he published an account of the Pequot war, reprinted by Increase Mather 1677, and by Prince 1736. D. at Norwich in 1672. (See his *Life*, by George E. Ellis, in Sparks's *Am. Biog.*, 2d series, vol. iii.)

Mason (JOHN MITCHELL), D. D., son of John (1734–92), b. in New York Mar. 19, 1770; graduated at Columbia College in 1789, and studied at the University of Edinburgh; succeeded his father in an Associate Reformed pastorate in New York in 1792; founded in 1804 a theological seminary in New York, in which he became professor of theology. He was provost of Columbia College 1811–16, president of Dickinson College 1821–24, and in 1822 united with the Presbyterian Church. D. in New York Dec. 26, 1829. (See his *Works*, edited by E. Mason (4 vols., 1832), and his *Memoirs*, by J. Van Vechten, D. D., 1856.) Dr. Mason was one of the first pulpit-orators of his time.

Mason (JOHN Y.), LL.D., b. at Greensville, N. C., Apr. 18, 1799; graduated at the University of North Carolina in 1816; became a lawyer, and served long in the State legislature, and became a judge in the district court of Virginia; was in Congress 1831–37; became in 1837 a judge of one of the Federal courts; was in the Virginia constitutional conventions in 1828 and 1849; became secretary of the U. S. navy 1846–49; was U. S. minister to France 1854–59. D. in Paris Oct. 3, 1859.

Mason (JONATHAN), b. at Boston, Mass., Aug. 30, 1752; graduated at Princeton 1774; studied law under John Adams; was admitted to the bar 1777; delivered the official oration before the authorities of Boston Mar. 5, 1780, on the tenth anniversary of the "Boston massacre," of which he had been a witness; took a high position at the Boston bar; served repeatedly in the State legislature; was a member of the governor's council 1798; U. S. Senator 1800–03; took a prominent part in the debates of the Senate, especially in that upon the repeal of the Judiciary act of 1801; was Representative in Congress from 1817 to 1820, when he resigned. He was an active and energetic politician of the Federalist party, and possessed great dignity of character and manners. D. at Boston Nov. 1, 1831.

Mason (Lowell), Mus. Doc., b. in Medfield, Mass., Jan. 8, 1792; began his career as instructor and leader of choirs in Savannah, Ga., 1812; in 1821 published the *Handel and Haydn Collection of Church Music;* removed to Boston in 1827, and gave himself entirely to the task of instructing classes in vocal music and encouraging the public taste for music. To him Massachusetts is indebted for the introduction of music into the public schools. His labors soon became arduous and extensive; his zeal was felt throughout New England; the Academy of Music was established in Boston; by means of classes, schools, lectures, institutes, textbooks, glee-books, collections for family and Sunday use, a practical interest in the subject was awakened even in the Middle States. The musical education of the people was Mr. Mason's object, and to this end he encouraged congregational singing in churches and the use of simple compositions in which mass of sound was effective. His own compositions were numerous, and his compilations exceeded in number those of any other man. Of juvenile collections, glee-books, compilations of church music there are more than forty that bear his name, either alone or in association with George J. Webb. Besides these there were several small books and single pieces. In 1837, Mr. Mason visited Europe to study on the Continent and in England the latest methods of musical instruction, and whatever he found he adopted and used. In 1855 the University of New York conferred on him the degree of doctor in music, the first instance of the kind in America. Mr. Mason did more to make the practice of vocal music popular than to raise the standard of musical culture, and long before his death, Aug. 11, 1872, the influence of his school had yielded to the power of more finished art. Still, his work was of great value in its time. O. B. Frothingham.

Mason (Stevens Thomson), b. at Chapawasick, Stafford co., Va., in 1760; was educated at William and Mary College; served in the Revolution, becoming a colonel when twenty years old, and afterwards a general officer; was a prominent member of the Virginia convention of 1788, U. S. Senator 1794–1803, and had great fame and popularity as an orator. D. at Philadelphia May 10, 1803.

Mason (Stevens Thomson), b. in Loudon co., Va., in 1811, a son of Gen. John T. Mason and grandson of S. T. Mason; when nineteen years old became secretary of Michigan Territory; was acting governor 1834–35; governor of the State 1836–40. D. in New York Jan. 4, 1843.

Mason (Thomson), brother of George, b. in Virginia in 1730; studied law in London; took an active part in opposing British aggressions, writing in 1774 a series of papers in favor of resistance; was in 1778 a member of the supreme court of Virginia; was appointed one of the revisers of the laws of Virginia, and was a member of the legislature in 1779 and 1783. D. in 1785.

Mason (William), b. at Hull, England, in 1725; graduated at the University of Cambridge 1745; became a fellow of Pembroke College 1747; took orders in the Church of England 1754; became royal chaplain and canon of York; wrote *Isis* (1748), a poem directed against Jacobitism in the university; *Elfrida* (1752) and *Caractacus* (1759), both dramatic poems, which were represented with moderate success; and *The English Garden*, a poem in four books (1772–82). Mason was a tasteful musician and painter and a correct poet, but will be best remembered as the intimate friend, executor, and biographer of the poet Gray—*Memoirs of Gray* (1775). D. at London Apr. 7, 1797. His *Works* appeared in 1811.

Mason and Dixon's Line, the line which forms the southern boundary of Pennsylvania, separating it from Delaware, Maryland, and Virginia. From the celebrity which this term acquired during the anti-slavery agitation as a synonym of the divisory line between free and slave territory, it has been generally confounded in Europe (and not unfrequently in America) with the parallel of 36° 30′, fixed by the "Missouri compromise" of 1820 as the northern limit for the extension of slavery into the Territories. According to the original grants from the Crown of England to William Penn and Lord Baltimore, the boundary between their respective colonies was fixed at the 40th parallel of N. lat. That line being found by subsequent observation to pass N. of Philadelphia, and to exclude Pennsylvania from Delaware Bay, negotiations ensued between the proprietors for the purpose of rectifying the blunder which the royal ignorance of geography had committed, and for the greater part of a century the matter was unsettled. An agreement was made between the proprietors (May 10, 1732) for fixing their boundary; and as Delaware then belonged by purchase to the heirs of William Penn, it was necessary to begin at its S. E. extremity, then fixed at Cape Henlopen. The boundary between Pennsylvania and Delaware had been already defined to be the arc of a circle drawn with a radius of twelve miles from the court-house at New Castle from the Delaware to the Maryland line. It was now agreed to bisect the line drawn W. across the peninsula from Cape Henlopen to Chesapeake Bay, and from the point of bisection to project a line northward as a tangent to the arc which formed the northern limit, the same to constitute the W. boundary of Delaware. From this point of tangency common to the three colonies, 12 miles N. E. of New Castle a line was to be projected due N. to a point 15 English statute miles S. of the southernmost point of the city of Philadelphia, and from this point a line was to be drawn due W. for five degrees of longitude as the S. boundary of Pennsylvania. Commissioners were appointed to run these lines in 1732, 1739, and 1750, but disagreed, and chancery suits were the result. By decision of Lord Chancellor Hardwick of May 15, 1750, taken as the basis of a final adjudication signed July 4, 1760, commissioners and surveyors were again appointed, who commenced operations Nov., 1760, and spent three years in measuring the base and tangent lines separating Delaware from Maryland. The proprietors then determined to send out more skilled mathematicians to complete the operations, and selected Messrs. Charles Mason and Jeremiah Dixon (see Mason, Charles), who verified the work of their predecessors, and ran the western line, fixed at lat. 39° 43′ 26.3″ N., since known by their name. They began work in Nov., 1763, and were stopped by the Indians in the summer of 1767 at a point 244 miles W. of the Delaware and only 36 miles E. of the terminus they were seeking. Stones were erected at intervals of one mile, and every fifth stone was engraved on the opposite sides with the arms of the lords proprietors. The remaining part of the line was fixed in Nov., 1782, by Col. Alexander McLean of Pennsylvania and Joseph Neville of Virginia, and was verified and permanently marked in 1784. In consequence of the accidental removal of the stone at the N. E. corner of Maryland, commissioners were appointed by the three States in 1849 to revise the former survey, which was done by Lieut.-Col. James D. Graham of the U. S. topographical engineers. The result of his revision was to confirm the work of Mason and Dixon, and Maryland gained by the operation a little less than two acres.

Porter C. Bliss.

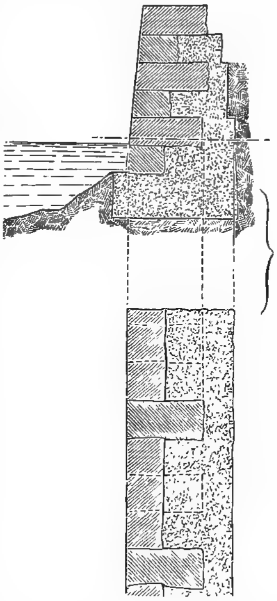
Mason Bee, a name applied to numerous bees, chiefly of the genus *Osmia*, which construct their cells of mud. They put their cells in the hollow stalks of plants, in empty shells, under flat stones, inside oak-galls, in chambers which they construct in rotten wood, etc. Some species form cells of great beauty and perfection, and line them with a kind of silk. The ceilings of many Egyptian temples are completely covered with these cells, masses of which hang down like stalactites. They are also very frequently met with in Northern Europe, in the regions of the Baltic, where they often cover the whole sunny side of the poor man's clay hut with their singular constructions. The cells are formed by boring into the clay wall, but at the orifice of each cell an outer tube is constructed, sometimes 2 or 3 inches in length, of pellets formed in the excavation. The U. S. has quite a number of mason bees.

Mason City, R. R. junction, Mason co., Ill. (see map of Illinois, ref. 5–D, for location of county), on the Chicago and Alton and the Wabash St. Louis and Pacific R. Rs., is the centre of one of the richest corn-growing regions in Illinois. Pop. of v. in 1870, 1615; in 1880, 1714.

Mason City, R. R. junction, cap. of Cerro Gordo co., Ia. (see map of Iowa, ref. 2–H, for location of county), on the Central Iowa and the Chicago Milwaukee and St. Paul R. Rs., in the midst of an agricultural and stock-raising section, has flouring-mills, water-power, and limestone quarries. Pop. in 1870, 1183; in 1880, 2510; in 1885, 3519.

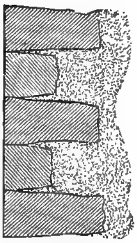
Masonry [Fr. *maçonnerie;* Ger. *Mauerwerk*] is the art of building in stone or brick with mortar, and is classified into *stone masonry*, *brick masonry*, and *concrete* or *béton*. *Stone masonry* is divided into *cut stone* (or *ashlar*) *masonry* and *rubble masonry;* and rubble may be *coursed* or *uncoursed*, while the uncoursed may be *squared rubble*, showing only vertical and horizontal joints on the face, or *irregular rubble*, with the joints running in random directions according to the shapes of the stones. *Concrete* may be *brick*, *stone*, *gravel*, or *shell* concrete, depending on the material used for ballast. The front of a wall is termed its *face*, and the material composing it *facing*, as distinguished from the *back* and *backing*, which apply to the rear or inner surface of the wall. The interior is called the *heart*, and the material *hearting* or *filling*. When the face or back of a wall is not vertical, but inclines toward the wall from bottom to top, the inclination is called the *batter* or *bâtir*. Thus, "a face-batter of 1 in 20" means that in a height of 20 feet the face of the wall departs 1 foot from a vertical line. The method of arrangement of the stones or bricks in order to secure strength and unity of mass is called the *bond.* *Headers* are those stones or bricks which show an end upon the face and back of the wall, and therefore reach into the wall their entire length and bind it together transversely. *Stretchers* are laid to show their longest dimensions on the face or back, as the case may be, and to give longitudinal strength. For walls of stone masonry not exceeding 3 feet in thickness each header should extend through from face to back, and is termed a *through.* In thicker walls the headers should reach back at least 18 inches beyond the contiguous stretcher, and are termed *binders.* The lower surface of a stone is termed its *lower bed,* the upper surface its *upper bed.* All the spaces between contiguous stones are also called joints, whether above, below, or at the sides. *Ashlar* is an external facing of cut stone laid with close joints in courses, the quality of the face-dressing being such—either axed, tooled, rubbed, or polished—as will best suit the character of the material and the design of the work under construction. In *rock-faced* ashlar the face of each block is the natural fracture or split of the stone, left undressed or only deprived of large protuberances. The filling and backing behind an ashlar facing may be rough, irregular rubble, brickwork, or concrete, preferably the latter in most cases, unless rubble stones are plenty and cheap. The ashlar should be well bonded to the hearting, for which purpose one-fifth to one-third of the entire length of each course should be headers, and these should not be placed one above the other in contiguous course, but so that the headers of each course shall rest on or near the middle of the stretchers of the course below. In important work, such as sea-walls, for example, the face-ends of headers for a distance back equal to the breadth of the stretchers are usually cut dovetail on the sides, the ends of the stretchers fitting against them being cut to corresponding angles with the face of the wall, so as to give close joints. The *tails* of the headers, in order to secure a good bond with the hearting, are left with the rough rock-face on the sides, although the beds, for convenience of laying, are roughly dressed to general parallelism with each other. The vertical and horizontal joints for a distance back equal to the breadth of the stretchers should therefore be formed accurately and full. (Fig. 1 gives a transverse and a horizontal section of a sea-wall on a concrete foundation, with stone facing and concrete backing.)

FIG. 1.



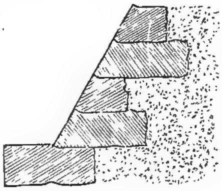
The practice of thinning off the blocks from a few inches from the face, so as to show close face-work, with little labor of stone cutting, as in Fig. 2, should be avoided.

FIG. 2.



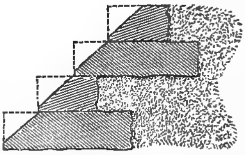
The method of building with headers and stretchers is not followed in laying the thin ashlar, a kind of veneering, generally not over 4 inches or 5 inches in thickness, used for facing the walls of city houses, in which the only bond-stones extending through or nearly through the wall are those forming the jambs to window and door openings. The face-stones, usually rubbed or finely-axed brownstone or sandstone or polished marble, are tied to the brick backing with hoop-iron clamps, and even these are sometimes omitted where the distance between the jambs of the openings does not exceed 5 or 6 feet. The rise or height of headers should not exceed their width as seen on the face of the wall; that of stretchers should be somewhat less than their transverse breadth. Where the batter is great—say, exceeding an angle of 25° to 30° with the vertical—the bed-joints should not be carried out horizontally to the face of the wall, for the reason that the lower edge of each face-stone would present an angle so acute as to be liable to injury from accidents and the effects of weather. One method of construction recommended in such cases is to cut the beds of the stones so that at least 4 inches in width of the bed-joint shall be normal to the face of the wall, as shown in Fig. 3.

FIG. 3.



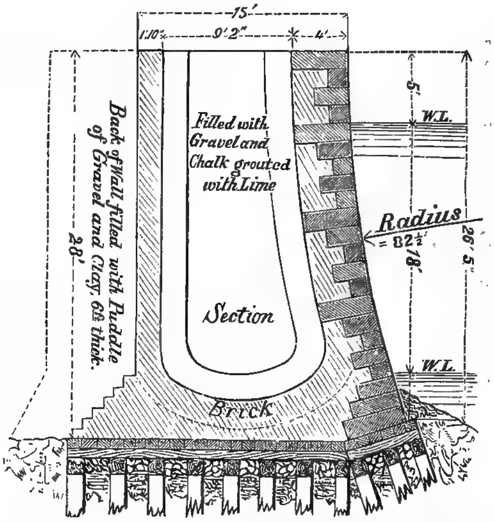
There are objections to this device unless the wall is under water, for the joints will retain water, and will be injured by frost in cold climates, and from the growth of vegetation during the summer season in all climates. Moreover, the stone-cutting is expensive. A better design is to secure the requisite strength at the angle by allowing the stones to project beyond the face of the wall, as in Fig. 4. Indeed, it will generally be less expensive, and produce stronger work, to lay up the wall in offsets, as shown by the dotted lines of Fig. 4.

FIG. 4.



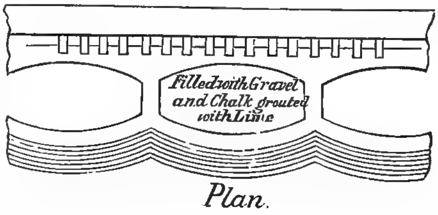
In compressive soils, or where from any cause it is difficult to get a solid and unyielding foundation, additional thickness, so as to distribute the weight over a larger area, should be given to the wall at the base; and in order to lessen the weight and cost of the superstructure, without endangering its stability, it may be built hollow; a concave batter is sometimes given to the face. Fig. 5 shows a transverse section, and Fig. 6 a plan, of a structure of this description.

FIG. 5.


15'
1'10½"
9'2"
4'
5'
W.L.
Back of Wall filled with Puddle of Gravel and Clay, 6ft thick.
28'
Filled with Gravel and Chalk grouted with Lime
Radius = 82½'
26'5"
18'
Section
W.L.
Brick

It is a river-wall in Sheerness, England, designed by Rennie.

FIG. 6.



Masses of cut stone in positions exposed to violent pressures and shocks, such as sea-jetties, piers, and lighthouses, should have the component parts connected together with great strength. Not only should the stones of each course be dovetailed and notched or clamped into each other, so that no single piece can move without displacing a large mass, but each course should be firmly connected with those above and below it. To prevent sliding projections may be left in the beds of one course to fit into corresponding cavities of the contiguous course, or cylindrical cast-iron dowels, 6 to 8 inches in diameter, may be placed in a vertical position between courses, extending some inches into the blocks above and below. Heavy wrought-iron bolts may be inserted vertically through several courses to prevent the uplifting of the mass.

Common *uncoursed* rubble, generally styled random rubble, is built with stones of random shapes and sizes as they come from the quarry, with only their most salient protuberances broken off with the scabbling-hammer. The only implements used in laying are the trowel and plumb-rule, and no attention is paid to courses. The interstices of the larger stones are filled in with those that are smaller and with spalls, all well bedded in mortar. The face and back of the wall should be well bonded to the hearting with headers, and the stones should be selected so as to fit together as closely as possible, and thus reduce to a minimum the volume of mortar necessary to completely fill all the voids; but no two stones should touch each other. For the angles or corners of a wall of this kind the stones should be as nearly rectangular as can be found. Ashlar is frequently introduced at the angles and around window and door openings to obtain architectural effect, after the manner of the *opus incertum* of the ancients. With stone of a dark color a fine effect can be produced by pointing the joints with white mortar (Fig. 7).

FIG. 7.

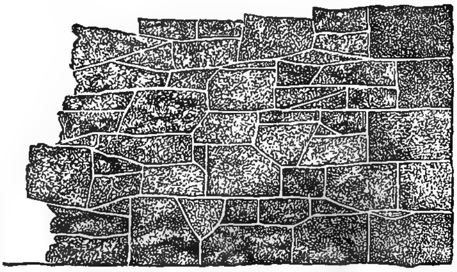


FIG. 8.

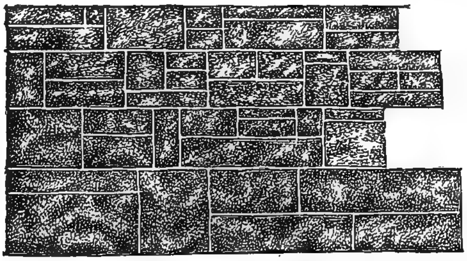


FIG. 9.

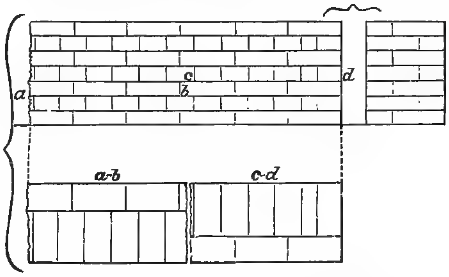
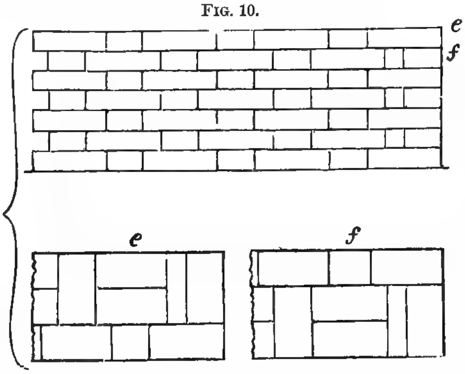


FIG. 10.



Coursed rubble, or squared rubble built in courses (Fig. 8), differs from *random* rubble in being built of stones that are, at least approximately, rectangular in form, so that only vertical and horizontal joints are shown upon the face of the wall, and they vary considerably in thickness. Although the stones are laid up in what are termed courses, there is no uniformity in the heights of the several courses, nor even in the stones of the same course, two or more small pieces being often employed to obtain a rise equal to that of a single large one; the height of a course being equal to that of the highest stone in it. The top of each course is carefully finished to a plane level surface by filling in voids and open spaces with rough rubble masonry or spalls set in mortar or with concrete, so as to get a good bed for the course which follows, especially for the headers, which should be set so as to be in close contact on their beds throughout their entire length. When the stones run very generally in rectangular blocks and of good size (containing, say, from 2 to 6 cubic feet), or are brought to that form by cutting, a good strong bond can be secured by frequent headers, and it is not desirable to lay them in *built* courses. Indeed, the wall will possess greater longitudinal strength by carefully avoiding continuous horizontal joints. Such work is sometimes called rubble masonry with horizontal and vertical joints, or simply *"squared uncoursed rubble"* or *"irregular coursed rubble."* It is much used, and by most architects and builders is preferred to coursed rubble, and by many to ashlar. With dark stone, showing a split rock-face, pointed with white mortar, a fine architectural effect can be produced. Stone having a fine cleavage is well suited to this kind of work. When rubble is laid without mortar it is called dry rubble. It is generally "random."

FIG. 11.

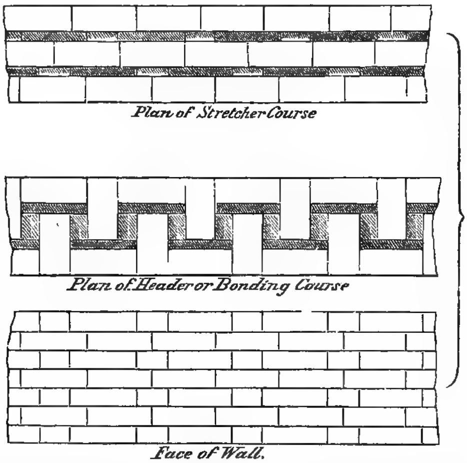
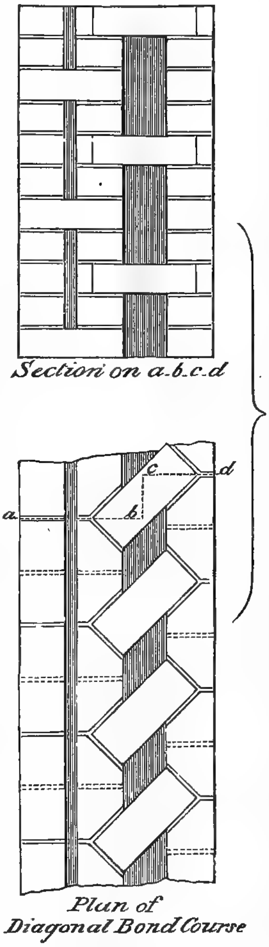


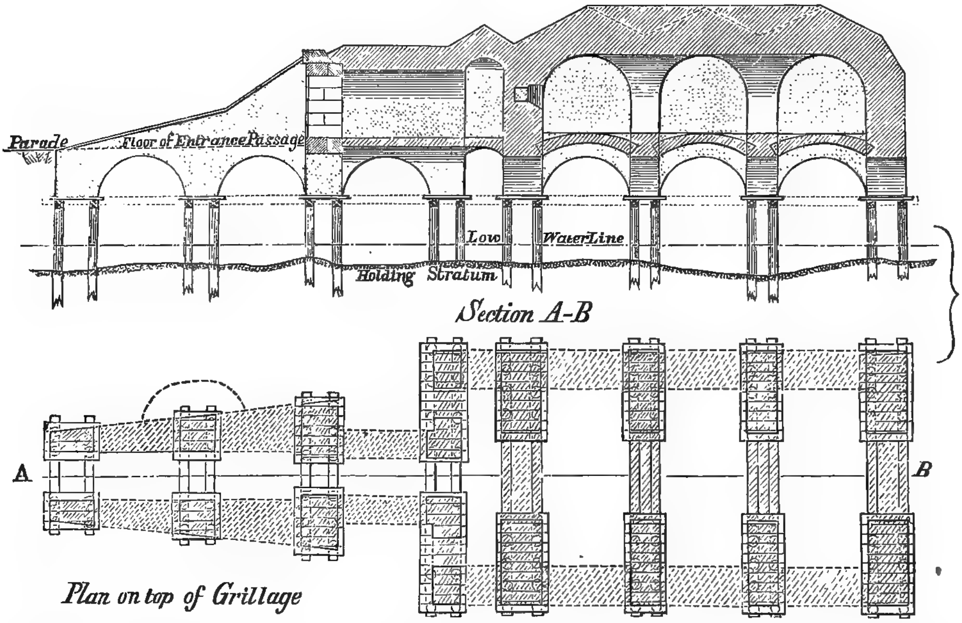
FIG. 12.



Brick masonry, when both the brick and mortar are of good quality and the work is well done, is strong and durable. Various kinds of bond are used, the most usual being the *English* and *Flemish*. The first (Fig. 9) consists in arranging the courses alternately, entirely as *headers* or *stretchers*, the bricks through the course breaking joints. In the second (Fig. 10) the bricks are laid as headers and stretchers in each course. The first gives the strongest bond, and the second the best architectural effect. Hollow brick walls are much used, the thickness of the inner shell being usually 4 inches, or the width of one brick. It is tied to the outer wall at frequent intervals with iron clamps, or more generally with bricks laid transversely or diagonally (Figs. 11 and 12), and bonded into the masonry at both ends. Moisture will not condense on the inner face of such a wall. The expense of firring out with wood and lathing is therefore saved, and the danger from fire lessened. The mortar for brickwork should be made with clean, sharp, and rather fine-grained sand, or preferably grains of variable sizes. For common lime-mortar the proportions will be 1 volume of lime-paste to from 3 to 4 volumes of sand. Sea-sand, or sand rounded by attrition, is not suitable, and neither sea-water nor even brackish water should be used in mixing. (For the preparation of cement-mortar, for either stone or brick masonry, see article CEMENT.) The bricks should be laid wet, so that they will not rapidly dry the mortar by extracting the moisture from it. All the void between the bricks should be completely filled with mortar, and no more mortar than will suffice for this purpose should be used. The joints, especially those between the courses, should not exceed a quarter of an inch in thickness.

Concrete (*béton*) masonry is admirably adapted to many important purposes. A brief description of the method of preparing and laying it is given in the article CEMENT. For foundations in damp and yielding soils and all kinds of submarine constructions; for quay-walls, jetties, piers; for foundations, hearting and backing of massive walls generally; for cisterns, reservoirs, and tanks; for tunnels and aqueducts, and for many other purposes, it possesses advantages over either brick or stone masonry. For submarine masonry concrete possesses the advantage that it can be laid without exhausting the water (which is an expensive operation under the most favorable circumstances), and also without the aid of a diving-bell or submarine armor. Groined and vaulted arches, and even entire bridges, dwelling-houses, and factories, in single monolithic masses, with moulded ornamentation of no mean character, have been constructed of this material alone. By omitting the coarse fragments or ballast a smoother finish and a more elaborate ornamentation can be given to the surface. The material is then usually called artificial stone, of which an excellent variety may be made with Portland cement (dry) 1 vol. and clean fine sand 2½ vols., mixed with little water, so as not to be plastic, and compacted in thin layers by ramming. The form to be given to the construction is accomplished by a plank moulding. In Europe a portion of the Portland cement is usually replaced by silicious hydraulic lime, like that of Theil, a good formula being ¾ vol. of dry cement, 1 vol. of dry (slaked) hydraulic lime, and 4 vols. of sand. This mixture was used in the construction of the aqueduct of the Vanne for supplying water to the city of Paris. The pipe is 6½ feet in interior diameter, 9 inches thick at top, and 12 inches at the sides at the water-surface, resting on an arcade, the whole forming a single monolith. (For details see *Béton Aggloméré and other Artificial Stones*, New York.) An entire Gothic church, with its foundation, walls, and steeple, was built of this material at Vesinet near Paris, as well as several large houses in that city. It is coming into extensive use in the U. S. A fine and highly ornamented bridge in Prospect Park, Brooklyn, and the fluted columns and other interior finish of the new cathedral in Fifth avenue, New York, are constructed with it. Fig. 13 shows a longitudinal section and foundation-plan of the concrete powder-magazine recently constructed by the writer at Fort Pulaski, Ga. The earthwork covering to make it shot-proof is omitted. The concrete for the entire work (except the arched floors) is composed of Rosendale cement, sand, and oyster-shells. For the floors Portland cement was employed. It will be seen that the substructure consists of a piling and grillage of timber, which supports an arcade of concrete, upon which the magazine rests. (For reference see Mahan, *Civil Engineering*, 1873; Rivingtons' *Notes on Building Construction*, 1875; Dupuit, *Traité de l'équilibre des Voutes*, etc., 1870; Gillmore, *Limes, Hydraulic Cements, and Mortars*, 1874; same, *Béton-Coignet and other Artificial Stone*, 1871; Nicholson, *Railway Masonry*, 1846; Robson, *Mason's Practical Guide*, 1865.) Q. A. GILLMORE.

FIG. 13.



Masonry. See FREEMASONRY.

Maso'rah, Masoreth, or **Massoreth** [Heb., "tradition"], the technical name given to a collection of grammatico-critical notes on the Hebrew text of the Old Testament, with the object of determining its divisions, grammatical forms, letters, vowel-marks, and accents. This species of authoritative commentary was rendered necessary by the fact that the early Hebrew text, like Semitic writings in general, consists of the consonants alone, without separation between the words, and consequently it was often a matter of no less delicacy than importance for the sense of the sacred text to discover which of several vowels should be employed in pronunciation. The same is true in a lesser degree in regard to the accents and the division into words. The Masorah was compiled by certain Jewish critics whose names and age are involved in great uncertainty. Some rabbins have formerly contended that Ezra and the "great synagogue" commenced the Masorah, but the more usual opinion assigns it to the schools which were formed at Babylon, Tiberias, and elsewhere in the second century A. D. Be this as it may, it was not committed to writing as a separate compendium until after the sixth century, having previously existed only in the form of marginal notes on the copies of the sacred books. The vowel-points introduced by the rabbinical editors are known as Masoretic, and the current Hebrew text of the Old Testament is called by the same name. The language of the Masorah is Chaldee, and of a very crabbed, difficult type. There are two recensions, called respectively the *Great* and *Small* Masorah, the former being the full text, of which the latter furnishes a synopsis. Much of the Masorah is devoted to puerile computations of the number of words and letters in the respective books and chapters, and the number of times that certain words and letters recur. The Masoretic editors have often been charged by modern Christian writers with having corrupted the text, but apparently without any evidence to support so serious a charge. As to the value of the Masorah, while much of it is confessedly useless, it is certain that the older portions, if they could be separated from the more modern, would supply valuable materials for a critical edition of the Hebrew Scriptures.

PORTER C. BLISS.

Masque, in drama. See MASK.

Masquerade, an amusement generally consisting of a ball, public or private, in which the participators wear masks for purposes of disguise. An eccentric costume was an early feature of the masquerade, and under the form of a "fancy ball" has nearly or quite superseded it in England and the U. S., each guest personating some mythological or historical character or assuming the costume of some remote people. The masquerade proper flourished in Italy in the fifteenth century, and was introduced at the French court by Catharine de' Medici, and at the English in the time of Henry VIII. It doubtless arose from the "miracles and mysteries" which were so popular in the Middle Ages, and to the present day a masked ball is in Catholic countries an invariable feature of the Carnival, on which occasion processions of maskers often pass through the streets playing wild pranks.

Mass, one of the many names by which the holy Eucharist has been designated. The derivation of the word is disputed. It has been derived from tho Saxon *mæſſe*, a "feast;" from the Hebrew מִסָּה, *missah*, an "oblation;" and from the termination of the service, *Ite! Missa est*—"Go in peace! you are dismissed." This last derivation is the one most commonly received. But *Missa est* are also taken in the sense of "The offering is made; the sacrifice is sent up to God by the ministration of angels." It is solely because the sense of sacrificial offering is attached to the word that any importance can be given to it. In the first book of Common Prayer of Edward VI. (1549) the term mass is retained in the title of the order for the administration of the Lord's Supper, etc. In the second book it was omitted, either through the influence of those who wished to reduce the idea of the service to that of mere communion, or because of a wish to avoid offending the prejudices of those who connected the word with supposed Romish doctrines, although it had been in use since the days of Ambrose. The name has never been restored by authority. But it has been resumed by some in the Anglican communion, who seek thus to show that they hold the doctrine of the ancient liturgies. On the part of others its use excites indignation, as the mark of a party denounced as Romanizers, who seek to undo all that was done at the Reformation.

W. F. BRAND.

Mass [Lat. *missa*], in music. When large portions of the service are set to music, the composition is known as a mass. A full mass comprises the *Kyrie, Gloria in excelsis, Credo, Sanctus, Benedictus,* and *Agnus Dei.*

Mas'sa, or **Massa-Carrara,** town of Italy, in the province of Massa, lies on the Frigido, with the sea on the W., and on the N. E. and S. are charming hills clothed with orange, lemon, olive, chestnut, and pine trees. The mildness and salubrity of the climate are almost unrivalled in Italy. The old part of the town is on a hill; the new, with its broad streets and squares and good buildings, spreads over the plain below. The national palace is a noble structure, built by the princes of the house of Cybo. Massa is first mentioned in the ninth century. It was for a long time subject to the republic of Lucca, but in the fifteenth century the Cybo family became its feudal lords, and Alberic I. built the new town and gave Massa a civil and penal code remarkable for that age. Pop. 20,032.

Massachu'setts, one of the Eastern or New England States of the American Union (see map of Conn., Mass., and R. I., in article CONNECTICUT), and one of the original States of the confederacy of 1776–88, is between 41° 14′ and 42° 53′ N. lat., and 69° 53′ and 73° 32′ W. lon. from Greenwich. It is bounded N. by Vt. and N. H., E. by the Atlantic, S. by the Atlantic and R. I. and Conn., and W. by R. I. and N. Y.; greatest length from E. to W., 180 m.; greatest breadth, 113 m.; total area, 8315 square m., or 5,321,600 acres.

Massachusetts, by census of 1880, ranked 7 among the States in population, 27 in value of agricultural products, and 3 in value of manufactures.

Face of the Country.—The W., middle, E., and N. E. sections are for the most part hilly and broken, and the S. E. more level and sandy, though with many rocks along the coast. The Taghkanic and the Hoosick ranges are separate ridges of the Green Mountain range of Vermont. Of these the Taghkanic is much the highest. Saddle Mountain, or Greylock, 3505 feet high, and Mount Washington, or Mount Everett, 2624 feet, belong to this range. The Hoosick range maintains a somewhat regular elevation of from 1200 to 1600 feet. Farther E., near the W. bank of the Connecticut River, are two isolated peaks, Mounts Tom and Sugarloaf, the former 1214 feet high, and, across the Connecticut, Mount Holyoke, 910 feet high; while, still farther E., Wachusett Mountain, in the township of Princeton, Worcester co., rises 2018 feet. The valley of the Connecticut in Massachusetts is remarkable for the fertility of its soil. The E. and S. E. part of the State, including the island counties and Cape Cod, is moderately level and sandy, but under careful cultivation much of it yields fair crops.

SIGILLUM REIPUBLICÆ MASSACHUSETTENSIS
ENSE PETIT PLACIDAM SUB LIBERTATE QUIETEM

Seal of Massachusetts.

Rivers and Lakes.—The principal rivers are the Connecticut, the Housatonic, the Hoosic, a tributary of the Hudson, in the N. W.; the Agawam or Westfield and the Deerfield, tributaries of the Connecticut, from the W.; and the Chicopee, with several branches, and Miller's River, E. tributaries of the same river; the Merrimack, which has its source in New Hampshire, but flows for 35 miles in Massachusetts, receiving in the State the Nashua and Concord rivers; the Charles, Taunton and branches, and the Blackstone. Wenham Lake, famous for its ice, is near Boston, and Quinsigamond Lake or Pond, for a long time the scene of the regattas of the colleges, lies between Worcester and Shrewsbury.

Bays, Islands, etc.—The coast of Massachusetts is deeply indented by bays, harbors, and sounds. The largest of these, beginning with the S. E., are Buzzard's Bay, almost landlocked by the Elizabeth Islands; Vineyard Sound, between the Elizabeth Islands and Martha's Vineyard; Edgartown and Nantucket harbors: Cape Cod Bay, three-fourths landlocked; Wellfleet Bay, Plymouth Harbor; Duxbury Bay; Massachusetts Bay, and within it Boston Harbor; Lynn Harbor, Nahant Bay, Marblehead, Salem, and Beverley harbors; Gloucester Harbor or Bay, Sandy Bay, and Annisquam Harbor. There are hundreds of islands along the coast, Martha's Vineyard, Nantucket, and several of the Elizabeth group of good size.

Mineralogy.—Silver has recently been discovered in Essex co. Lead, copper, and zinc have been discovered in the vicinity of the Connecticut River. Iron is found abundantly in the W. part of the State, and to some extent in Plymouth and Bristol cos. Talcose slate, limestone, steatite, and soapstone all exist in large quantities in Berkshire, Hampshire, and Franklin cos.; glass-sand of excellent quality in Berkshire. Asbestos, plumbago, several of the ochres and ochreous earths, slate, and in Berkshire co. a beautiful white marble, are the other principal minerals of the State.

Vegetation.—Much of the soil of Massachusetts is naturally sterile, and though originally covered with heavy forests of pine, hemlock, oak, chestnut, hickory, maple, and other deciduous trees, except in the S. E., where the sandy flats were treeless, yet when these forests were cleared the soil produced but scanty crops except by the aid of manure. The indigenous flora of the State was, nevertheless, copious in both quantity and variety of genera and species. Nearly all the trees, shrubs, and flowering plants indigenous in any part of New England and N. or Central New York were natives of Massachusetts; and, though cultivation of the soil has driven out some of them, their place has been supplied by many naturalized plants and trees, as well as some noxious weeds from other States and countries. It is not easy to speak in too high terms of praise of the industry, patience, and skill which the agriculturists of Massachusetts have exercised in bringing these lands, not naturally fertile, to so high a degree of productiveness. The red sandstone region of the Connecticut Valley and the Valley of the Housatonic, as well as some portions of the central counties, have a better soil and have been kept in excellent condition by skilful farming.

Zoology.—Of smaller game there are considerable numbers, rabbits, squirrels, and the various game-birds being tolerably abundant. Of the other larger birds the variety is not great. Two species of eagle are occasionally though rarely seen; no vulture is found in the State; the great owl, the fish-hawk and other species of hawks, several species of gulls, the brant, and wild ducks, and most of the song-birds common to the Northern States, are found in the State. There is the usual variety of batrachians and reptiles, though not more than three species of the latter are venomous. The fish of the coast and rivers are abundant. The halibut, mackerel, cod, tautog, bass, etc. have the highest reputation.

Climate.—The climate is cool. The winters are generally long and severe, the summers short and warm. Snow falls usually during five or six months, and in rare instances exceeds six months. The amount of annual rainfall has been for a term of years from 40 to 43.5 inches; it is very equably distributed through the seasons.

Agricultural Products.—The principal crop is Indian corn—by census of 1880, 1,797,768 bushels; oats, 645,159 bushels. The amount of wheat, rye, and barley produced is trifling. Of tobacco, 5,369,436 pounds were raised in 1880; wool, 299,089 pounds.

*Farm Animals.**—Massachusetts had, in 1880, 59,629 horses, 261,051 cattle, 67,979 sheep, 80,123 swine.

Manufactures.—Massachusetts is one of the heaviest manufacturing States in the Union, producing every variety of cotton and woollen fabrics, iron and steel manufactures, wooden-ware, furniture, jewelry, machinery, glassware, etc. There were produced in 1880 iron and steel manufactures to the value of $10,288,921, employing capital of $6,738,408 and 6513 hands, to whom wages amounting to $2,576,539 were paid. Boston produced in 1880 total manufactures to the amount of $130,531,993. The cotton manufactures of Massachusetts in 1880 employed 62,903 operatives, running 4,465,290 spindles.

Fisheries are very extensive and productive, aggregating more than half the product of all New England. Cod, mackerel, haddock, and bluefish are the principal varieties, and the value by census of 1880 was $8,141,750.

Railroads.—In 1881 there were 2128 miles of R. R. in operation, costing $152,843,129, with net earnings of $9,221,102, and paying in interest and dividends $7,114,939. The State is a network of R. Rs., crossing each other in all directions, and doing a heavy business.

Finances.—The taxable value of property as assessed in 1881 was: real estate, $1,149,465,827; personal, $498,274,149; total, $1,648,239,976. The State tax was only 35 cents on $1000, yielding, with corporation tax, $4,950,000. Total taxes in 1881, for State, county, and town purposes, $24,180,245, or about $13.56 to each inhabitant. State debt, 1881, less sinking fund, $19,749,272; total indebtedness, local and State, 1880, $91,283,913.

Commerce.—The foreign commerce of Massachusetts in 1881 exhibited exports, $72,100,193; imports, $62,102,830. The internal commerce is large, and Boston is a great supply market for the neighboring States.

Banks, Savings-Banks, etc.—In Oct., 1881, Massachusetts had in operation 244 national banks, with capital of $96,177,500; circulation, $71,267,089; U. S. bonds to secure circulation, $79,762,600; deposits, $126.544,300. Besides these there were 6 State banks and trust companies, with deposits of $10,131,176; 12 savings-banks, with deposits of $59,921,155; 47 private banks, deposits, $2,570,068. The insurance companies insured risks to the amount of $499,854,480 in 1880, receiving $4,147,719 in premiums and paying $2.639,495 for losses.

Education.—The number of children of school-age (five to fifteen years) in 1880 was 307,321, of whom no less than 306,777 were enrolled in public schools, with average attendance of 235,664. Public-school expenditure, 1880, $4,720,951, of which $4,491,225 was for teachers and school-books. There are 7 universities and colleges, with 159 instructors and 2009 students, paying in tuition $150,335. There are 7 theological, 5 medical, and 2 law schools. Number of newspapers and periodicals in 1882, 420, of which 43 were daily.

Churches.—The Congregational Church has the lead, with 528 churches and 91,787 members; Baptists, 289 churches, 48,883 members; Methodist Episcopalians, 319 churches, 45,517 members; Roman Catholics, 272 churches; Unitarians, 185 churches and 11,000 members. There are about 20 other denominations, with churches varying from 100 down to 1.

Population.—In 1860, 1,231,066; 1870, 1,457,351; 1880, 1,783,085 (white 1,763,782, colored 19,303, including 369 Indians, 229 Chinese, and 8 Japanese); in 1885, 1,941,465.

Principal Cities and Towns, Pop. 1885.—Boston (cap.), 390,406; Worcester, 68,383; Lowell, 64,051; Cambridge, 59,660; Fall River, 56,863; Lynn, 45,861; Lawrence, 38,845; Springfield, 37,577; New Bedford, 33,393; Somerville, 29,992; Salem, 28,084; Holyoke, 27,894; Chelsea, 25,709; Taunton, 23,674; Haverhill, 21,795; Gloucester, 21,713; Brockton, 20,783; Fitchburg, 15,375; Waltham, 14,609; Pittsfield, 14,466; Newburyport, 13,176; Northampton, 12,896; North Adams, 12,540; Woburn, 11,750; Chicopee, 11,528; Milford, 9343.

COUNTIES.	† Ref.	Pop. 1880.	Pop. 1885.	COUNTY TOWNS.	Pop. 1885.
Barnstable....	5-K	31,897	29,845	Barnstable ‡	4,050
Berkshire......	2-C	69,032	73,634	Pittsfield ‡.........	14,466
Bristol.	5-I	139,040	158,491	New Bedford.. Taunton	33,393 23,674
Dukes...........	6-J	4,300	4,135	Edgartown ‡......	1,165
Essex............	1-I	244,535	263,694	Lawrence....... Newburyport. Salem............	38,845 13,176 28,084
Franklin.......	2-E	36,001	37,448	Greenfield ‡	4,869
Hampden......	3-D	104,142	116,777	Springfield	37,577
Hampshire....	3-E	47,232	48,472	Northampton ‡..	12,896
Middlesex.....	2-H	317,830	356,810	Cambridge..... Lowell...........	59,660 64,051
Nantucket....	6-K	3,727	3,143	Nantucket ‡......	3,143
Norfolk.........	5-I	96,507	102,174	Dedham ‡	6,641
Plymouth	4-J	74,018	81,689	Plymouth ‡.......	7,239
Suffolk	2-I	387,927	421,122	Boston	390,406
Worcester.....	3-F	226,897	244,031	Fitchburg ...... Worcester	15,375 68,383
Total.........		1,783,085	1,941.465		

History.—The evidence seems to be conclusive that South-eastern Massachusetts was discovered by Leif Bjornsen and his brother Thorwald about 1000–03; named Vinland from the abundance of wild grapes. Nearly five hundred years later, in 1497, John Cabot and his son Sebastian again discovered the Massachusetts coast. The English claimed it under Cabot's discovery, he having been at the time in their service. In 1602, Bartholomew Gosnold, with a colony of thirty-two persons, landed in or near Salem Harbor, and subsequently coasted along Cape Cod and discovered the Elizabeth Islands and the little island of No Man's Land. In 1603 another attempt was made at a settlement in Martha's Vineyard by Martin Prynne; this failed two months later, as did that of George Weymouth in 1605, but the latter led to the formation of the Plymouth Company in England, to whom was assigned Northern Virginia, lying between 38° and 45° N. lat. After several attempts to found colonies under the jurisdiction of this company, the first which proved permanent was the Pilgrim colony, a body of Puritans who had migrated to Leyden, but resolved to emigrate to the New World. They sailed from Plymouth, England, Sept. 6, 1620, one hundred and two in number, and entered what is now Provincetown Harbor, Cape Cod, Nov. 11, and before landing organized a government. After exploring the coast the colonists landed Dec. 22 at Plymouth. They endured great privations till 1623, when they gathered their first plentiful harvest. They organized and maintained a system of self-government under which they prospered. Meanwhile, other colonies were founded by Puritans within the present limits of the State —one at Salem in 1628 under John Endicott, which in 1630 was merged in a larger one undertaken in 1629 under John Winthrop, and which was connected with the transference of the government and patent of the Plymouth colony to New England. About 1300 persons came over from England in the two years 1629 and 1630. Friendly and cordial relations were maintained between the two colonies, but each maintained its separate and independent government till 1692, when they were united under one charter. During this period of over sixty years both colonies had had troubles from without and within. In 1636 and 1637 troubles with the Pequod Indians led to the Pequod war. Internal difficulties led to dissensions, accusations, banishment, and severe punishments of the disaffected. The colonies had also serious difficulties with the English government, especially after the restoration of Charles II. The great struggle with the Indians in 1675 and 1676, known as King Philip's war, checked the prosperity of the colonies for a long time. One man in every twenty in the colonies had fallen, and one-twentieth of the families were without shelter. The expense of the war was a little more than $500,000—a sum equal to at least $3,000,000 in our day, and crushing in its magnitude in colonies not fifty years old. Before this disastrous war had ended new troubles with the king had begun. Prompted by the vindictive spirit of Edmund Randolph, Charles II. had at last decided to annul the charter of Massachusetts Bay and to bring all the New England colonies under the sway of a royal governor. The colony of Massachusetts Bay by its agents endeavored to avert the impending disaster by concessions, protestations of loyalty, appeals to the king and privy council, and finally by a policy of delay; but their efforts were fruitless. In 1684 the English high court of chancery gave judgment against them, and declared their charter forfeited. Joseph Dudley, a citizen of Massachusetts Bay, son of the early emigrant governor, and who had been one of the colonial agents in London, was appointed president under control of the revengeful Randolph, and the general court or legislature was abolished. Two years later, on the accession of James II., in Dec., 1686, Dudley was superseded by Sir Edmund Andros, already known to the colonists as an imperious and tyrannical commissioner. Andros lost no time in asserting his power over all the New England colonies, and subsequently over New York and New Jersey, but his head-quarters were at Boston, and he determined to make the humiliation of Massachusetts complete by exercising his authority with the utmost oppression and greed, seizing the property and persons of the citizens and disposing of both as he saw fit. His administration was endured for two years and four months, and then, upon the first report that the prince of Orange had landed in England, Andros and all his coadjutors, including Joseph Dudley, whom he had made chief-justice, were arrested, imprisoned, and held for trial; the general court reassembled; the former deputy governor, Thomas Danforth, was made acting governor till the king's pleasure should be made known; and immediately upon the receipt of the intelligence of the proclamation of William of Orange in England he was proclaimed in Massachusetts Bay, and simultaneously in the Plymouth Colony. In 1690, Massachusetts took part in the intercolonial war between the possessions of France and England, and to pay the colonial troops issued, for the first time in its history, treasury notes. Sir William Phips, a native of New England, and greatly endeared to the Massachusetts people, was their commander in this colonial war, and was in 1692 appointed the first governor under the new charter granted by the king, by which Massachusetts Bay and Plymouth were consolidated into one government. During his administration the Salem witchcraft delusion occurred. The consolidated colony had at this time a population of about 47,000. There were frequent disturbances with the Indians for the next twenty-three years, the French colonists in Canada prompting the savages to make raids upon the colony of Massachusetts. From 1722 to 1725 these raids assumed the larger proportions of a war, and they were finally ended by the almost complete extermination of the Indian tribes adjacent. From 1744 to 1748, in the war between England and France, Massachusetts contributed largely to the capture of Louisburg, in 1745, and to the success of the Canadian expeditions. In the second war with France, in the following decade, the colony again played a conspicuous part. Her enterprise, her rapidly-increasing population (she had 247,000 inhabitants in 1767), and her independent spirit seemed to have excited jealousy toward her. Oppressive measures of taxation were devised, her commerce was hampered by restrictions, and large bodies of troops were kept upon her soil to repress any attempted resistance. But the spirit of her people was not to be crushed. Every measure of oppression was resisted, and the other colonies were appealed to for sympathy and harmony of action. The Boston Massacre, in 1770, increased the excitement of the people, and the destruction of the tea in 1773 in Boston Harbor, the opposition to the Port Bill in 1774, the representation of the colony in the General Congress, the seizure of the arsenal at Charlestown by the militia, the adjournment of the assembly to Concord, and its reorganization there as a provincial Congress, were the most prominent of the many events which immediately preceded the Revolution. The first blood of the Revolutionary war was shed at Lexington and Concord on Apr. 19, 1775; the battle of Bunker Hill, on June 17 of the same year, followed, and Massachusetts was fairly involved in the great issues of the war more than a year before the Declaration of Independence. In 1780 she adopted her constitution, and it was decided not long after that by a clause in the Bill of Rights prefixed to that constitution slavery in the State was abolished. John Hancock, the patriotic leader of the colony in the Continental Congress, was her first State governor. An insurrection occurred in the W. part of the State in 1786, known as Shay's rebellion, arising from the poverty and distress of the people of that section and the severity of the taxes; some lives were lost in its suppression. The Constitution of the U. S. was ratified in Jan., 1788, by a State convention, by a vote of 187 to 168. In the division of parties which occurred at the beginning of the present century a large majority of the citizens of Massachusetts sided with the Federal party, and many of them were opposed to the war with Great Britain in 1812, which was so disastrous to her commerce, though the State furnished great numbers of seamen to the navy during that war. Several delegates from the State appeared at the convention of the New England States which met at Hartford, Conn., in 1814, to confer upon their grievances, and George Cabot, a Massachusetts man, presided over the convention. In 1820 the district of Maine was set off as a separate State. In the same year a convention met to revise the constitution and proposed fourteen amendments, of which nine were accepted and five rejected by the people. Numerous other amendments have been adopted in the years 1831, 1833, 1836, 1840, 1855, 1857, 1859, 1860, 1863, etc. The amendments of 1857 changed the mode of electing representatives and senators to the State legislature to a district system. It is probable that the number of persons who, born in this State, have emigrated to other States is equal, at least, to her present resident population. They have exercised a marked influence in moulding the social and political institutions of their adopted States.

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* On farms only.

† Reference for location of counties. See map of Massachusetts, in article CONNECTICUT.

‡ Township.

Governors.

Of Plymouth Colony, elected.

John Carver	1620–21
William Bradford	1621–33
Edward Winslow	1633–34
Thomas Prence	1634–35
William Bradford	1635–36
Edward Winslow	1636–37
William Bradford	1637–38
Thomas Prence	1638–39
William Bradford	1639–44
Edward Winslow	1644–45
William Bradford	1645–57
Thomas Prence	1657–73
Josiah Winslow	1673–81
Thomas Hinckley	1681–86
Sir Edm. Andros, gov.-gen	1686–89
Thomas Hinckley	1689–92

Of Massachusetts, chosen annually under First Charter.

John Endicott (acting)	1629–30
Matthew Cradock (did not serve).	
John Winthrop	1630–34
Thomas Dudley	1634–35
John Haynes	1635–36
Henry Vane	1636–37
John Winthrop	1637–40
Thomas Dudley	1640–41
Richard Bellingham	1641–42
John Winthrop	1642–44
John Endicott	1644–45
Thomas Dudley	1645–46
John Winthrop	1646–49
John Endicott	1649–50
Thomas Dudley	1650–51
John Endicott	1651–54
Richard Bellingham	1654–55
John Endicott	1655–65
Richard Bellingham	1665–73
John Leverett	1673–79
Simon Bradstreet	1679–84
Jos. Dudley, pres	1684–86
Sir Edm. Andros, gov.-gen	1686–89
Thomas Danforth (acting)	1689–92

Appointed by the King under the Second Charter.

Sir William Phips	1692–94
Wm. Stoughton (acting)	1694–99
Richard Coote, earl of Bellomont	1699–1700
Wm. Stoughton (acting)	1700–01
The Council	1701–02
Joseph Dudley	1702–Feb., 1715
The Council	Feb.–Mar., 1715
Joseph Dudley	Mar.–Nov., 1715
Wm. Tailer (acting)	1715–16
Samuel Shute	1716–23
Wm. Dummer (acting)	1723–28
Wm. Burnett	Jan.–Sept., 1728
Wm. Dummer (acting),	Sept., 1728–June, 1730
Wm. Tailer (acting),	June–Aug., 1730
Jona. Belcher	Aug., 1730–41
William Shirley	1741–49
Spencer Phips (acting).	1749–53
William Shirley	1753–56
Spencer Phips (acting).	1756–57
The Council	Apr.–Aug., 1757
Thomas Pownal	1757–60
Thomas Hutchinson (acting)	June–Aug., 1760
Sir Francis Bernard, Bart	1760–69
Thos. Hutchinson (acting)	1769–71
Thomas Hutchinson	1771–74
Thomas Gage	May–Oct., 1774
A Provincial Congress,	Oct., 1774–July, 1775.
The Council	July, 1775–80

Under the Constitution.

John Hancock	1780–85
James Bowdoin	1785–87
John Hancock	1787–Oct., 1793
Saml. Adams (acting),	Oct., 1793–94
Samuel Adams	1794–97
Increase Sumner,	1797–June, 1799
Moses Gill (acting),	June, 1799–1800
Caleb Strong	1800–07
Jas. Sullivan	1807–Dec., 1808
Levi Lincoln (acting),	Dec., 1808–09
Christopher Gore	1809–10
Elbridge Gerry	1810–12
Caleb Strong	1812–16
John Brooks	1816–23
Wm. Eustis	1823–Feb., 1825
Marcus Morton (acting)	Feb.–July, 1825
Levi Lincoln	1825–34
John Davis	1834–Mar., 1835
Samuel T. Armstrong (acting)	Mar., 1835–36
Edward Everett	1836–40
Marcus Morton	1840–41
John Davis	1841–43
Marcus Morton	1843–44
George N. Briggs	1844–51
George S. Boutwell	1851–53
John H. Clifford	1853–54
Emory Washburn	1854–55
Henry J. Gardner	1855–58
Nathaniel P. Banks	1858–61
John A. Andrew	1861–66
Alexander H. Bullock.	1866–69
William Claflin	1869–72
William B. Washburn,	1872–May, 1874
Thomas Talbot (acting)	May–Dec., 1874
William Gaston	1874–76
Alexander H. Rice	1876–79
Thomas Talbot	1879–80
John D. Long	1880–83
Benjamin F. Butler	1883–84
George D. Robinson	1884–87

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Massachusetts Indians. The tribes inhabiting the territories in which the colonies of Plymouth and Massachusetts Bay were founded belonged, like those of New England generally, to the great Algonkin stock, but neither constituted a nation nor lived within well-defined boundaries, and consequently cannot be accurately discriminated from the tribes of the adjoining colonies. Five principal tribes are enumerated as dwelling chiefly within the limits of the two colonies—the Nausets, on Cape Cod; the Pokanokets or Wampanoags, living between Plymouth and Narragansett Bay; the Massachusetts, in the vicinity of the bay of that name; the Pennacooks, on the northern frontier, extending into New Hampshire; and the Nipmucks, in Central Massachusetts, extending into Connecticut and Rhode Island. There were few Indians in the upper Connecticut Valley, and none in the Green Mountain region. The language of all these tribes was substantially the same, so that Eliot's Bible and the books written in the Massachusetts dialect by his successors were available for their religious instruction. All these tribes, except the Christian Massachusetts and Nausets, took part in King Philip's war (1675), and as a result were nearly exterminated, most of the survivors having been sold as slaves in the West Indies. There were, in 1880, 369 Indians in Massachusetts, most of whom lived at Mashpee, Cape Cod, and on Martha's Vineyard. They have all lost their original language, have generally intermarried with negroes, and are commonly regarded as mulattoes. (For their language see Eliot's *Indian Grammar Begun* (1664) and *Indian Primer* (1720), and Cotton's *Vocabulary of the Massachusetts Language* (1830).)

Massa'fra, town of Southern Italy, in the province of Lecce. It stands on a hill near the sea, about 10 miles from Taranto, on the railway to Bari. The neighboring district is almost entirely devoted to the cultivation of the olive, which yields in the best years 30,000 quintals of oil. The cotton-plant also thrives well here. Pop. 9719.

Massa'getæ [of doubtful etymology, thought by some to be the Magog of the Bible], an ancient Turanian or Turkish tribe, inhabiting the steppes to the N. of the Jaxartes. According to Herodotus, it was with them that Cyrus of Persia went to war, and fell in battle, 529 B. C., their queen, Tomyris, having refused an offer of marriage made by Cyrus for the purpose of picking a quarrel with her. According to Ctesias, the war was with another tribe, and Cyrus died of his wounds after the battle.
R. D. HITCHCOCK.

Mas'sa Lombar'da, town of Northern Italy, in the province of Ravenna, situated near Lugo, in a level tract once occupied by woods and swamps, but now very fertile. It acquired some importance in the thirteenth century, and was walled and fortified by the Bolognese. It belonged to the Papal States till 1859. Pop. 5488.

Massalubren'se, town of Southern Italy, in the province of Naples, situated on a narrow tongue of land, with several small islands near it, and one of greater size which appears to have been violently torn from the continent. The present town had its origin in the third century. It was sacked by the Turks in 1558, and the inhabitants carried off as slaves. The town now contains some good churches and extensive conventual buildings. Pop. 8296.

Mas'sa Marit'tima (*Massa Maritiba*), town of Italy, in the province of Grosseto, about 40 miles N. of the town of Grosseto. It is composed of several villages lying near each other, the principal one having become the seat of a bishopric in the place of the once celebrated Populonia. During the Middle Ages this town was often contended for by the rival cities of Siena and Pisa. Pop. 13,052.

Massaro'sa, town of Italy, in the province of Lucca, containing within its municipal limits a pop. of 9200.

Massasoit, the chieftain of the Pokanoket or Wampanoag Indians, found by the colonists of Plymouth, Mass., living in their vicinity in 1621 as ruler of the territory from Cape Cod to Narragansett Bay. (See MASSACHUSETTS INDIANS.) He made a treaty with the settlers at Plymouth Mar. 22, 1621, and maintained friendship with them until his death. His permanent residence was in the present township of Warren, R. I., where he was frequently visited by commissioners from the neighboring settlements. He entertained Roger Williams for several weeks when banished from Massachusetts. He was supposed to be eighty years of age when he d. in 1661, leaving two sons—Mooanum and Pometacom, called by the colonists Alexander and Philip. They succeeded him in the chieftainship, the latter being the celebrated "King Philip."

Massé (FELIX MARIE VICTOR), b. at Lorient, France, Mar. 7, 1822, studied music in the Conservatory of Paris and in Rome, made his *début* as a composer by some charming melodies to Victor Hugo's *Orientales* and a comic opera in one act (*La Chanteuse voilée*, 1852), and was appointed singing-master to the Grand Opera in 1860 and professor of composition in the conservatory in 1866. He has written quite a number of comic operas (*La Fée Carabone*, *Le Fils du Brigadier*, etc.), but his greatest success was his opera *Paul et Virginie* (1876).

Mas'se di Sie'na or **di Città,** town of Italy, in the province of Siena, embracing several small villages within its communal limits. Pop. 10,258.

Masséna (ANDRÉ), duke of Rivoli, prince of Essling, marshal of France, b. May 6, 1758, at Nice, began his career as a cabin-boy and afterwards joined an Italian regiment in French pay, but left it in 1789, as his humble descent prevented him from obtaining a commission. After the outbreak of the Revolution, however, and the annexation of Nice to France in 1792, he re-entered the army; became chief of a battalion Aug. 1, 1792, and brigadier-general Aug. 22, 1793. His most brilliant exploits were his victory over the allied Austrian-Russian army at Zurich Sept. 25, 1799, which freed France from invasion; the siege of Genoa in 1800, which he held for three months, though invested by an Austrian army and blockaded by an English fleet; and his valorous defence of the villages of Aspern and Essling during the battle (May 21, 1809) which saved the French army from total destruction. In 1810 he received the highest command in Spain, and drove Wellington back to the lines of Torres Vedras, but receiving no reinforcement he was compelled to retreat into Spain, and in the spring of 1811 he resigned his command on account of ill-health. In the events with which Napoleon's career closed he played no conspicuous part. D. Apr. 4, 1817. He had a great military talent, but a mean and rapacious character. Napoleon called him a robber, and by the soldiers he was much disliked.

Mas'sey (GERALD), b. at Tring, Herts, England, May 29, 1828, of poor parents; worked in youth in a silk-mill and as a straw-braider, and received a scanty education; went to London; published *Poems and Chansons* (about 1846); started in 1849 and became editor of the *Spirit of Freedom*, and was secretary of the Christian Socialists, a co-operative society; was placed upon the civil list with a pension in 1863. He has published several volumes of poems and some prose works, among which are *Robert Burns, and other Lyrics* (1859), *Havelock's March, and other Poems* (1861), and *A Tale of Eternity, and other Poems* (1870); is a frequent contributor to periodical literature, a popular lecturer, and an earnest believer in Spiritualism. He lectured in the U. S. in 1873.

Mas'sico (the *Mons Massicus* of Latin poetry), a mountain in the province of Terra di Lavoro, Naples, Italy, famous in ancient and modern times for the Massic wine produced from its vineyards. On the southern slope is a town of the same name. The locality was on the frontier between Latium and Campania, and was celebrated for the victory gained there by Appius Claudius over the Samnites.

Mas'sicot [Fr.], protoxide of lead (PbO), prepared without fusion. (See LEAD.) C. F. CHANDLER.

Massie (Gen. NATHANIEL), b. in Goochland co., Va., Dec. 28, 1763; entered the Revolutionary army at the age of seventeen years; studied surveying; settled in Kentucky in 1783; became a resident of Manchester, O., in 1790, and laid out the town of Chillicothe upon his own lands; was engaged in the Indian wars of the North-west, in which he gained the rank of general of Ohio militia; was a delegate to the convention which framed the Ohio constitution in 1802; was frequently a member of the State legislature, having served one term as Speaker of the senate; was a candidate for governor in 1807, and declared elected, but resigned before entering upon the office. D. at Paint Creek Falls, O., Nov. 13, 1813.

Massillon, city and R. R. centre, Stark co., O. (see map of Ohio, ref. 3–H, for location of county), 65 miles S. of Cleveland, on the Tuscarawas River and Ohio Canal, in the midst of the Tuscarawas Valley coal-fields, has a good educational system, gasworks, blast furnaces, 3 quarries of Massillon white sandstone, a large rolling-mill, several flouring-mills, a sash-factory, machine-shops, an iron-bridge factory, paper-mill, and the extensive agricultural implement establishment of Russell & Co., the Massillon Excelsior Works and the Massillon Harvester Works, the two latter furnishing machinery for the West in large quantities. Pop. in 1870, 5185; in 1880, 6836.

Massillon' (JEAN BAPTISTE), b. at Hyères, Provence, France, June 24, 1663; entered the Congregation of the Oratory in 1681; went in 1696 to Paris; became Roman Catholic bishop of Clermont 1717; was admitted to the Academy in 1719. D. Sept. 18, 1742. His worldly ambition was not very great. He was startled at the attention his first attempt at preaching attracted, and retired to the abbey of Septfonds, where he subjected himself to a very severe discipline. Cardinal de Noailles, however, was determined that the Church should not lose so rare a talent, and, in 1696, Massillon was recalled to Paris and began to preach again with great effect. Louis XIV. said of him that, while other preachers made him pleased with them, Massillon made him displeased with himself; but, in spite of the great compliment he thus paid both to his character and to his talent, he gave him no preferment. His worldly success Massillon owed to the regency. His style is one of charming delicacy, pathos, and grace, and his own character was pure and gentle, but his public life, though marked by modesty and simplicity, was ever manly and independent. His complete works, mainly sermons, lectures, and synodal addresses, were first published 1745–46, and are models of elegant rhetoric. (See Theremin, *Demosthenes u. Massillon*, Berlin, 1845.)

Mas′singberd (FRANCIS CHARLES), b. in Lincolnshire, England, about 1800; graduated at Magdalen College, Oxford, with honors in 1822; took orders in the Church of England in 1824 and 1825, when he received the living of South Ormsby. In 1847 he was made a prebendary of Lincoln, and was 1862–72 chancellor of the cathedral church, and afterwards a residentiary canon. He was an active member of the lower house of the convocation of Canterbury; author of a *History of the English Reformation* (1842), *Church Reform* (1833), *Law of Church and State* (1857), *Lectures on the Prayer-Book* (1864), and other works. D. in Dec., 1872.

Mas′singer (PHILIP), b. at Salisbury, England, 1584; studied at St. Alban's Hall, Oxford; went in 1606 to London, where it has been supposed that he became a Roman Catholic. Little is known of the events of his life. His first play is the *Virgin Martyr* (1622). Only eighteen of his works are extant, the MSS. of several others having been carelessly destroyed. He excelled in the drawing of tragic character, in the dignity, refinement, and moral superiority of his sentiments, and in melody of expression. Among his best works are the *Duke of Milan* (1623), *Fatal Dowry* (1632), *A New Way to Pay Old Debts* (1633), which still keeps the stage; *A City Madam* (1659), *A Very Woman* (1655), and *The Picture*. D. Sept. 18, 1640. Says a burial-register of London, "March 20, 1639–40, buried Philip Massinger, a stranger." He was the associate of Fletcher and Decker. Best edition of his works by William Gifford (London, 1850).

Mas′son (DAVID), M. A., b. at Aberdeen, Scotland, Dec. 2, 1822; educated at Aberdeen and Edinburgh; was for a time a journalist; professor of the English language and literature in University College, London, 1852–65; became in 1865 professor of rhetoric and English literature in the University of Edinburgh; and was from 1859 editor of *Macmillan's Magazine*. His articles in reviews and magazines are widely known. Author of *Essays, Biographical and Critical* (1856), *Life of Milton* (vol. i. 1858; vol. ii. 1871, vol. iii. 1873; vols. iv. and v. 1878; vi., and last, 1880), *British Novelists* (1859), and other works.

Mass′mann (HANS FERDINAND), b. at Berlin Aug. 15, 1797; studied theology, natural science, and the German language and literature; was an enthusiastic disciple of Turnvater Jahn; became professor in Old High German at Munich in 1829, and at Berlin in 1842. He gave annotated editions of the Gothic and Old High German literary monuments, of Tacitus's *Germania*, and wrote a number of essays on the oldest history of Germany.

Massorah. See MASORAH.

Mas′sowah, or **Masoua,** town belonging to Egypt, on a small island of coral formation in the Red Sea, in lat. 15° 36′ N., lon. 39° 21′ E., has a good harbor. It is ill built, dirty, and filthy, but has some importance as a commercial place. Pop. about 6000.

Mast [Ang.-Sax. *mäst*], a nearly upright spar of wood, iron, or steel rising upward through the decks of a vessel for the purpose of affording attachment to the sails and rigging of a ship. The fir and pine of Puget Sound and Norway are of great repute as material for masts. Iron and steel masts are constructed upon several different systems. In all vessels of any considerable size each mast consists of several parts, of which the lowest is the mast proper, next the top-mast, the top-gallant-mast, and the royal-mast, and sometimes a sky-scraper, the highest of all. The foremost mast of a ship is the foremast; the central one, the mainmast; the one farthest aft, the mizzen-mast; and the separate parts of each are distinguished as the fore-top-mast, the main-top-gallant-mast, etc., by combining the name of each mast with the appropriate name of each part of a mast. Ships, barques, and some schooners have three masts. Brigs, barkentines, and schooners have usually two masts. Many sloops, smacks, luggers, and other small craft have but one mast. Large sea-going steamers have often four, and sometimes five, masts.

Mastacembelidæ. See APPENDIX.

Mas′ter [Ang.-Sax. *mäster*], an officer in the U. S. navy belonging to the grade next above that of ensign and next below that of lieutenant. Masters correspond in rank to first lieuts. in the army and the marine corps.

Master and Servant. These terms indicate a mutual personal relation which implies on the one side authority and will to direct and appropriate, and on the other obligation, under direction, to perform labor, chiefly manual labor. It is a relation indispensable in the social life of mankind. It grows necessarily out of that diversity of capacity among men which springs from difference of natural endowment and acquired wisdom and skill, and out of the principle of division of labor, which is the most effective means of multiplying human comforts, and out of recognized factitious distinctions based on wealth and social position. When the liberty and equality of men, as men, with regard to their rights, are recognized and respected, the parties enter into this relation voluntarily for their mutual advantage. The benefits on either side are defined by contract, expressed or implied, the rights and obligations of which are guarded by law. This is the natural and legitimate basis of the relation. But in the actual history of the world, under the sway of human selfishness, this natural order has been very extensively subverted. Masters have used their superior power to gain ownership of their fellow-men, and to hold them as servants bereft of freedom, subjected to their absolute control, and fixed in a condition of servitude from which neither they nor their children could emerge. Hence the existence of slavery almost universally under the ancient civilization; hence villeinage and serfdom in the Middle Ages; and hence, too, the domestic slavery of modern times. (See SLAVERY, VILLEINAGE, SERF.) The consequent division of society into classes tended to degrade all forms of manual labor as more or less servile and disgraceful. Thus, in the palmy days of Greece and Rome all mechanical industry and mercantile operations were carried on by slaves for the benefit of their masters, and all such pursuits came within the purview of this one relation of master and servant. But the spirit of Christianity has worked steadily an influence adverse to slavery in all its forms, and now almost throughout Christendom the claim of one man to own the person and labor of his fellow-man is abrogated, and the principle of individual freedom in the relation under consideration is established. The great industries of society are raised to the dignity of honorable vocations, and other terms, such as merchant and salesman or clerk, master and apprentice or journeyman, farmer and laborer, manager and operative, and especially the broad terms of capital and labor, distribute much that was formerly treated of under this relation. Especially is this true in our own country, where the terms master and servant are restricted very much to household or domestic relation. Even there the spirit of liberty quite generally protests against everything servile by substituting for "servant" the term *help* or *hired man*.

It is one of the problems of modern social science so to adjust this relation, and so to mould public sentiment concerning it, as to protect the rights of both parties in full recognition of their freedom and independence, and at the same time to secure more of permanence and more of mutual regard, attachment, and fidelity in this relation. This is closely linked with the *labor question* in its broad application. The solution of the problem is to be reached not mainly by legislation, nor in great combinations and associations, fitly as these means may be employed, but by magnifying to the common apprehension the dignity of "honest work well done" in every sphere, and by applying the Christian law of love to repress the suspicions, envies, jealousies, and restless aspirations which are now the disturbing elements in the relation. A. L. CHAPIN.

Master and Servant, in Law. The duty of one person to render service to another may either be derived from a rule of law or may be created by contract. Servants are thus capable of division into two principal classes—slaves and servants by contract. Slaves will be considered in a separate article. (See SLAVES.) Apprentices form a special class of servants, which has already been treated of. (See APPRENTICES.) While the relation of a master to an apprentice usually originates in a contract, yet it is governed by a peculiar set of statutory rules, whereby labor under it is made compulsory. In the ordinary relation of master and servant, as understood in modern times, there is simply a contract relation. The remedies on either side are those which attach ordinarily to breach of contract; *e. g.* an action in a court of law for compensation. It is this class of servants only which will form the subject of the present article. The topic will be considered under the following divisions: I. The rights and duties of the parties; II. The effect of the relation upon third persons.

I. The principal duty of a servant is to work for the master for the entire time required by his contract, with reasonable skill, depending upon the nature of the employment, and to follow such reasonable orders and directions as may be given him in the course of his service. He may be engaged either indefinitely or for a fixed period. In the former case he may quit the employment without notice; in the latter instance, the contract is an "entire" one, and he can recover no wages unless the term of service is fully performed. Thus, if the servant were hired for a year at a specified sum, and should leave during that time without cause, he could recover no portion of his wages. The same result would follow though his wages were estimated by the month. Thus, a hiring for a year at $50 per month is an annual hiring, the mention of the month being a mode of reckoning the annual wages. If, however, the contract prescribed that the wages should be *paid monthly*, the servant would earn wages for each month that he continued in service, subject to deductions for any injury sustained by his master by his breach of contract. There is a tacit engagement on the part of a servant that he has the usual skill possessed by the persons who follow the calling in which he professes to serve; as, if he becomes a clerk to a merchant, that he has the ordinary qualifications of a clerk. If these be absent, he can properly be dismissed by his master on that ground alone. Dismissal may also be made for any failure or refusal on his part to obey such orders as the master may properly give him in the course of his employment. The remedies of the master are not confined to a dismissal of a refractory servant. As in general in cases of breach of contract, he may have his action for damages. A servant—as, *e. g.*, an accomplished singer—may have made a contract whereby if performed the master would naturally reap large gains. If she wilfully breaks it, she will be liable to pay an adequate amount of damages. This contract is of a personal nature, and there is a tacit stipulation in it that if either party die it is at an end. It seems, accordingly, to follow that the representatives of the servant would be entitled to receive such portion of the wages as had equitably been earned at the time of death.

The principal duty of the master is to keep up the relation created by the contract, to furnish the servant with suitable tools and instruments of labor, to employ suitable fellow-servants, and to pay the stipulated wages. When these obligations are violated the servant has a right of action.

When the master wrongfully discharges a servant before the time of service has expired there is a choice of remedies. The servant may take one of two views—either that the contract is at an end, or that it continues. If he adopts the first theory, he may sue for what he has done, and recover its value. If he prefers the second, he has an action for not being permitted to work, or, in other words, for the non-recognition by the master of the relation existing between them. His action in such a case is not for wages, but for breach of contract. This doctrine has recently been carried so far in England as to allow the servant who is discharged after the contract is made, but before the time for entering upon the service has arrived, at his election to bring an immediate action, without waiting until the contract-day occurs. The positive refusal of the master to recognize the relation of service relieves the servant from any readiness to perform on the stipulated day. Still, the servant may in such a case await the day fixed, tendering performance or showing readiness to perform, and base his action on a refusal then to receive him. This theory has not yet been fully recognized in this country.

It is a well-settled rule that the master must not knowingly supply his servant with tools or other instruments of labor which are unfit for use. Should he do so, and the servant without his fault sustain damage in consequence, the master is responsible. This rule is, however, subject to an important qualification. If the servant is aware of the defect, and notwithstanding continues his work, he is in a sense the author of his own injury, or, in legal language, is guilty of "contributory negligence," which is a fatal objection to his claim. (See Negligence.) The same general remark may be made of the duty of the master to select competent fellow-servants. It is a matter of common knowledge that in the great undertakings of modern times it is frequently necessary to employ a number of servants to co-operate in the accomplishment of a particular result. It is a well-settled general rule that if the master has used reasonable care in selecting such co-operating servants, and one of them by his carelessness injures another, no action will lie against the master, but only against the servant in fault. The theory is, that the servant in fixing his rate of wages took this risk into account as one of the dangers incident to the business in which he was engaged. Nice distinctions are taken as to whether the employment in which the two servants are engaged is a common one or not, as the rule cannot be extended in reason to a case where, though the employments are distinct, the master is the same. The rule itself gives way when the master has not used due care in the selection of the servant at fault. But even in that case, if the person injured, knowing of the carelessness of a fellow-servant, still works with him and sustains injury, the doctrine of contributory negligence may be applied to him, and the master thus be relieved from liability. A servant has no claim upon his master for damage sustained by him owing to the dangerous nature of the business which he follows, as this risk is plainly assumed by him in fixing his rate of wages. Nor can he call upon his master to provide him with medicines or medical attendance in case of sickness, though if the latter should engage a physician to render him service he may become liable to pay the medical fees, on the ground that the physician contracted with him and gave him credit. It is not essential to the existence of the relation of master and servant that there should be any agreement to pay wages. The nature of the service may show that it is intended to be gratuitous. Thus, if a bystander should, in the absence of a master, volunteer to aid hired servants in performing a task which they should not have sufficient force to accomplish, he would become in some respects a servant, and clearly would have no action against the master for injury sustained by the negligence of those whom he aided. It frequently happens that the relationship between the parties leads to a presumption that no wages are to be paid. An instance is that of a daughter living in her father's family after attaining majority, rendering services and receiving support. It may, however, be shown that there was a mutual understanding that wages were to be paid, when they can be collected.

It is not, by the rules of the common law, necessary that the relation of master and servant should be created by writing. The provisions of the statute of frauds (see Frauds, Statute of), requiring that every contract "not to be performed within a year" should be written, may, however, be applicable. In such a case, if the term of service should extend beyond one year from the day when the contract is entered into, it must be written. Still, if such a contract should be void by the statute, the servant could collect the reasonable value of any services that he may have rendered.

II. The principal question under the second subdivision of this article concerns the right of third persons to hold the master responsible for the acts of the servant. The liability of the master in such a case depends largely upon the fact that there is in law a substitution of the servant in his place, so that the legal maxim may be applied that he who acts by another, himself acts. There is also another principle of importance to be noticed. Even where the servant goes beyond the course of his employment, yet if the master has so conducted himself as to induce third persons, acting in good faith, to suppose that the servant has authority, he will be precluded from denying the apparent authority of the servant. This rule is, in fact, a branch of the doctrine of estoppel (see Estoppel), and is especially applicable to the case where a servant acts in making a contract substantially as an agent. (See Agent.) Thus, if a master should send his servant on several occasions to purchase for him family stores on credit, and the servant should on a further occasion make a purchase without authority and for his own private ends, the merchant still supposing him to be acting for his master, the latter would be liable. Dismissing from view this class of cases, the more serious inquiry is, How far is the master responsible for the wrongful or tortious acts of his servants? The great inquiry is in this case whether the servant is acting in the course of his employment. As this is a subject of great complexity and importance, it will conduce to clearness to consider (1) the distinction between a contractor and a servant, and (2) the master's liability for the acts of the latter. (1) It is of great consequence to distinguish accurately between a servant and a contractor. The rule of *respondeat superior*, which makes a master liable for the acts of a servant, has no general application to the case of a contractor. There are certain well-known tests whereby a servant is to be distinguished from a contractor. The following general characteristics in each case may be stated: The latter follows an independent employment, receives compensation for an aggregate amount of work done rather than for the time occupied in it, and supplies a result to his employer, who has no control over the means whereby it is effected. The former in general has no independent employment, is paid for his time rather than for the end attained, and is liable to be controlled both in the mode of doing his work and in the result to be accomplished. While these distinctions may not always be so broadly drawn as they are here given, yet they in substance always exist. They have, however, only been recently recognized in jurisprudence. In the year 1799 the following case occurred in the English court of common pleas: A, having a house by the roadside, contracted with B to repair it for a stipulated sum; a carpenter, having a contract under B to do the whole business, employed a bricklayer under him, and he again contracted for a quantity of lime with a limeburner. The servant of the latter laid a quantity of lime in the road, by means of which the chaise of the plaintiff was overturned, and he was thrown out and injured. The question was whether A was responsible for the act of the limeburner's servant. It will be observed that the specific act which caused the injury was not authorized by A, and the most that could be contended was that it was included in the acts which he did in fact authorize. This the court held, and pronounced A liable. The decision, however, has since been disregarded in England, as well as in this country, and the proposition maintained that as B was a contractor, none of the persons acting under him could be regarded as A's servants. The act of ordering the house to be built did not naturally or necessarily result in causing the injury. That was to be imputed simply to the negligence of the limeburner's servant, for which it is not reasonable to consider the original employer responsible.

While this general rule has now become fully settled, there are cases in which an employer will be liable for the act of a contractor. One is where the thing to be done is in its nature unlawful. Thus, if one should employ a contractor to commit a nuisance in a public street by tearing up, without legal authority, a pavement and disturbing public travel, he would be responsible for the injury caused. The same rule would perhaps be applied if a contractor was directly employed to do the very act which caused the injury; as, for example, if in the above case he had been employed by A specifically to place the lime in the road. Similar doctrines are applied to cases where the employer is under a duty to the public to perform an act in a prescribed manner. In that case he cannot shift off responsibility by employing a contractor. This proposition may be illustrated by the case of a city having a duty imposed upon it by law to keep its streets in repair or properly lighted. If it employs a contractor to make the necessary repairs, and he acts negligently, so that individuals making use of the streets are thereby injured, the city will be responsible. (2) Having thus distinguished the case of contractors from that of servants, it remains to consider the responsibility of a master for the acts of a true servant. The sole question here is, Was the act done within the scope of the servant's employment? Attempts have been made to take a distinction between negligent and wilful acts, on the theory that the master is liable for the former and not for the latter. It has been found in the late exhaustive discussions of this subject that this difference does not exist, and that it is immaterial whether the act be negligent or wilful, so long as it falls within the scope of the servant's employment. Under this rule, whenever the master entrusts the servant with power to decide whether a given state of facts exists, on the existence of which he is authorized to act, and he makes an erroneous decision and acts so as to injure another, that person will have an action against the master. Thus, if a proprietor of an omnibus should entrust a driver with power to eject an intoxicated passenger, and the driver should erroneously conclude that intoxication existed in a particular case, and should remove the passenger accordingly, the master would be liable. The same rule would be applied if the same circumstances should exist in the common case of a passenger to be removed for the non-payment of fare. On the other hand, if the driver or conductor knew that the passenger was not intoxicated or that he had paid his fare, and removed him simply to vent his own spite or malice, he could not be said to be acting within the scope of his employment. In some cases the master is *directly* liable for the wrongful acts of the servant; in others, indirectly. In the former case in technical language he is said to be liable to an action of trespass, and in the latter to an "action on the case." Thus, whenever the master directs the specific act to be done, and it directly results in injury, the master is a trespasser, as if he ordered a servant without cause to eject a passenger from one of his vehicles. The same rule prevails where the act which he orders necessarily results in a trespass, as if he should order earth to be removed from his own land in such a manner as must inevitably lead to the caving in of his neighbor's land. But in cases where the act of the servant can be performed in a manner which will cause no injury to third persons, and yet it is in fact done by him in such a way as to invade another's rights, the master is no longer liable directly, but only consequentially. The correct theory, then, is, that he is legally responsible for the employment of a servant who in the performance of orders is so derelict in his duty as unnecessarily to injure others. The rules that have been stated cease to prevail when the service is at an end or is even temporarily suspended. For the time being the apparent servant is not a servant. Thus, if it were a coachman's duty to put up his master's horses at six o'clock at night, and he should without his master's knowledge use them in a particular instance at a later hour for his own purposes, he would not be in his master's service, and the latter would not be responsible for his conduct, though it was apparently but a repetition of acts performed while in service at an earlier hour of the day. Reference should be made to a class of cases where the master has entered into a contract with a person to do a specified act, and through the wilful act of the servant the contract remains unperformed. In that case an action may be based upon the breach of contract, it being immaterial to the injured party whether that breach is occasioned by the wrongful act of the servant or not. Thus, if a railroad company should agree to carry goods or passengers from one place to another within a specified time, and its servants should by a combination among themselves prevent the transportation, the contract is broken and the company is liable.

There are instances in which it has been determined that a master is liable for the acts of one employed by his servant, even without any specific authority to make use of his services. The ground of this would seem to be that the master by implication confers upon a servant the power of obtaining assistance from others, so far as to become responsible for acts done within the scope of the general employment. It is thus a dictate of public policy that the master should be answerable. In an early case it appeared that a master having employed a servant to do some act, the servant out of idleness employed another to do it, and that person in carrying into execution the orders which had been given to the servant committed an injury. The master was held liable. This doctrine was sanctioned by the New York court of appeals in a recent instance, in which a servant was directed to throw snow from the roof of a house into a street, and one passing by was injured by a piece of ice carelessly thrown down by a person employed by the servant without the master's knowledge.

There is such a complete identity between a master and a servant acting in the course of his employment that notice to the latter of a certain fact connected with the business is deemed to be notice to the former, even though the servant is so neglectful of his duty as not to mention the fact to the master. Thus, if a servant having charge of a vicious dog should know his propensities, the master would be deemed to have like knowledge, and would be answerable accordingly.

Assuming that a person is a servant, it is sometimes difficult in a legal point of view to determine who is his master. He may be regularly employed by one person who may commission him to serve another. The question will be, if he is guilty of an act of negligence whereby some third person is injured, whether he is the servant of the regular employer or of the one whom he happens temporarily to be serving. Thus, if an owner of a carriage should hire for a day a pair of horses and a driver from the keeper of a livery stable, and the driver should, while obeying the directions of the owner of the carriage, through negligence, injure a stranger, who would be liable? The answer is, that the driver is the servant of the party who selected him and who pays his wages, and not of the man whom he happens to be serving by force of the directions of the true master. Under special circumstances the owner of the carriage may, undoubtedly, make himself liable, as if he should personally interfere with the mode in which the driver performs his service.

The fact that the master is liable for the wrongful act of the servant does not relieve the latter. He is the true author of the wrong done. The injured party may at his election sue either the master or the servant, and according to some authorities both in one action. If the master is obliged to pay damages, he has a remedy over against the servant. It is a wise course for the master when sued to notify the servant to defend the action, in which case the judgment against the master is conclusive against the servant.

The master may on his part have an action against third persons who injure his servant and thus deprive him of his services. The ground of the action is "loss of service." Examples of this are cases in which an assault has been committed or there has been a deprivation of personal liberty. So, if a female servant were seduced and loss of service thereby sustained. It is a further rule that if one knowingly entices away a servant and leads him to break his contract of service, the master will have a cause of action against the enticer, even though he may also have one against the servant. This rule has been applied to cases of greater magnitude than those usually found in contracts of service; *e. g.* contracts with managers of theatres or operas by musical or dramatic performers. These principles cannot be extended so far as to give the master a cause of action for a mere breach of contract made by the third person with the servant, whereby the latter is injured. Thus, if a servant should enter into an ordinary passenger contract with a railway company, and in the course of it should sustain injury, disabling him from service, the master could have no action, as he would be no party to the contract. The servant alone could enforce its provisions. When, on the other hand, no contract intervenes, and the efficiency of the service is impaired by a wrongful act done to the servant, the master has his remedy in an action for damages. If, however, the servant were killed by the wrongful act of another, the master would have no action. The contract of service is deemed to be terminated by the death of the servant, and every remedy is suspended. Statutes in some States have varied this rule in the case of parent and child, but not in that of the mere contract of service. The rules thus stated are not reciprocal. The servant has no remedy for an injury done to the master, not even if the master is so disabled as to prevent him from continuing the work in which the servant is engaged. It is an old rule of the common law that the servant may defend the master from unjustifiable personal assaults, as well as the master in like case the servant. These rules are extended to the cases of parent and child and of husband and wife. A parent may sue one who injures or seduces his child for "loss of service." (See Parent and Child.) On the same ground a husband may sue an adulterer who has seduced his wife, or any person who in legal language has "harbored" her, or wilfully and without good cause withdrawn her from his service. (See Husband and Wife.)

This branch of the law has become in modern times one of great extent and importance, particularly in the administration of such great departments of business as railways. The general rules of law will be applied to corporations acting as masters, as well as to individuals. (For further information consult Smith on *Master and Servant;* Redfield on *Railways;* Kent's *Commentaries:* lecture on this topic.) There is some legislation in England concerning "laborers" and "servants of husbandry." This has not been copied in this country. (For peculiar rules concerning seamen consult Seamen.) T. W. Dwight.

Master in Chancery, in former times an officer in the English court of chancery who acted as general assistant to the judge, and performed much of the administrative and collateral business of the court. These officers were twelve in number, of whom the master of the rolls was the chief. (See Master of the Rolls.) The practice of appointing them grew up at a very early period in the history of English law. Their principal functions were the hearing of references of causes, the taking of affidavits and acknowledgments, the examination of witnesses in certain cases—as, *e. g.*, for the perpetuation of testimony—the taking of recognizances, etc. When a suit involved a matter of account, particularly if this were long and complicated, it became the usual practice to refer its settlement to a master. The masters also examined upon reference the propriety of bills in equity, and if report was made that a bill contained scandalous and impertinent matter, it was struck out. If no objection was made to the report or decision of a master in any case, it was the regular practice to perfect and confirm it by a judicial order. Within a comparatively recent period the office of master in chancery has been abolished in England by statute (15 and 16 Vict. ch. 86), and the duties which formerly devolved upon this officer are performed by the judges and registrars. In the U. S. there are still masters in chancery in some of the States. In those which follow the New York code of procedure it is the usual practice to refer matters of account and other incidental business in equity to attorneys-at-law or solicitors for settlement or determination, who are in such a case styled technically "referees." In performing such functions they have much the same powers as masters in chancery formerly possessed. (For further information as to masters in chancery consult Spence, *Equitable Jurisdiction of Courts of Chancery,* Daniell's *Chancery Practice,* Barbour's do.)

George Chase. Revised by T. W. Dwight.

Master of a Ship (law), the chief officer of a merchant vessel, having supreme command of the crew and the sole management of the ship, often in common speech called the "captain." This office, with its peculiar legal functions, is very ancient; it is described in the *Laws of Oléron,* which appeared in the twelfth century in the Italian *Consolato del Mare,* a collection or digest of the principal commercial usages of the thirteenth century, and in other maritime codes of the Middle Ages. The master is appointed by the owners of the vessel, and as an agent represents both them and the owners of the cargo. He is clothed with very great powers in respect to the ship, the cargo, and the crew, and while in foreign countries his authority to act for and to bind his principals exceeds that of any other regular commercial agent, and is almost unbounded. (For a full description of his powers, duties, and functions see Shipping.)

Master of the Rolls, one of the judges of the court of chancery in England, before whom equitable causes may be heard in the first instance. He possesses co-ordinate jurisdiction with the three vice-chancellors. (See Courts.) Appeals may be taken from his decisions to the court of appeal in chancery or to the lord chancellor. This specific title was given to him originally because he had the custody of the public rolls and records. This custody, however, was gradually withdrawn from him, and vested in officers not in his appointment, but has in recent times been restored to him by statute (1 and 2 Vict. ch. 94). He was formerly chief of the masters in chancery until this office was abolished. (See Master in Chancery.)

Mas'tersingers [Ger. *Meistersinger*], the name of a peculiar kind of literary guild or association which was formed in various German cities in the fourteenth and fifteenth centuries, when poetry had died out at the courts among the Minnesingers, and was taken up by the burghers. The productions of these schools have comparatively little poetical interest, and as the invention of some novelty in form was the condition of becoming master of the guild, hunting after novelties soon drove the form into absurdity. (For interesting information of this peculiar phenomenon see Puschmann, *Gründlicher Bericht des Deutschen Meistergesangs* (Görlitz, 1573), and Wagenseil, *Buch von der Meistersinger holdseligen Kunst* (1697).)

Mas'tic [Gr. μαστίχη; literally, *chewing* substance, because it was used as a masticatory by the ancients as now by the Orientals], a valuable gum-resin used as an ingredient of many varnishes. Alone, it is transparent, tough, brilliant, and delicate, and is often employed in finishing maps and paintings. It is obtained from cuts in the bark of *Pistachio lentiscus, P. Atlantica,* etc., shrubs of the order Anacardiaceæ. It comes from Barbary, the Levant, and especially from China. It has a limited use in medicine and in mounting objects for the microscope, and in dentistry is a temporary material for filling decayed teeth.

Masticura. See Appendix.

Mas'tiff [L. Lat. *mastivus*], a name applied to several distinct breeds of large watch-dogs. The old English and Irish mastiffs (breeds which are unfortunately now nearly extinct) resemble the bull-dog in courage and strength, but excel him in magnanimity, faithfulness, and affection for man. The mastiff is a most dangerous enemy. The Thibet mastiff, from Central Asia, is one of the largest of the dog tribe. He is bred both as a sheep-dog and as a defender of the house. The so-called Cuban bloodhound is really a mastiff of Spanish origin, but in ferocity and blood-thirstiness appears to excel all other breeds.

Mas'tin (Claudius Henry), M. D., LL.D., b. in Huntsville, Ala., June 4, 1826; educated at the University of Virginia; began the study of medicine in 1846; was a private pupil of the distinguished Dr. George B. Wood, and graduated M. D. in the University of Pennsylvania 1849; went to Europe in 1850, and studied in London, Paris, and Edinburgh. Returning, settled in Mobile, where he has since practised, chiefly as a surgeon, in which capacity he served in the Confederate army. In Mar., 1874, delivered the annual address before the medical alumni of the University of Pennsylvania, and that institution conferred upon him the honorary degree of LL.D. in 1875. Dr. Mastin has contributed valuable articles to medical journals, and is a most excellent surgeon. Paul F. Eve.

Mas'todon [Gr. μαστός, a "nipple," and ὀδούς, a "tooth"], an extinct genus of Tertiary and Quaternary quadrupeds of large size, belonging to the order Proboscidea, and closely related to the elephant and the mammoth. They are distinguished from those animals principally by the more simple structure of the crowns of the molar or grinding teeth. These teeth, according to Owen, are seven on each side, above and below. The first two, at least in the upper jaw, are followed by vertical successors, but the remaining teeth displace one another from behind forward, usually not more than two of each series being in use at one time, or eight in all. The molar teeth have wedge-shaped, transverse ridges, and the summits of the ridges are divided by a depression lengthwise with the tooth, and further subdivided into smaller cones, more or less resembling the teats of a cow, whence the name, meaning "nipple-tooth." The form of these teeth is of peculiar interest, as being intermediate between those of ordinary herbivorous anima's and the complex teeth of the elephant. In the common American species, *M. Americanus* (*Ohioticus, giganteus*), the posterior molars are crossed by three to five such ridges, the last molar above and below being subject to some variation; but in the three teeth preceding the last there are three such ridges, and this form was taken by Dr. Falconer as the type of his sub-genus *Trilopodon* ("three-crested"). *M. longirostris* of Europe has four such ridges on the corresponding teeth, representing his sub-genus *Tetralophodon* ("four-crested"). *M. Sivalensis* has five ridges, while another group, considered by that author as intermediate between *Elephas* and *Mastodon*, and named *Stegodon*, has six or more such crests. These ridges are built up of dentine or the bony substance of the tooth, and covered by a layer of enamel. The fangs and base of the tooth are further covered by a coating of cement, which in the typical *Mastodon* extends only in a very thin layer over the enamel of the crown, while in *Stegodon* it is present in considerable quantity in the valleys between the crowded ridges. In the elephant the same process has been carried still further. The ridges of dentine coated with enamel have become numerous, thin, and proportionally high, and the intervals are filled with cement, which also invests the whole crown of the tooth. As such a tooth becomes worn by use the grinding surface will present a series of ridges of enamel crossing the tooth, and uniting with each other in pairs at the sides of the tooth, so as to enclose an elongated area of dentine. Each of these areas represents a section of a dentinal ridge, while between the areas, and continuous with the exterior of the tooth, is a layer of cement. Both the cement and dentine, being softer than the enamel, will be worn into hollows alternating with ridges of that material.

The coarser teeth of the *Mastodon* indicated a coarser food than that of the elephant, and the remains of twigs and branches of trees, especially spruce and hemlock, found in the position of the stomach of some mastodon skeletons, have given very positive evidence as to the nature of their food. There were no canine teeth, but two of the upper incisors were developed in the form of tusks, like those of the elephant. These were also preceded by a pair of deciduous tusks, and in some species were provided with a band of enamel upon their surface. Shorter tusks were also present in the lower jaw of many and perhaps all the species. These were early deciduous in the females, and in the males one, usually the right, was frequently retained. The skull was massive, but considerably lightened by air-cavities. The form and position of the nasal opening, as well as the shape of the nasal bones, indicate the presence of an elongated and flexible proboscis, and the necessity of such an organ is shown by the shortness of the neck, the vertebræ of which are much compressed longitudinally and flattened. All the vertebræ are short, with the neural spines of the thoracic region elongated. The *M. Americanus*, the earliest and best known species, has been very fully described under the name *M. giganteus* by Dr. J. C. Warren, the description being mostly drawn from a very perfect skeleton discovered in a swamp at Newburg, N. Y. This skeleton measures 11 feet in height, and 17 feet in length to the base of the tail. The entire length of the tusk is 10 feet 11 inches, about 2½ feet being included in the socket. The fore foot measures nearly 2 feet across. The bones were massive compared with those of the elephant. When alive this animal must have been 12 or 13 feet high, and, including the tusks, about 25 feet long. Other skeletons more or less complete have been discovered in Orange co., N. Y., in New Jersey, Indiana, and on the banks of the Missouri, while isolated bones and teeth have been found in nearly all parts of the U. S. and in Canada. This species seems to have been confined to the Quaternary. At the same time there were living at least two species in South America, the *M. Andium* and *M. Humboldtii*, the former species extending into the southern parts of this continent. From the Pliocene of Nebraska, Dr. Leidy has described a species, *M. mirificus*, smaller than *M. Americanus*, and with a greater number of transverse ridges upon its molars. *M. obscurus* was first described from the Pliocene of Maryland, and remains of the same or a closely allied species have since been found in North Carolina, Georgia, California, and New Mexico. This species closely resembled the *M. angustidens* of Europe, and like that species was provided with a band of enamel upon the tusk. No American species are known earlier than the Pliocene, but in Europe *M. longirostris* and *M. tapiroides* are from the Miocene, and the explorations of Capt. Cautley and Dr. Falconer have made known several species from the Sewalik Hills of India, which are referred to the Miocene. Below that formation no species have yet been discovered. O. C. MARSH.

Mastodonsau'rus [Gr. *μαστός*, a "nipple," ὀδούς, a "tooth," and *σαῦρος*, a "lizard"], an extinct genus of **Amphibia.** (See LABYRINTHODON.)

Masû'di, or **Al-Masûdi** (ALI-ABUL-HASSAN), b. at Bagdad about the close of the ninth century; received a brilliant education and spent many years in travel. The Mohammedan power and the Arabic language were then at their highest development, and Masûdi visited and described many regions which no writer of his race and creed had seen, including the shores of the Caspian, Persia, India (perhaps even China), Madagascar, Arabia, all the countries of North Africa, and Spain. His later years were passed in Palestine, Bassora, Antioch, and Damascus, and he d. in Egypt in 956. His work, embracing the geographical and historical results of his travels, is the most celebrated of its kind in the Arabic language, and abounds in curious information illustrating the manners, morals, and beliefs of the time. It is styled *Meadows of Gold and Mines of Gems*, and is but an epitome of a larger work, now lost, called the *History of the Times*. The *Meadows of Gold* has been frequently printed, and a partial English translation was published by Dr. A. Sprenger in 1841 under the title of *El-Masûdi's Historical Encyclopædia*. Other works of Masûdi are extant in MS., and several others have been lost.

Masulipatam', seaport of British India, the capital of a district of the same name in the presidency of Madras, at the mouth of the Kristnah, in lat. 16° 10′ N. It carries on a considerable trade, as its harbor is the only place on the whole eastern coast of the Deccan where the heavy surf allows large vessels to cast anchor; from October to December, however, no ships can arrive on account of the monsoon. Pop. 27,884.

Mat, or **Matting** [Ang.-Sax. *meatte*], a coarse textile fabric made by weaving grasses, rushes, palm-fibre, bark, and the like, and used for summer floor-covering, for packing furniture and other goods, as material for bags, as covering for hotbeds and cold-frames in gardens, etc. In rude nations matting is used instead of sailcloth. Vast quantities of "bass matting," made from the inner bark of the European linden tree (*Tilia*), are made in Northern Russia. Nearly all kinds of Russian exports are packed in this material, which has an extensive sale. Chinese or Canton matting is made from rushes, as are the excellent mats of the Japanese. The Mauritius exports sugar and grain packed in mats, which are made of the leaves of a tree. When washed they are sold very cheaply. The beautiful India matting is woven from a sedge, the *Papyrus Pangorei*. In Portugal and Spain very handsome mats are made from Esparto grass and reeds. Mats are also made from coir or cocoanut and other palm fibres. These are used for covering the floors of public halls, and are very durable. The Japanese make mats so soft and elastic that they are used as bedding.

Matagorda, cap. of Matagorda co., Tex. (see map of Texas, ref. 6–J, for location of county), on the N. shore of Matagorda Bay, is an old Spanish town, and a favorite summer resort. During the severe storm of Sept. 15–20, 1875, which visited this section of the Texas coast, Matagorda was submerged, with much loss of property and a few lives. (See INDIANOLA.) Pop. in 1870, 386; in 1880, 438.

Matagorda Bay, an extensive bay of Calhoun and Matagorda cos., Tex. It receives the waters of the Colorado River, and Lavaca Bay, one of its arms, receives Lavaca River. The land about the bay is flat and much cut up by bayous, but a part affords rich pasturage. The entrance to the bay is by Pass Cavallo. Matagorda Peninsula, which separates the bay from the sea, is a low sand-spit, often marshy, and in some places is overflowed completely by high tides. Indianola, Port Lavaca, and Matagorda are the principal towns on the bay, which is the channel of much commercial activity.

Matagorda Island, a long sandy island in Calhoun co., Tex., separating Espiritu Santo Bay from the Gulf of Mexico. Its N. E. end reaches Pass Cavallo, and has an iron lighthouse with flashing light; lat. 28° 20′ 49″ N., lon. 96° 23′ 30″ W.

Matamo'ras, or **Matamoros,** a frontier town of Mexico, state of Tamaulipas, on the Rio Grande, 40 miles from its mouth, just opposite Brownsville, in Texas. With its broad, regular streets, it looks very much like an American city, and, in spite of the bar at the mouth of the Rio Grande, it has considerable trade, exporting horses, hides, wool, and metals, and importing manufactured goods of all kinds, cotton, linen, silk, and woollen fabrics from Europe, cottons, tobacco, flour, and preserved meats from America. The average value of its annual importation amounts to some $2,000,000. Pop. about 20,000.

Matamo'ros (Gen. MARIANO), b. in Mexico about 1770; was in 1811 priest of the village of Jantelclco, in the district of Cuernavaca, when the excesses of the

Spanish soldiery induced him to join the insurgents who had proclaimed independence. He went to Izucar, S. of Puebla, then held by the celebrated chieftain Morelos, who, being himself a priest, received him with great favor, and at once made him a colonel. In that capacity he soon showed such decided military talent as to be called "the right arm of Morelos," and the heroic defence of Cuantla (1812) was largely due to his efforts. He bore a distinguished part in the successful expedition against Oaxaca, and was in command at the signal victory of San Agustin del Palmar (Oct., 1813). Had he then exercised supreme power, Mexican independence would probably have been established; but Morelos, having resolved to attack Valladolid, was repulsed and his forces shattered at the battle of Puruarán, in which Matamoros was captured. He was shot a few days later at Valladolid (now Morelia) Feb. 13, 1814. His remains at a later day were placed with those of Hidalgo and Morelos in the cathedral of Mexico, and his memory has been honored by giving his name to an important city, as well as to numerous towns and districts. Alaman, in his *History of Mexico,* characterizes Matamoros as the best military genius among the insurgent leaders.

Matan'zas, town of Cuba, on the northern shore of the island, at the head of a beautiful bay of the same name, 52 miles E. of Havana, with which it is connected by two lines of railway, is well built, and contains one of the best educational institutions in the West Indies, the Empresa Academy. It is fortified, has a good harbor, and carries on a very considerable trade, having rapidly developed after the removal, in 1809, of the old commercial restrictions. Its principal exports are sugar and molasses. Two and a half miles E. of the city are the celebrated stalactite caves of Bellamar. Pop. estimated at 40,000.

Mataro', town of Spain, in the province of Barcelona, on the Mediterranean, 21 miles N. E. of the city of Barcelona. It has large manufactories of cotton, sailcloth, and glass, iron-foundries, and shipbuilding docks. The surrounding districts produce excellent wines, and great quantities of roses, strawberries, vegetables, and fruit for the Barcelona market. The fisheries are considerable. But the town has no harbor and must carry on its commerce by way of Barcelona. Pop. 17,405.

Matches, fine sticks or splinters of inflammable material tipped with a substance yet more inflammable to facilitate ignition. Our English word—like the Fr. *mêche,* a "wick," a "lock of hair;" the Port. *mecha,* a "match or wick;" It. *miccio, micco*—is derived from the Mid. Latin, *myxa, myxus,* the "wick or snuff of a candle," a modification of the Gr. μύξα, "mucus;" μύξα, which also signifies the nozzle of an antique lamp, is traceable to the Sanskrit *muc, muncāmi,* to "throw away," to "scatter." The earliest matches of which we have any record were thin strips of wood about six inches long and tipped with sulphur or brimstone. These were first used with the old tinder-box, one being applied to the smouldering tinder, into which a spark had been struck with flint and steel; but they were also employed in conjunction with more rapid means of obtaining light. Phosphorus, discovered in 1677, was first applied to common lighting purposes by Godfrey Haukwitz, who in 1680 found that a minute portion rubbed between folds of brown paper would take fire and ignite a sulphur match brought in contact with it. But as phosphorus was for some time very costly, neither this invention nor others necessitating its use could be of general service. Among the best of these inventions was a small bottle in which a piece of phosphorus had been stirred with a hot wire so as to coat its interior with oxide of phosphorus; the bottle was kept tightly corked except when a light was required, then the cork was withdrawn, and a sulphur match was dipped in and thus ignited. Oxymuriate matches, a much later invention, were strips of wood tipped first with sulphur, then with a paste of chlorate of potash, gum, and sugar, colored with vermilion. They were sold in small boxes with double compartments, in one of which fitted a little bottle containing a piece of asbestos soaked in oil of vitriol; a match dipped into this bottle ignited immediately. But the plan had its disadvantages, for the oil of vitriol was dangerous to carry about, and soon deteriorated from exposure to the air. The first friction matches, or *lucifers,* invented in 1829, were tipped with a paste of chlorate of potash, sulphate of antimony, and starch, and were ignited by being drawn between folds of sand-paper. For greater safety they were made in the shape of a comb, twelve or fifteen together, and were broken off as required. When first introduced into America they were called *locofoco,* a jingling term with no apparent meaning, unless its second part be the Italian *fuoco,* "fire." In 1835 the expression became the nickname of a political party. A meeting having been called by the New York Whigs, the Democrats, in order to obtain possession of the hall where it was held, blew out the candles, and after their opponents had left the building relighted them with these matches. Thence the name *Locofoco* was given to the Democrats, and retained for about thirty years. The sand-paper for lighting was after a time gummed on the box, so that the lucifers could be drawn across it. So noisy was this operation that the matches were called congreves, after the rockets of that name. It was also dangerous, for such pressure was needed to light a match that its top was liable to be forced off and to ignite after falling on the carpet or on people's clothes. But in 1834, more than a century and a half after the discovery of phosphorus, that substance was employed in making a safer and more agreeable match, to which the old names congreve and lucifer were applied.

Those workpeople who have to do with the igniting composition are subject to necrosis of the lower jaw, called the "jaw" or "match" disease, or "the flute." It begins with toothache, gradually becoming more intense; the teeth decay and fall out, and then the decay extends to the jawbone, causing intense pain, which never ceases until a surgical operation or death relieves the sufferer. In bad cases the whole lower jawbone may be lost, and the disease, even when cured, causes terrible disfigurement. Some German manufacturers refuse to employ persons whose teeth are in the least decayed, as they are more readily attacked. It is said that cleanliness, ventilation, and constant attention to the teeth are almost infallible preventives of the jaw disease; workers in large factories, whose masters can and do spend money on sanitary arrangements, are therefore comparatively safe. But very different is the case of those employed in small factories, or, as too often happens, making matches clandestinely in their own homes. They, says Tomlinson, "are never free from the fumes. Their clothes are luminous in the dark, and in the daytime white fumes may be seen ascending from them. In some cases they eat and sleep in the room where the matches are made, and the materials when not in use are kept under the bed." In the matches made by these poor creatures the phosphorus sometimes "forms four-ninths of the igniting paste, while in proper factories 1 pound of phosphorus to 20 pounds of the other ingredients would be thought excessive." All danger of disease is avoided by substituting red phosphorus for the common kind. The use of machinery in matchmaking is much to be desired, as lessening the risk of accident and disease, and diminishing the number of women and young persons employed in the more unhealthy processes. Machines have been invented for dividing the wood into blocks, for cutting splints, round and square, for separating the double matches, for dipping, and for cutting and folding the wooden boxes. The consumption of matches is enormous, 95 per cent. of all the phosphorus made being employed in their manufacture. According to Muspratt over 300 tons of phosphorus are fabricated annually in Europe, and as 1 pound of this substance will make 1,000,000 matches, some idea of the number manufactured may be arrived at. Timber and labor being very cheap in Austria and some parts of Germany, matches are there made in specially large quantities. JANET TUCKEY.

Matè, or **Paraguay Tea** [Sp. *yerba de matè;* matè is properly the vessel in which it is prepared], the dried and broken leaves and shoots of *Ilex Paraguayensis* and several other species of *Ilex* (order Aquifoliaceæ), shrubs which grow in Brazil and Paraguay. The leaves are gathered in great quantities, dried by artificial heat, and stored away for several months to cure. They are then sent to market, and are an important article of commerce. Matè is used in most parts of South America much as we use tea and coffee, like which it abounds in caffeine. It is drunk in large quantities in an almost boiling state, and has the general properties of tea and coffee.

Mate'lica, town of Italy, in the province of Macerata, about 30 miles from the town of Macerata. This place contains interesting works of art, and its secret archives are very curious. It was an important town during the Roman period, many vestiges of which still exist, and it was the scene of much turbulence during the Middle Ages. Woollen cloths are now largely manufactured here. Pop. 7298.

Mate'ra [prob. *Mateola*], town of Southern Italy, in the province of Potenza, situated in a plain flanked by two deep valleys and surrounded by smiling hills. It contains several well-built churches and a remarkable chapel, San Pietro Barisano, consisting of three naves, the whole excavated in a single huge block of stone. This town suffered cruelly from wars and earthquakes during the Middle Ages. The present inhabitants are mostly agriculturists or shepherds. Pop. 15,700.

Mate'rial Cause, in ontology, the first of the four kinds of causes distinguished by Aristotle and accepted by later metaphysicians. As defined by him, the material cause of a thing is the physical basis of its existence—namely, the matter from which it was formed or developed; *e. g.* the block of marble from which a statue is carved. The material cause of a thing is thus partly, but not absolutely, identical with the thing itself (*das Ding an sich*). In the instance cited a portion of the material cause, or block of marble, must be eliminated in order to arrive at the semblance of the pre-existing type—*i. e.* the finished statue.

Materialism [Lat. *materia*, "matter"]. In general, materialism is the doctrine that nothing exists but matter with its sensible properties. It is opposed to idealism, the doctrine that nothing exists but mind with its ideal phenomena; and it may be distinguished from spiritualism, which maintains the existence of mind or spirit as well as matter, and from dualism, which seeks to co-ordinate the two as distinct essences in man and in nature. It might also be distinguished from some kinds of sensualism or sensationalism, which imply the separate substance of the mind, though they derive its ideas through the senses from material impressions. In its extreme form it would resolve all spiritual beings and phenomena into mere illusions, or explain them as refined material manifestations. Rightly to appreciate it as a philosophical doctrine we must briefly trace its history and modern phases, the problems it has raised, and the terms of their solution.

Materialism, says its latest and best historian, Lange, is "as old as philosophy, but not older." It could not arise until men began to reflect upon the spiritualistic religions which everywhere prevailed, and it would then be among the first attempts to explain their seeming inconsistency with natural phenomena, and construct in their place a purely rational theory of the world and of the nature and destiny of man. Grecian materialism led the way. While the systems of the Orient—unless the Chinese be excepted—continued to be dualistic, and even largely idealistic in their tendency, the Greek philosophers, Leucippus, Democritus, and Epicurus, speculating upon the origin of the universe, posited an infinite number of atoms or refined particles of matter combining and recombining in mathematical proportions throughout space and time, until, after endless trials, all existing things have been produced. In these systems not only were solid objects, plants and animals, regarded as mere masses of compounded atoms, but also the souls of men, which were supposed to consist of ethereal and luminous particles diffused like air or light through the body, and dispersed with it at death; and even the gods themselves were fancied as atomic beings or dream-like images in human form, dwelling in the interspaces between the worlds in happy indifference to the course of nature and the affairs of mortals. Roman materialism followed as little more than a reproduction of the Grecian, and had its chief representative in Lucretius, who expounded the doctrines of Epicurus in a majestic philosophical poem, *On the Nature of Things*. Traces of Epicureanism are also to be found in the writings of Horace, Virgil, and other men of letters, but it did not maintain at Rome the high ethical character which it had claimed among the Greeks, having been so bitterly assailed by the Stoic philosophers that the very name has since remained a synonym for sensual pleasure.

Italian materialism rose with the classical revival as a mock compromise between the dogmas of the Church and the speculations of the Alexandrian school of Aristotle. The leader of the movement, Pomponatius, until silenced by a decree of the Lateran Council, held the mortality of the soul, the necessity of the will, and the embodiment of God in nature. And subsequently the systems of Democritus and Epicurus were partially revived by Telesius, Campanella, and Magnenus, and at length fully sanctioned by Peter Gassendi, a French ecclesiastic, whose learned defence of Epicureanism as consistent with Christianity has caused him to be styled the father of modern materialism.

English materialism at the same time was opening new paths with greater boldness and freedom. Thomas Hobbes, in a work well named *Leviathan*, described the soul as a corporeal substance receiving ideas as material images, the state as an incarnation of absolute power, and God himself as but a name for the incomprehensible omnipotence of nature. He was followed by Locke, sowing the seeds of a sensual materialism, not only by deducing all ideas from sensation through reflection, but by suggesting that reflection itself might be a property of matter. And upon this system the free-thinkers Layton, Coward, and Collins espoused anew the materiality and mortality of the soul and the mechanical necessity of the will, while more devout philosophers, such as Dodwell, Hartley, and Priestley, sought to reconcile the same views with the Christian faith.

French materialism grew out of the previous systems under the combined influence of Gassendi and Locke. The Abbé Condillac, as a disciple of the latter, illustrated the process of transforming sensations into ideas by an imaginary human being encased in marble and allowed to acquire successively the different senses and combine their impressions by acts of attention, memory, and judgment. It would seem to have been but a step farther for La Mettrie, in his treatises *On Man a Machine* and *Man a Plant*, to reduce the mind to a mere perishable mechanism or organism. And at length the Baron d'Holbach, in his *System of Nature*, brought materialism to the climax of impiety, as well as sensuality, by not only denying the existence of mind, freedom, and immortality, and maintaining the eternity of matter, the indestructibility of force, the immutability of physical law, but by assailing virtue, religion, and God as mere superstitious fictions.

German materialism has since followed under a reactionary impulse against the long-prevailing idealism. Schopenhauer had already substituted his Universal Will or Force for the Absolute Reason of Hegel; Feuerbach had resolved his ideas into phosphates; and it has only remained for Moleschott, Vogt, and Büchner, in the light of these speculations, to revive the materialism of La Mettrie and D'Holbach with illustrations drawn from recent physical research.

It is evident from this glimpse of the history of materialism that numerous questions have arisen from time to time through its conflicts with opposing doctrines, and it will be found that these questions have at length been brought to definite issues in our day as if for final settlement. A preliminary question is the essential nature of matter. The idealist, distinguishing between matter in itself and as it appears to us, begins by referring certain of its properties, such as light and sound, to the percipient subject as without objective reality; then adds to these the other more metaphysical properties of extension, impenetrability, figure, even space and time; and thus ends by resolving all matter into mind. But the materialist, reversing the process, starts with the idea of matter as an external independent something which he divides into invisible atoms, distributes through space and time, endows with motion, life, even sensation and thought, until at length he has resolved mind itself into mere matter. Such extremes were reached in the opposite systems of Berkeley and D'Holbach.

The next question is the connection of matter with force, or materialism as opposed to dynamism. Newton, though an atomist, could only conceive of force as an expression of mind, of some voluntary agent imparting it to the ultimate atoms of matter in the form of attraction, repulsion, and other properties; Leibnitz regarded the atoms themselves as intrinsically active substances termed monads; and Boscovich, in his dynamic theory, treated them as mere metaphysical points or centres of attraction and repulsion, thus virtually resolving all matter into force. But the modern materialists, Moleschott and Büchner, seem to have reverted to the atomic theory of Leucippus, maintaining the properties of attraction, repulsion, affinity to be inseparable from the particles which manifest them, and even inconceivable without them; thus apparently resolving all force into matter. It is their maxim, "No matter without force; no force without matter."

Another consequent question is the connection of matter with life, or materialism as opposed to vitalism. In the early speculations upon organized beings there was always supposed some immaterial principle or cause of life, such as the *psyche* of Pythagoras, the *archæus* of Paracelsus, and the *anima* of Stahl, who went so far as to imagine that it unconsciously moulds the body and presides over all its functions. Berthez termed it the vital principle or force, to distinguish it from the physical and chemical forces which govern inorganic matter, and Bichat lodged it in the animal tissues under the name of the vital properties. But since Buffon vainly endeavored to distinguish between organic and inorganic molecules, the course of materialistic speculation has tended to obliterate the distinction between living and dead matter by referring one vegetal and animal process after another to purely physical and chemical laws. Prof. Huxley has lately maintained that "protoplasm," the original organic matter of all living beings, is composed of the same atoms as ordinary lifeless matter, and differs from it only in the manner in which they are aggregated; so that there is no more reason for explaining vital phenomena by a supposed principle of vitality than to speak of aquosity as the cause of water.

A still more important question is the connection of matter with thought, with mind, and with will, or materialism as opposed to spiritualism. The soul was carefully distinguished from the body by Descartes as a thinking substance; by Leibnitz as a conscious monad; and more recently by Herbart, Beneke, and Lotze as a spaceless essence, spiritual atom, or force endowed with the immaterial properties of thought, free-will, and immortality. The opposite school, however, since Locke suggested the possibility of cogitative matter, has been steadily undermining this fundamental distinction, and reducing the mental faculties to physical functions and processes. Carl Vogt, even more grossly than Cabanis, has described the brain as an organ secreting thought; Maudsley has defined the mind scientifically as an exalted natural force developed from the other chemical forces of the body; and Huschke has likened the relation between thought and the molecular movements of the brain to that between color and the vibrations of ether. Others have pushed such views to their moral consequences by merging the will in mere animal automatism, and declaring the only immortality to be that of the disintegrated body whose atoms may chance to enter future generations of men.

All these questions have at length been brought together under the modern hypothesis of evolution, thus opposing materialism to theism or dualism. In the early cosmogonies, both heathen and Christian, some immaterial principle or Intelligent First Cause was supposed to have moulded and fashioned chaotic matter into worlds, and gradually produced plants, animals, and man by specific acts of creation, with definite forethought and design. Of late, however, this dualistic conception of God and the world as distinct existences, the former creating the latter, has been disappearing before a system of materialistic monism which would derive the universe from matter alone as the sole original substance, without the agency of any mind or intelligent purpose. Büchner has revived the doctrines of Democritus and D'Holbach in their baldest form, maintaining the absolute eternity, infinity, and indestructibility of matter as the only real existence. Herbert Spencer, after representing a Creator as utterly inconceivable and unknowable, has proceeded to unfold the whole knowable universe out of mere persistent force, acting under laws, from the primitive nebula up to the highest forms of human society. Prof. Huxley suggests that the existing world once lay potentially in the cosmic vapor, so that the present state of the fauna of Great Britain might have been predicted from a knowledge of the primitive forces and molecules. And Dr. Tyndall has lately startled religious as well as scientific circles by proclaiming from the presidential chair of the British Association that he discovers in the original matter of the world the promise and potency of every quality of life. While some advocates of the new scientific materialism, as the last named, take an indifferent position in reference to theism, others are pressing it to the most atheistic and irreligious consequences.

For a full discussion of these different questions the reader must be referred to the opposing authors that have been named. It will be enough in this place to state the general principle applicable to them all—that while materialism has never adequately explained the phenomena of life, intelligence, and creation, spiritualism affords a consistent account of the material world and retains any elements of truth involved in the other system, as may be shown by the fact that nearly every materialistic school has had its Christian advocates endeavoring to reconcile it with the spiritual doctrines of Holy Scripture. It should also be observed that ethical as distinguished from scientific materialism, or sensualism, has usually flourished in corrupt states of society as both a cause and consequence of decaying civilization, while spiritualism has generally exercised a refining and ennobling influence, and done good service in the cause of virtue and religion. (Consult the valuable work of Prof. A. Lange, *History of Materialism;* and compare Büchner, *Matter and Force;* Paul Janet, *Recent Materialism:* Maudsley, *Physiology and Pathology of Mind;* Leacock, *Mind and Brain;* Huxley, *Lay Sermons;* Lionel Beale, *Protoplasm, or Matter and Life;* and the controversial literature called forth by Prof. Tyndall's *Address to the British Association at Belfast.*) C. W. SHIELDS.

Materials, Strength of. See STRENGTH OF MATERIALS.

Mate'ria Med'ica [Lat.], a phrase used to designate the substances used in the practice of medicine. But as the art of the physician embraces the scientific use of articles in common vogue, as food and drink, and of moral and hygienic influences, fully as much as of drugs, it is plain that the term *materia medica* cannot be used to designate a definite group of substances, but is simply a convenient phrase by which to refer to the weapons of the physician in general. So far as drugs are concerned, they are derived principally from mineral and vegetable sources, though some few are of animal origin. They are commonly classified according to their effects on the animal system in health or disease. But inasmuch as the majority produce an effect more or less complex, as these combinations of effects are almost endless, and as even with the same drug the effect varies with varying circumstances of dose or state of the patient, it follows that an accurate division of medicines into groups on the basis of their effects on the living organism is simply impossible. Such terms as irritant, anodyne, astringent, etc. must therefore be taken as defining simply a kind of effect, not as designating a distinct group of medicines. The meaning of these various terms and the uses of each drug will be found described under the individual headings. EDWARD CURTIS.

Mathemat'ics [Gr. μαθηματική], the science that treats of the properties and relations of quantities. It is based on a few simple and universally admitted propositions, from which, as premises, the whole system is built up by a chain of rigid logical arguments. The science of mathematics is naturally divided into three branches: I. arithmetic; II. geometry; and III. analysis.

I. *Arithmetic* is that branch which treats of the relation of numbers expressed by the aid of figures and combinations of figures. It is divided into two parts. The *first* part treats of the methods of expressing numbers by the aid of figures, together with the fundamental operations that may be performed on them. It embraces notation and numeration, addition, subtraction, multiplication, division, raising numbers to powers, and extracting their roots, whether the units of the numbers are entire or fractional. It also treats of the transformation of numbers from one scale to another. The *second* part explains the methods of applying these principles to the practical wants of life. This part embraces the rule of three or proportion, percentage, practice, and a variety of other rules and applications.

II. *Geometry* is that branch which treats of the properties and relations of geometrical magnitudes—that is, of lines, surfaces, and volumes—to which may be added angles. In this branch we reason directly upon the magnitudes themselves, or upon their pictorial representations. Geometry is divided into two parts. The *first* part is called *elementary* geometry; it treats of those magnitudes whose elements are the right line and the circle. This part embraces all propositions relating to figures bounded by straight lines, circles or portions of circles, together with the surfaces of the sphere, cylinder, and cone. It also treats of all volumes bounded by plane surfaces, as well as of the volumes of the three round bodies, the sphere, the cylinder, and the cone. An immediate application of this part of geometry is to trigonometry, which considers the relations between the sides and angles of triangles, and also the properties and relations of the circular functions. Elementary geometry embraces the solution and construction of all geometrical problems which can be effected by the rule and compass—that is, by the straight line and circle alone. The *second* part is called *higher* geometry; it embraces all propositions relating to magnitudes whose elements are more complex than the straight line and circle, such as the conic sections and curves of a higher order, with the corresponding surfaces and volumes. It includes the higher investigations of the ancient geometers, of which class are the famous isoperimetrical problems from which originated the modern branch of *calculus of variations.* It also includes the noted problems of the duplication of the cube, the trisection of an angle, and the insertion of two geometrical means between two given lines. This part of geometry has been vastly extended by the modern researches of Monge, Carnot, Chasles, and others. An immediate application of this part of geometry is to the solution of geometrical problems requiring the aid of other instruments than the rule and compass. Among the applications of both parts of geometry, are descriptive geometry and its cognate branches. Descriptive geometry undertakes the graphical solution of all problems involving the three dimensions of space. In this branch of applied geometry lines are given by their projections on two rectangular planes of reference (called planes of projection), planes are given by their intersections with these planes, and surfaces are given by the projections of their characteristic elements. Descriptive geometry embraces within its scope the solution of all problems in shades and shadows, perspective, spherical projections, and stonecutting, together with many other problems in engineering and architecture. In many of its uses—as, for example, in perspective and spherical projections—but one plane of projection is employed.

III. *Analysis* is that part of mathematics in which the quantities considered are represented by letters and other symbols, and in which the operations to be performed are indicated by conventional signs. Analysis is usually divided into three parts—algebra, analytical geometry, and calculus. (1) *Algebra* investigates the properties and relations of numbers analytically; it may be divided into *elementary* and higher or *transcendental* algebra. *Elementary* algebra explains the nature and use of the symbols employed, and teaches the method of interpreting results. It also treats of what are called the *ordinary operations* of algebra—that is, addition, subtraction, multiplication, division, raising to powers denoted by constant exponents, and extracting roots indicated by constant indices. It also investigates the properties and methods of solution of algebraic equations—that is, equations in which the relations between the known and unknown quantities are expressed by the ordinary operations of algebra. *Transcendental* algebra treats of quantities that cannot be expressed (in a finite number of terms) by the ordinary operations of algebra; such quantities are called transcendental. It also treats of transcendental equations, under which head are embraced logarithmic, exponential, and trigonometric formulas, and series of all kinds. (2) *Analytical geometry* is that branch of analysis which has for its object the analytical investigation of the properties and relations of geometrical magnitudes. In this branch of analysis the points of the lines and surfaces considered are referred to fixed objects by means of elements called *co-ordinates;* the relation between the co-ordinates of each point is then expressed by one or more equations, which are termed equations of the magnitude; and finally, the properties and relations of the magnitudes are determined by discussing these equations. Analytical geometry may be either determinate or indeterminate. *Determinate geometry* is that branch in which the conditions of the given problem limit the number of solutions; in this case there are as many independent equations as there are unknown quantities. *Indeterminate geometry* treats of the general properties and relations of lines and surfaces; in this case there are fewer equations than unknown quantities. The equations of magnitudes may be algebraic, or transcendental, and there are consequently two corresponding divisions of the subject. The first division treats of all lines and surfaces of the first, second, and higher orders. The second division treats of transcendental lines, such as the cycloid, logarithmic curve, exponential curve, curve of sines, etc., together with the corresponding surfaces. Most of the processes of analytical geometry are facilitated by the use of the principles of the differential and integral calculus. (3) The calculus treats of relations of functions and of their laws of variation. It is divided into three general parts—*differential calculus, integral calculus,* and *the calculus of variations.* 1. The *differential calculus* explains the relations that exist between given functions and certain other functions that may be derived from them, called *derived functions* or *differential coefficients.* It treats of the properties of these differential coefficients, and of the methods of applying them in the higher branches of analytical geometry, and in those branches called mixed mathematics, such as mechanics, optics, astronomy, and the like. 2. The *integral calculus* is the inverse of the differential calculus. It explains the methods of passing from a differential coefficient back to the function from which it may have been derived; it also explains the methods of applying the principles of integration to the investigations of higher geometry and physical science. We are often able to find the differential coefficient of a function without knowing the form of the function; in such cases the integral calculus enables us to find the function itself. In this manner we may sometimes deduce important mathematical and physical laws. 3. The *calculus of variations,* which is usually regarded as the highest branch of mathematics, treats of the laws of variation of the forms of functions. Its principal object is to solve certain problems in maxima and minima which cannot be solved by the ordinary methods of the differential calculus. As an example, we may instance the problem of the *brachystocrone,* a problem in which it is proposed to find the curve along which a heavy body must move from one point to a lower one, not in the same vertical, in order that the time of descent may be the least possible. By means of the calculus of variations this curve is shown to be the arc of an inverted cycloid. This branch of the calculus was used, in an imperfect form, by Legendre, Euler, and other mathematicians, but it owes its complete development to Lagrange, who gave it the general form under which it is now employed. Lagrange applied the method of variations to physical investigation, making it the basis of a complete system of rational mechanics. (See CALCULUS.)

It will be noted that every principal branch of mathematics enumerated in this brief sketch consists of two parts. The first part has for its object to investigate the principles peculiar to that branch, and the second part shows how to apply these principles to science and the arts. The first part of each branch, as thus pointed out, belongs to the field of pure mathematics, and the second part may be termed applied or mixed mathematics. The former parts make up the *science* of mathematics; the latter may be considered as forming the *art* of mathematics. The *science* of mathematics forms an important element of a liberal education. It impresses the mind with clear ideas; it cultivates habits of close discrimination; it develops the powers of abstraction and generalization; it cultivates and expands the reasoning powers. The applications of mathematics aid in the discovery of new truths in science, and contribute vastly to the progress of every branch of art and manufacture. The mason computes the quantity of his material by the principles of geometry and the rules of arithmetic; the carpenter frames his building and adjusts its parts by the rules of practical geometry; the millwright computes the pressure of the water and steam, and adjusts all the parts of his machinery by rules evolved from analytical formulas; in fine, every workshop and manufactory is an embodiment by intelligent labor of some of the more difficult investigations of mathematical science.

W. G. PECK.

Mathematical Machines. See CALCULATING MACHINES.

Math'er (COTTON), D. D., F. R. S., son of Increase Mather and grandson of John Cotton, b. at Boston, Mass., Feb. 12, 1663; was trained by Ezekiel Cheever, and graduated at Harvard College in 1678; became a teacher, and in 1684 was ordained his father's colleague over the North church, Boston, having by persistent effort overcome an impediment in his speech; labored with great zeal as a pastor, endeavoring also to establish the ascendency of the churches and ministry in civil affairs, and in the putting down of witchcraft by legal sentences, a work in which he actively engaged. Author of *Memorable Providences relating to Witchcraft* (1689), *Wonders of the Invisible World* (1692), *Essays to Do Good* (1710), *Magnalia Christi Americana* (London, 1702), a very quaint and curious book, full of learning, piety, and prejudice; and other works, large and small, numbering 382, not reckoning his great *Illustrations of the Sacred Scriptures* and other unpublished writings. He was made D. D. in 1710 by the University of Glasgow, and F. R. S. in 1713. Mather, with all the faults of his early years, was a man of great excellence of character. He labored zealously for the benefit of the poor, for mariners, slaves, criminals, and Indians. His cruelty and credulity were the faults of his age, while his philanthropy was far more rare in that age than in the present. D. at Boston Feb. 13, 1728.

Mather (INCREASE), D. D., b. at Dorchester, Mass., June 21, 1639, son of Richard Mather; graduated at Harvard 1656, and at Trinity College, Dublin, 1658; preached in England and America; was ordained over the North church, Boston, in 1664; was president of Harvard College 1685–1701; received (1692) the first doctorate in divinity conferred in English-speaking America; procured in England (1692) a new charter for Massachusetts, which conferred upon himself the power of naming the governor, lieutenant-governor, and council; opposed the severe punishment of witches; author of 92 publications, large and small, of which one of the most noteworthy is *An Essay for the Recording of Illustrious Providences* (1684; republished London, 1856). D. at Boston Aug. 23, 1723.

Mather (MOSES), D. D., b. at Lyme, Conn., Feb. 23, 1719: graduated at Yale College 1739; was minister of the Congregational church at Darien, Conn., sixty-two years; author of two theological treatises, and twice imprisoned in New York as a patriot during the Revolution. D. at Darien, Conn., Sept. 21, 1806.

Mather (RICHARD), b. at Lowton, Lancashire, England, in 1596; studied at Oxford; became parish minister of Toxteth, Lancashire; was silenced in 1634 for non-conformity; went to New England in 1635; was minister of Dorchester, Mass., 1636–69; did much to settle church discipline, and was an able writer. D. at Dorchester Apr. 22, 1669.—Three of his sons, SAMUEL, INCREASE, and NATHANIEL, became noted divines. The latter, b. Mar. 20, 1630, preached many years in England and Holland; was a learned author; and d. at London July 26, 1697.

Mather (SAMUEL), b. in Toxteth, England, May 13, 1626; graduated at Harvard 1643; preached at Rowley and Boston, and at Oxford and Dublin, where he became senior fellow of Trinity, and wrote *Old Testament Types Explained and Improved* (1673). D. at Dublin Oct. 29, 1671.

Mather (SAMUEL), D. D., son of Cotton Mather, b. at Boston, Mass., Oct. 30, 1706; graduated at Harvard 1723; was ordained 1732, and held Congregational pastorates in Boston till his death, June 27, 1785; wrote a *Life of Cotton Mather* (1729); published several pamphlets, sermons, and short poems.

Mather (WILLIAM WILLIAMS), LL.D., b. at Brooklyn, Conn., May 24, 1804; graduated at West Point 1828; assistant professor of chemistry there 1829–35; first lieutenant in U. S. army 1834–36; professor of chemistry University of Louisiana 1836; engaged in the New York geological survey 1836–44; Ohio State geologist 1837–40; State geologist of Kentucky 1838–39; professor of natural science in the University of Ohio 1842–45; its vice-president and acting president 1847–50; editor of *Western Agriculturist* 1851–52; author of numerous geological reports and scientific papers. D. at Columbus, O., Feb. 27, 1859.

Math'ew (Theobald), D. D., known as "Father Mathew," b. at Thomastown, Tipperary, Ireland, Oct. 10, 1790; studied for a time at Maynooth College; joined the Capuchins at Kilkenny, and was ordained a Roman Catholic priest in 1814. He was distinguished for his laborious charities and his heroism at Cork, especially in the cholera season of 1832. In 1838 he organized the first total abstinence society in Cork. He afterwards travelled over all parts of Great Britain and Ireland, and induced hundreds of thousands to sign the temperance pledge. He labored 1849–51 in the U. S., and met with remarkable success. D. at Cork Dec. 1, 1856. (See his *Life*, by J. F. Maguire.)

Math'ews (Charles), b. in London June 28, 1776; after a brief apprenticeship to his father, a bookseller, went on the stage as an amateur, and then as comedian of the regular company at the Theatre Royal, Dublin; made his first appearance in London in 1803 as Jubal in *The Jew;* in 1818 introduced his *At Home*, and on his return from a successful trip to this country appeared in his specialty, a *Trip to America*, which was well received. D. at Plymouth June 28, 1835.

Mathews (Charles J.), son of Charles, b. in Dec., 1803; though intended for an architect, he adopted the stage as a profession, achieving remarkable success on his first appearance in public in *The Hunchbacked Lover;* in 1838 married Madame Vestris, at the time lessee of the Olympic Theatre; they visited the U. S., and on their return to England managed the Covent Garden and Lyceum theatres, but not successfully. His wife dying in 1857, Mathews again visited the U. S. in 1858 and married Mrs. Davenport, better known as Lizzie Weston; in 1860 introduced a similar entertainment to his father's *At Home*, in which his wife assisted; in 1863 made a successful professional trip to Paris, and in 1869–72 visited America and Australia, returning to England in 1873, in which year his wife died. D. June 24, 1878.

Mathews (Cornelius), b. at Port Chester, N. Y., Oct. 28, 1817; graduated in 1835 at the University of New York; admitted to the bar in 1837; author of successful plays, tales, poems, etc., and distinguished as an editor of various periodicals and as an advocate of international copyright; prepared *Indian Fairy Legends* (1868) from materials furnished by William Schoolcraft.

Mathews (George), son of Gen. George Matthews, b. near Staunton, Va., Sept. 21, 1774; was admitted to the Georgia bar 1799; was appointed judge of the superior court of Mississippi Territory 1805, and transferred in the same capacity to New Orleans 1806, and on the organization of the State judiciary became presiding justice of the supreme court of Louisiana, which post he filled until his death, at Bayou Sara Nov. 14, 1836. His decisions form an important portion of the jurisprudence of Louisiana.

Mathews (William), LL.D., b. at Waterville, Me., July 28, 1818; graduated in 1835 at Waterville College (now Colby University) and at Dane Law School, Cambridge. From 1841 to 1855 he was editor of the *Yankee Blade*. Since 1861 he has been professor of rhetoric and English literature in the University of Chicago, Ill. Has published *Getting on in the World, or Hints on Success in Life* (1872).

Mathi'as (Thomas James), b. in England about 1750; graduated at Trinity College, Cambridge, 1774; wrote a volume of *Runic Odes* (1781), imitated from the Norse; an *Essay on the Evidence relating to the Poems attributed to Thomas Rowley* (1783), sustaining the authenticity of the Chatterton poems; and a poem, *The Pursuits of Literature* (4 parts, 1794–97), issued in sumptuous style, with copious notes, chiefly devoted to a ferocious criticism of the literary favorites of the time. The work made a great sensation, and is still much sought. Mathias was for many years previous to 1818 treasurer of the household to Queen Charlotte. He published in 1805 an edition of Tiraboschi's *History of Italian Literature* (4 vols.), and in 1814 an edition of Gray's works. His last years were passed at Naples, Italy, where he d. in 1835. Mathias was proficient in the Italian language, in which he wrote several works.

Mathura, or **Muttra,** town of British India, in the North-western Provinces, on the Jumna, is a decaying and disagreeable place, but as the birthplace of Krishna it is highly venerated by the Brahmans, and visited by a great number of pilgrims. The shores of the river are provided with gorgeous flights of steps, and the city contains an immense temple, from which, however, foreign conquerors have carried away the idols of gold and silver with eyes of diamonds. Sacred apes are kept here; they are fed at the public expense, and allowed to do what mischief they like; swarms of holy parrots and peacocks are also maintained. Pop. 65,749.

Mati'co [Peruvian], the leaves of *Artanthe elongata* and *A. adunca*, shrubs of the order Piperaceæ, the former growing in Peru and the latter in various parts of tropical America. It is a stimulant and styptic, but not an astringent. It has valuable medicinal properties.

Matilda (Countess), b. in 1046, a daughter of Count Boniface of Tuscany and Beatrice of Lorraine, inherited very extensive possessions in Northern and Central Italy—Tuscany, parts of Lombardy, Mantua, Parma, Reggio, Piacenza, Ferrara, Umbria, Spoleto, etc.—and played a most prominent part in papal history. The traditional policy of the family was firm adherence to the empire, but it was entirely reversed by Count Boniface on account of the treacherous manner in which he was treated by Henry III.; and during the reigns of Nicholas II., Alexander II., Gregory VII., Victor III., Urban II., and Paschalis II., Countess Matilda was the principal support of the papacy. Especially intimate were her relations with Gregory VII., and Canossa, where the famous penance of Henry IV. took place, was a fief of hers. She was twice married—first to Godfrey of Lorraine, then to Guelph of Bavaria—but her marriages did not count much in her life; and after her death she bequeathed her enormous wealth to the papal see. It formed part of the so-called *patrimonium Petri*, and, though the will was hotly contested by the emperor, the pope succeeded in retaining the larger portion of the property. (See her *Life* by Luigi Torti, 1859, and Amédée Benée, 1859.)

Matile (George Auguste). See Appendix.

Mat'ins [Lat. *matutinus*, relating to the morning], specifically, the early morning service of the Church, as distinguished from vespers or even-song.

Mat'rix [Lat.], a term used in geology to denote the rock in which a mineral or fossil is imbedded.

Matsmai', town of Japan, on the southern coast of the island of Jesso, in lat. 41° 32′ N., lon. 140° E., at the head of a large bay which forms an excellent harbor. The number of inhabitants is sometimes stated to be 60,000, but the statement is the merest guesswork; nothing is known of the place.

Mat'sys (Quentin), b. at Antwerp about 1450; was in youth a blacksmith; loving the daughter of an artist, he became a painter of great merit; and of his masterpieces, *The Descent from the Cross* is in the museum at Antwerp, *The Misers* in the gallery at Windsor, and the *Portrait of a Jeweller* in the imperial collection of Vienna. D. in 1529.

Mat'tacks (John), b. at Hartford, Conn., Mar. 4, 1777; became a lawyer of Danville, Vt., 1797; removed in 1798 to Peacham; was much in public life; was a militia brigadier-general during the war of 1812–15; was in Congress 1821–25 and 1841–43; a judge in the State courts 1833–34; a member of the constitutional convention 1835; governor of Vermont 1843–44. D. at Peacham, Vt., Aug. 14, 1847.

Mattap'ony River, in Virginia, unites with the Pamunkey to form the York River. It is itself formed from the union of four streams—the Mat, the Ta, the Po, and the Ny rivers.

Mat'tawa, located on the eastern division of the Canadian Pacific Railway, is at the junction of the Ottawa and Mattawa rivers, Nipissing district, Ontario, 189 miles above Ottawa. It is the site of an old Hudson's Bay trading-fort.

Matteawan', Duchess co., N. Y. (see map of New York, ref. 6–J, for location of county), on Newburg Duchess and Connecticut R. R., and on Fishkill Creek 1½ miles above Fishkill Landing, has important manufactures of felt goods, hats, files, lawn-mowers, wood-working machinery, etc. Pop. in 1880, 4411.

Mat'ter [Gr. ὕλη; Lat. *materia;* Ger. *Stoff*] has two main significations, which have changed gradually with the changes in philosophical thinking. They may be called the idealistic and the materialistic, the former dating from Parmenides, and receiving its full expression in Plato and Aristotle; the latter from Thales and the atomists Leucippus and Democritus. In the former signification *matter* is little more than a logical postulate; in the latter, it is an abstraction of the imagination. In Parmenides it is simply not-being (μὴ ὄν) as opposed to being, and is the ground of the phenomenal, illusory multiplicity of the world.

This is virtually the view of Plato, who, however, is compelled to attribute to matter something more than a mere negative existence. With him it is the correlate of *idea*. (See Plato, Parmenides, Philebos, Timæos; Siebeck, *Plato's Lehre von der Materie*, in *Untersuchungen zur Philosophie der Griechen*.) According to Aristotle, ὕλη is one of the four αἰτίαι or grounds of existence, the correlate of *form*, the ground of change, being pure potentiality, utterly devoid of determination, and therefore, as such, unknowable. (See FORM.) Aristotle sees process where Plato sees but multiplicity. When united with *form*, *matter* gives οὐσίαι, or substantial things, which owe to it their imperfection. The Aristotelian doctrine was adopted by the Stoics, and the Platonic by the Neo-Platonists. Proclus held that matter was neither good nor bad, but constituted the ground of necessity. The Fathers of the Church, mingling philosophic speculation with dogmatism, were divided on the question of the eternity of matter, as well as of the mode of its production. The same is true of the Arabic philosophers, who based their doctrines mainly upon Aristotle. Bishop Berkeley denied the existence of matter altogether, as does Lotze at the present day. The materialistic view of matter was held in a rude form by the Ionian philosophers, whose whole efforts apparently were a search for a single material principle to explain the world. The *atomic* theory was apparently first propounded by Leucippus or Democritus of Abdera, and has been held by the majority of materialists ever since. According to it, matter consists, in the last analysis, of an indefinite number of indivisible particles. Some naturalists, such as Democritus, imagined that these differed in form, position, and aggregation; which differences constituted the differences of material objects. Lucretius was the great atomist among the Romans. In modern times an atomic doctrine has been maintained by Diderot, Kant, Herbart, and by all or nearly all the natural scientists of the present day. (See ATOM, MOLECULE.) By most of them matter is no longer looked upon as dead or separable from force, but as endowed with all the potencies of which existing things are the realizations. Whichever theory we adopt, matter remains an abstraction, the correlate of force, without which it would be unthinkable. (Cf. Lange, *Geschichte des Materialismus*; Fechner, *Uber die physikalische und philosophische Atomlehre*; Hartmann, *Philosophie des Unbewussten*, § c. cap. v.; Büchner, *Force and Matter*; and various articles in *Popular Science Monthly* and *Philosophie positiviste*.) THOMAS DAVIDSON.

Mat'ter (JACQUES), b. May 31, 1791, at Alt-Eckendorf, Alsace, of German parents; studied at Strasburg, Göttingen, and Paris; became in 1819 professor of history at Strasburg, in 1832 inspector-general of the University of Paris, in 1845 of the public libraries of France; retired afterwards to Strasburg, and d. there June 23, 1864. His *De l'Influence des Mœurs sur les Lois, et des Lois sur les Mœurs* (1832), was crowned by the Academy. The most prominent of his numerous other writings are *Histoire Critique du Gnosticisme* (1828), *Histoire Universelle de l'Église Chrétienne* (1829–32), *Schelling et la Philosophie de la Nature* (1842), *De l'Etat Moral, Politique, et Litteraire de l'Allemagne* (1847), *Saint Martin* (1862), *Emmanuel de Swedenborg* (1863), and *Le mysticesme en France aux temps de Fénelon* (Paris, 1864), a work of both historical and theological interest.

Matter, Nature, Properties, and Relations of. See SOMATOLOGY.

Matteuc'ci (CARLO), b. at Forli June 21, 1811; graduated at University of Bologna in 1828, and began his scientific experiments at Forli, but soon after went to Paris to prosecute them. After the publication of his articles upon electricity and upon torpedoes in 1840 he was appointed, on the recommendation of De la Rive and of Humboldt, to the chair of physics in the University of Pisa. In 1848 he was sent by the Tuscan government as civil commissioner into Lombardy with the Tuscan troops, and later on a diplomatic mission to the diet of Frankfort. After the political events of 1849 he resumed his professorship at Pisa, and in 1859 the Tuscan government gave him a mission to the court of Berlin, afterwards to the government of Turin before the annexation of Tuscany to Piedmont. After this annexation he took an active part in the moderate constitutional politics of Italy. In 1862 he became for a short time minister of public instruction for the kingdom of Italy. On the transfer of the capital to Florence he was made director of the Museo di Fisica Fiorentina, and devoted himself almost exclusively to the prosperity of that institution. D. at Leghorn 1868. Among his very numerous scientific publications the following are best known: *Cenni sull' Influenza dell' Elettricità nella Formazione delle Principali Meteore Acquee* (Bologna, 1827); *Sull' Influenza del Calore sul Magnetismo* (Forlì, 1831); *Sulle Correnti elettro-Magnetiche di Faraday* (Forlì, 1833); *Sur l'Electricité animale* (Florence, 1834); *Discorso sul Metodo Razionale Scientifico* (Forlì, 1835); *Essai sur les Phénomènes Electriques des Animaux* (Paris, 1870); *Lezioni di Fisica* (Pisa, 1852); *Cours d'Electro-Physiologie* (Paris, 1856).

Mat'thew (SAINT). I. *Character.*—Among the twelve apostles there was only one whose previous occupation had made him familiar with the use of the pen; and this one, St. Matthew, seems also to have been the first among them to prepare an evangelical record. We know very little of his character and life. His apostolical calling is narrated in Matt. ix. 9; Mark ii. 14; Luke v. 27. He was sitting at the receipt of customs on the border of the sea, near Capernaum, filling the office of a publican. It is said that these officers were generally abhorred by the Jews, being considered as renegades because they served the pagan lords of the country. Jesus passing by, followed by a great multitude, noticed him, and discovered at first glance that there was in him a future apostle and preacher of the new faith. The publican, who perhaps previously had received salutary impressions from the teachings of Jesus, obeyed without hesitation the call of the Lord, and in order to celebrate the career which opened before him he invited all his former colleagues to a feast in his house, together with Jesus and his disciples, desirous that they too should partake in some manner in the grace which had been conferred on him. It was his first missionary act. Mark and Luke call this publican Levi; and it is probable that this was the original name of the apostle, and that Jesus, as he had given to Simon the surname of Peter on their very first meeting (John i. 42), gave to Levi the surname of Matthew—that is, "a gift from God"—in order to designate the striking manner in which God had given him this disciple in the very moment when their eyes first met. The only surprising circumstance according to this explanation is, that Mark and Luke do not indicate the identity of Matthew with this publican Levi, whose calling they have previously narrated in their lists of the twelve apostles (Mark iii. 18; Luke vi. 15; Acts i. 13). Thus, from the second century, and up to our days, some have been of the opinion that there were two different publicans whose callings occurred in a similar manner. But this is not probable; the story of the calling of Levi and Matthew is so similar that it is difficult to consider it as the record of two different facts. There is a more natural solution. From a regard to the apostle, tradition would not like to attach to his name the humiliating title of publican; and this seems to be the simple reason why it is omitted in the lists of the Gospels of Luke and Mark, which were prepared from the general tradition, while Matthew himself had no fear of recalling in his Gospel the memory of his former profession; hence, these words in the first Gospel: "Matthew the publican" (Matt. x. 3). The father of Matthew is called Alphæus, but must not be confounded with Alphæus called Clopas, who was the brother of Joseph and the uncle of Jesus. Matthew remained, no doubt, in Jerusalem, together with the twelve, as long as the preaching of the apostles in this city continued—that is, nearly up to the year 60. When Paul came to Jerusalem for the last time, in 59, he seems to have found none of the apostles there (Acts xxi.). Clement of Alexandria tells us of Matthew that he ate no meat, but only vegetables and fish. The historian Hegesippus, in the second century, attributes a similar ascetic practice to James, the brother of the Lord, the first chief of the congregation of Jerusalem and a contemporary of the apostles. It is also known that the Essenes, a Jewish sect which aspired to a particular sanctity, confined themselves to the same diet. But in this privation the aim was merely a more complete consecration of the body to the service of God, and not the attainment of any legal merit; the law never gave any such precept. The Jewish Christians of Rome, mentioned in Rom. xiv., ought also to be remembered here. By this austere discipline James and Matthew no doubt desired to recommend their ministration to the Jews and procure access among them for the gospel, in accordance with the spirit of St. Paul's precept: "To them that are under the law, as under the law, that I might gain them that are under the law" (1 Cor. ix. 20). Various later traditions, originating between the fourth and sixth centuries, tell us that Matthew went to Ethiopia, or Macedonia, or Parthia, or Arabia, or India; we are even told by some that he suffered martyrdom in Arabia or Persia. But the discord between the dates prevents us from attaching any importance to these traditions.

II. *The Gospel.*—All the Fathers agree that the apostle Matthew wrote a Gospel, but in the Hebrew language, and not in the Greek, in which is written the book contained in the canon under the name of Matthew. Papias, at the beginning of the second century, says: "Matthew composed the speeches (the teachings of Jesus) in the Hebrew language (Aramæan), and each translated them (into Greek) as well as he could." These last words signify, very probably, that each evangelist translated orally from Matthew into Greek while teaching in the church. Eusebius tells furthermore that Pantænus, the founder of the catechetical school of Alexandria, when in the second century he went to India to preach Christianity, found the Gospel of Matthew in Hebrew among some Christians to whom it had been brought by the apostle Bartholomew, the first missionary to that country. All the other Fathers have the same traditions concerning the original language of our first Gospel. Nevertheless, our Greek Matthew does not make the impression of being a translation, at least not in the narrative parts. The language is vigorous, fresh, pure, like that of an original writing. Thence it has been inferred, in accordance with the literal sense of the expressions of Papias, that the Gospel mentioned by him contained only the speeches of Jesus, and not a complete history of his ministration, and that the narrative part was added later as a historical framework, in which the primitive work of Matthew was inserted, translated into Greek. Two circumstances confirm this inference: First, in the record of the first Gospel five principal groups of speeches of Jesus can be distinguished—namely, chs. v.–vii.; x.; xiii.; xviii.; xxiii.–xxv.; all of which are connected with the narrative by very similar formulas, and which might very well have originally formed a separate work having for its subject the teachings of Jesus. Second, in these great speeches in our Matthew the Old Testament is most frequently quoted according to the translation of the Septuagint, while in the narratives it is most frequently quoted from the Hebrew text—a circumstance which seems to indicate a different origin. Accordingly, we must suppose that Matthew composed an Aramæan work which comprised only the teachings of the Saviour, arranged according to some leading principles. Thus, (1) *the justice of the kingdom of heaven*, which division appears in our first Gospel as the sermon on the mount (v.–vii.); (2) *the apostolate*, which second division is found in our first Gospel (x.); (3) *the picture of the kingdom of heaven*, the grand collection of parables (xiii.), which depicts the foundation of the kingdom (the sower), its anomalous development (the tares), its power, both externally and internally (the mustard-seed and the leaven), its worth both to him who finds it without seeking, and to him who seeks (the hidden treasure and the pearl), and its terms (the net); (4) *the discipline of the Church*, which division is contained in ch. xviii. 1–20 of our first Gospel; and, lastly, (5) *the consummation of the present era*, or the judgment of Israel, the Church, and all the nations, which division (xxiii.–xxv.) formed the imposing conclusion of the work of Matthew, corresponding with the opening, the sermon on the mount. Christ thus appeared as the divine *legislator* (chs. v.–vii.), *king* (ch. xiii.), and *judge* (chs. xxiii.–xxv.). This original work by Matthew, in Aramæan, was probably the foundation of that *Gospel of the Hebrews* which was adopted by the Jewish Christian communities of the first centuries. This Gospel needed a complement, and this need was supplied, no doubt, by the narrative part of our first Greek Gospel, translated into Aramæan, and adorned with many legendary additions borrowed from an already falsified tradition. It also suffered mutilation in order to conform to the peculiar ideas of the different Jewish Christian sects. As for the narrative frame of our first Gospel, it was possibly composed by one of the companions of St. Matthew, who had partaken of his evangelical labors and written down the apostolical tradition, such as it had become fixed at Jerusalem and in Palestine. In the arrangement of the historical matter the same method of systematical grouping may be observed here as in the composition of the speeches: chs. viii. and ix., following after the sermon on the mount, give a collection of *acts of power:* chs. xi. and xii., following after the apostolical instruction, give a collection of *words of wisdom;* chs. xiv.–xvii., following after the collection of parables, contain a record of *various excursions* which preceded the teaching of the discipline (ch. xviii.) and the departure from Galilee (ch. xix.). Two small details show that Matthew had taken part in this labor, directly or indirectly: (1) the surname of "publican" added to his name, as we have seen, in the list of the twelve apostles in the first Gospel (x. 3); (2) the fact, so much the more significant as it is unobtrusive, that in this same list, in the fourth couple of apostles—which couple in all the lists comprises Matthew and Thomas—the name of Thomas is placed before that of Matthew, while in the other lists Matthew is placed before his colleague. It is evident that he could not change the place of the couple to which he belonged, but he could change the place of his name in this couple; and this he did. Eusebius says, referring to his predecessors, that "Matthew, after preaching to the Jews, and about to depart in order to preach to other nations, composed in the language of the Fathers (in Hebrew) the Gospel he had preached, in order to fill the void which his absence would leave among his audience." This date is closely connected with the preceding, relating to the language in which Matthew wrote; and it accounts for the absence in this Gospel of all explanations of Hebrew customs, such as we find in Mark and Luke, also Jewish writers, but writing in a pagan country. The time of the composition is indicated by Irenæus: "Matthew published among the Hebrews and in their native tongue his evangelical record at the time when Peter and Paul preached at Rome and founded the Church there." Some have taken umbrage at this tradition, because neither Peter nor Paul founded the Church of Rome, which follows clearly from the Acts of the Apostles and the Epistles of St. Paul. But they have forgotten that in the epoch in which Irenæus wrote (the last third of the second century) the apostolical times appeared in a general way as the epoch of the foundation of the Church. The work of Matthew bears, so to speak, its date marked on its face. This Gospel is a divine act, an official proclamation issued by the government of God. It is God himself who summons His people by a solemn ultimatum to recognize Jesus as Messiah, and threatens them with destruction if they will not obey. This is the reason why the Gospel opens with the genealogy of Jesus, and why he is called "Christ, the son of David, the son of Abraham" (i. 1), the Messiah who shall raise the "throne of David, his father," and redeem the promise of the salvation of the world attached to the posterity of Abraham. This is furthermore the reason why the whole Gospel is a demonstration of the Messianic dignity of Jesus; why the five traits of the history of his infancy, recorded in the first two chapters, are accompanied each by a prophecy; why his residence in Galilee at the beginning of his ministration is justified (iv. 14–16) by a prophecy of Isaiah; why the collection of the acts of power (viii.–ix.) is grouped around a prophecy by Isaiah, quoted viii. 17, which serves as text; why the collection of the words of wisdom (xi. and xii.) centre in a prophecy by Isaiah, quoted xii. 17. Moreover, there is no trait in the history of the Passion which is not accompanied by a prophecy, and the last words, "Go ye, therefore, and teach all nations, baptizing them," etc., give the programme of the work of the Messiah. By such a book God said to his people, "The forty years of repentance which were accorded to thee (Matt. xxiv. 34) will soon expire; acknowledge Jesus as thy Messiah or thou shalt perish." This situation is indeed in harmony with the date indicated by Irenæus—namely, about 64, or five to six years before the destruction of Jerusalem. There is especially one passage which determines exactly the period of the composition. It is the parenthetical clause xxiv. 15, by which the author interrupts, in the same manner as Mark, the speech of Jesus on the destruction of Jerusalem, and invites the Church to take notice of the signal of flight which Jesus gave in advance. Such a *nota bene* shows evidently that the sign has not yet been realized, but is imminent. The sign was the invasion of Judæa by the Roman armies, which took place about 66, and the time of the composition is consequently about 64 or 65. Thus we arrive at nearly the same time of composition for all the three earlier Gospels, composed as they were in different countries and for different nations (Romans, Greeks, Hebrews); and this chronological result coincides with the fact, evident to our eyes, that none of the three evangelists has employed the writings of any of the others in the composition of his work. This reciprocal independence, which seems to us to have been demonstrated by a minute exegesis, would have been impossible if one of the three had written a long time before the others; the last writer must necessarily have known the writings of the others. Moreover, the date indicated corresponds very well to the situation of the Church at this epoch. Was it not the time in which those who had witnessed the appearances of the Saviour began to die out? Hence resulted in the feeling of the Church a void and uneasiness, which demanded a rich compensation; and this was given to the Church in the different countries in which it existed by the publication of our first three Gospels. A fragment of an antique work, found in the last century by Muratori in the library of Milan, speaks thus of our four Gospels: "Although the beginning of each of our Gospels differs (each choosing its own point of departure), this is nevertheless of no importance to the faith of the believers, since all things are represented by them all *in the same ruling spirit*" (*uno ac principali spiritu*). Thus, the relation between our four Gospels was understood in the second century, while modern criticism has attempted to place these works in opposition to each other, and to discover among their authors motives of mutual rivalry and hostility unworthy of the characters of such men and of the sanctity of such an object. But this false criticism will break down before the indestructible feeling of the moral purity of these books. The Church feels that in calling these authors the *holy evangelists* she has not followed an illusion. That spirit of holiness which is her own life-blood recognizes itself in the spirit which, one and the same, pervades all the four books. And it is this divine spirit which produces that grave and firm bass which sounds in the Gospel of Matthew, that evangelical soprano which issues from the lips of Luke, that alto, so moderate and suited for the transition, which the ear catches from Mark, and, at last, that brilliant silver tenor which, like the voice of an angel, makes our heart vibrate in the Gospel of John. The Author of this incomparable quartet is, and will always remain, one and the same, though His inspiration bursts forth through four different organs. The picture of the divine work, its *history* proper, was written by Luke; the simple, apostolical *memoirs*, with all their ingenious and dramatic freshness, were given by Mark; the official and theocratic proclamation of Jesus as King, Messiah, was issued by Matthew; and to John we owe the revelation of Jesus as the Son of God, as the everlasting Word. Matthew forms evidently the transition from the Old to the New Testament. His Gospel is the Old Testament reflected in the New. Hence, it was always placed at the head of the evangelical collection and of the whole New Testament. It is the *Genesis* of the New Testament. On the other hand, the Gospel of Matthew corresponds to the Revelation. As the former reproduces under the form of history in the New Testament that part of the Old which is already accomplished, the latter reproduces under the form of prophecy at the end of the New Testament that whole part of the Old which is not yet realized. The Revelation says, "All is accomplished." Thus, in the divine word the beginning, middle, and end correspond with each other in a marvellous manner. FRÉDÉRIC GODET.

Matthew of Paris. See PARIS, MATTHEW.

Matthew of Westminster. See PARIS (MATTHEW).

Matthews, cap. of Matthews co., Va. (see map of Virginia, ref. 6–I, for location of county), near East River, and 35 miles E. by N. of West Point. Pop. not in census.

Matthews (E. ORVILLE), b. in Maryland Oct. 24, 1836; graduated at the Naval Academy in 1855; became a master in 1858, a lieutenant in 1860, a lieutenant-commander in 1862, a commander in 1870, a captain Sept. 14, 1881. Served in the Wabash at the capture of Forts Hatteras and Clarke, and commanded a battery of naval howitzers in the battles of Honey Hill and Tullifinny Cross-roads in Nov. and Dec., 1864. Commended for "zeal and gallantry." In 1883–84 member of gun-foundry board, organized by Act of Congress with a view to the establishment of national foundries for the manufacture of heavy ordnance.
FOXHALL A. PARKER. REVISED BY S. B. LUCE.

Matthews (Gen. GEORGE), b. in Augusta co., Va., in 1739; served with great distinction in the Indian and Revolutionary wars; was taken prisoner at Germantown, Pa., after receiving nine bayonet wounds; removed in 1785 to Oglethorpe co., Ga.; was governor of Georgia 1780 and 1793–96; Representative in Congress 1789–91, and was engaged in military operations in Florida in 1811, with the rank of brigadier-general of militia. D. at Augusta, Ga., Aug. 30, 1812. (See MATHEWS, GEORGE.)

Matthews (JOHN), b. in South Carolina about 1744; was an active patriot during the Revolution; Speaker of the South Carolina house of representatives; associate justice of the supreme court 1776; was a member of Congress 1778–82; governor of South Carolina 1782–83, and became in 1784 a judge of the court of equity. D. at Charleston, S. C., in Nov., 1802.

Matthews (STANLEY), b. July 21, 1824, at Cincinnati, O., was educated at Woodward High School; graduated from Kenyon College in 1840; studied law, and, removing to Maury Co., Tenn., was admitted to the bar and began the practice of his profession. He then married, and shortly after returned to Cincinnati. From 1846 to 1849 he assisted in the editorial management of the Cincinnati *Herald*, an anti-slavery journal. In 1851 he was elected judge of the court of common pleas for Hamilton Co., and in 1855 to the State senate. In 1858 he was appointed U. S. district attorney for the southern district of Ohio. At the outbreak of the civil war he was commissioned lieut.-colonel of the 23d regiment Ohio volunteers; in Oct., 1861, was commissioned colonel of the 57th regiment, and in that capacity commanded a brigade in the Army of the Cumberland; in 1863 resigned his commission to enter upon the duties of judge of the inferior court of Cincinnati. In 1877 he took part as counsel before the Electoral Commission, opened the argument in behalf of the Republican electors in the Florida case, and made the principal argument in the Oregon case; was soon after elected to the U. S. Senate, and in 1881 was appointed associate judge of the supreme court of the U. S.
JAMES A. WHITNEY.

Matthi'as, SAINT, the twelfth apostle, in place of Judas Iscariot, chosen during the ten days between Ascension and Pentecost. Of the 120 disciples in Jerusalem, apparently only two (Barsabas and Matthias) could be found who had been companions of Christ during the whole course of his ministry; and of these two the latter was chosen somehow by *lot*. In spite of specious arguments against it, the validity of this election can be sustained. The New Testament makes no further mention of Matthias, and ancient traditions clash. (See the *Acta Sanctorum*, Feb. 24.) R. D. HITCHCOCK.

Matthias, the assumed name of ROBERT MATTHEWS, a religious impostor, b. in Washington co., N. Y., about 1790; resided in Albany when, excited by the preaching of the celebrated revivalists Rev. Charles G. Finney and Rev. E. N. Kirk (about 1830), he determined to become a religious leader. He began by ardent advocacy of temperance, and having had some success in street-preaching, claimed to have received a revelation, and undertook to convert the city of Albany. His violence, however, defeated itself, while his absurd pretensions were promptly refuted and placed in their proper light. Enraged at the failure of his projects, he prophesied the destruction of Albany, and proceeded secretly to New York, where he succeeded in imposing upon several respectable families and created a great popular sensation. Having been accused of poisoning one of his wealthy disciples, he was tried and acquitted, but, having then lost all influence, quietly disappeared, and d. some years later in Arkansas. (See *Matthias and his Impostures*, by William L. Stone, New York, 1835.)

Matthias, German emperor from 1612 to 1619, b. Feb. 24, 1557, a son of Maximilian II., and educated in Spain at the court of Philip II. In 1577 he repaired secretly to the Netherlands, and made an attempt at managing affairs there, but failed, and withdrew in 1580. On June 14, 1612, he succeeded his brother, Rudolph II., as emperor of Germany, but his reign was very unsuccessful. The differences between the Protestant Union, formed in 1608, and the Catholic League, formed in 1609, grew now into open controversies. The emperor first tried to put himself at the head of the Catholic League, but, failing in this, he undertook to suppress both associations by an imperial decree, to which, however, neither of them paid any attention. In 1617 the bigoted archduke Ferdinand was appointed king of Bohemia, and on May 23, 1618, the Protestant inhabitants of Prague took arms and broke out in open rebellion. Thus began the Thirty Years' war. Hardly a year after (Mar. 20, 1619) the emperor d., and was succeeded by Ferdinand.

Matthias I., Corvinus, king of Hungary from 1459 to 1490, b. in 1443, a son of John Hunyady, and educated in Bohemia, where for a long time he was detained a prisoner; afterwards he married the daughter of the Bohemian king, George Podiebrad. In Hungary a large party among the nobility was opposed to the election of Matthias, and invited the German emperor, Frederick III., to the throne, while at the same time the Turks, taking advantage of these internal dissensions, invaded and ravaged the country. Matthias, however, fought with great success against both his enemies. The Turks he drove out with heavy losses, and in a later war of 1485 he compelled Frederick III. to cede to him large parts of Austria, including Vienna. George Podiebrad having been excommunicated in 1469 as a Hussite, and a crusade being preached against him by Pope Paul II., Matthias invaded Bohemia in 1469. At first he had only small success, but by the final peace in 1470 he received Moravia, Silesia, and Lusatia: he also gained some advantages over the Poles. But although his reign was a long series of wars and campaigns, the interior government was by no means neglected, and although the king was a most brilliant soldier, he possessed a fine taste for learning and art. A great collection of Greek manuscripts was brought together in Buda, but, unfortunately, the largest part of it was destroyed by the Turks in 1527. D. Apr. 7, 1490.

Mat'tison (HIRAM), D. D., b. at Norway, N. Y., Feb. 8, 1811; resided in childhood at Oswego; was a teacher for some years; joined the Black River (N. Y.) conference as a preacher 1836; removed to New York City in 1852, and filled important pulpits until 1861, when he withdrew from the Methodist Episcopal Church on account of slavery, but returned to it in 1868, and became secretary of the American and Foreign Christian Union. D. Nov. 24, 1868. Dr. Mattison published *The Doctrine of the Trinity* (1843), *Astronomy* (1846), *Spirit-Rappings* (1854), *Resurrection of the*

Body (1866), and edited Burritt's *Geography of the Heavens* (1850), a popular textbook of astronomy.

Mat'tocks (C. P.), b. at Danville, Me., Oct. 11, 1840; educated at Bowdoin College in 1862 and at Harvard Law School in 1867; served during the civil war with the Army of the Potomac in the 1st Maine Vols., rising to be colonel, and brevetted brigadier-general; made prisoner at the battle of the Wilderness May 5, 1864, and held until Mar., 1865; has been county attorney of Cumberland co., Me.

Mattocks (John). See Mattacks (John).

Mat'to-Gros'so, the largest and westernmost province of Brazil, comprising an area of 865,800 square miles, and bounded E. by the provinces of Goyaz and São Paulo, S. W. by Paraguay and Bolivia, and N. by the provinces of Amazonas and Pará. It is traversed from W. to E. by a mountain-range whose branches form valleys which by degrees slope down to the vast plains around the Amazon and Rio de la Plata. Large tracts of this province are covered with immense forests; others are arid and sandy; and as a whole it is very imperfectly known. Gold, diamonds, and iron are frequently found, and mineral springs abound. But the entire population of this immense territory does not probably amount to more than 46,000—that is, 1 to each 20 square miles—and of this number nine-tenths are Indians and negroes, very little suited to utilize the riches which the land evidently contains. The gold and diamond mines are worked by the government; agriculture does not raise sufficient food; the forests are unused; rearing of cattle is the only productive pursuit of the inhabitants.

Matto-Grosso, town of Brazil, in the province of the same name, on the Guapore, was founded in 1734 by gold-diggers; rose rapidly, and was in 1818 the capital of the province, the residence of the provincial government, and had 18,000 inhabitants. It has now hardly 1500. The gold-fields have become exhausted, the insalubrity of the place has put the government officials to flight, and the surrounding districts cannot be cultivated, as they are annually inundated by the Guapore.

Mattoon', city and R. R. junction, Coles co., Ill. (see map of Illinois, ref. 7–F, for location of county), has several mills and railroad repair and car shops. Pop. in 1880, 5737.

Mattoon (Gen. Ebenezer), b. at Amherst, Mass., Aug. 19, 1755; graduated at Dartmouth College 1776; joined the Revolutionary army in Canada; served as lieutenant of artillery at the battle of Bemis Heights 1777, and rose to the rank of major; settled in his native town as a scientific farmer; served often in the legislature; was for twenty years sheriff of Hampshire co.; member of Congress 1801–03; major-general of State militia 1797–1816; adjutant-general 1816; colonel of the Ancient and Honorable Artillery Company of Boston 1817, and member of the State constitutional convention 1820. D. at Amherst Sept. 11, 1843, having been blind nearly twenty-five years.

Mat'urin (Charles Robert), b. at Dublin, Ireland, in 1782: educated at Trinity College; took orders in the Church of England, and became curate of St. Peter's, Dublin. Pecuniary losses induced him to write several novels of an extravagant character, which had little success on account of the turgidity of their style, the incoherence of their plots, and the total lack of consistency in the psychological delineation (*The Fatal Revenge*, 1804; *The Wild Irish Boy*, 1808; *The Milesian Chief*, 1811), but his tragedy of *Bertram*, represented by Edmund Kean at Drury Lane Theatre, brought him £1000 and a considerable reputation as a poet, which his later productions scarcely justified: *Manuel* (1817) and *Fredolpho* (1819), two tragedies, and the novels *Women* (1818), *Melmoth* (1820), and *The Albigenses* (1824). There were, however, in both his novels and his dramas, outbursts of genuine eloquence of a high order which could not but captivate the reader who was able to appreciate them, and some of his works were highly commended by Sir Walter Scott. He was an eloquent pulpit-orator and a bold opponent of Roman Catholicism. D. at Dublin Oct. 30, 1824.

Maubeuge', town of France, department of Nord, on the Sambre, which here becomes navigable, is fortified, and has iron-foundries and manufactures of firearms, iron and steel goods, saltpetre, oil, and sugar, and an active trade in coal, slate, and marble. It originated from a great double monastery for monks and nuns founded in the seventh century by St. Aldegonde, and was incorporated with France by the Peace of Nimeguen. Its fortifications were planned by Vauban. Pop. in 1881, 17,221.

Mauch Chunk', R. R. junction, cap. of Carbon co., Pa. (see map of Pennsylvania, ref. 4–I, for location of county), 120 miles N. W. of New York City, in the centre of the Lehigh anthracite coal-region. It derives its chief importance from its connection with the anthracite coal-trade, and all tolls and wages are based on the fluctuations of its markets. The first iron smelted by anthracite coal was made here. The Switchback R. R., one of the most famous pleasure-roads in the world, annually brings large numbers of tourists to this place. It is a gravity road, 18 miles in length, the necessary elevation being attained by stationary engines. Mauch Chunk has a public library and foundries, machine-shops, etc. Pop. in 1870, 3841; in 1880, 3752.

Maudada, cap. of Traverse co., Minn. (see map of Minnesota, ref. 7–A, for location of county). Pop. not in census.

Mauds'ley (Henry), M. D., b. at Giggleswick, Yorkshire, England, Feb. 5, 1835; studied at the University of London, where he graduated in medicine in 1857; was physician to the Manchester lunatic asylum 1859–62; settled in London as a consulting physician upon lunacy 1862; published *The Physiology and Pathology of the Mind* (1867); was made fellow of the Royal College of Physicians 1869; appointed Gulstonian lecturer to that body in 1870; published his course of *Lectures on Body and Mind* (1870), and wrote a treatise on *Responsibility in Mental Disease* (1874) for the "International Scientific Series." He was in 1875 professor of medical jurisprudence in University College, consulting physician to the West London Hospital, and editor of the *Journal of Mental Science.*

Mauduit Duplessis, de (Thomas Antoine), Chevalier, b. at Hennebon, France, Sept. 12, 1753; entered in boyhood the school of artillery at Grenoble, from which he ran away and made journeys as cabin-boy to Greece, Egypt, and Constantinople; became in 1776 captain in an artillery regiment; came to America with La Fayette; rendered good service as an engineer in constructing Fort Mercer at Red Bank, N. J., and as a soldier in defending it; was distinguished at Brandywine, Germantown, Monmouth, and Yorktown. Sent to Hayti in 1787 as colonel of the regiment of Port-au-Prince, he disarmed the national guard (1790) and enlisted the white settlers in companies of "royal volunteers," at the head of which he made sanguinary campaigns against the disaffected blacks. Upon the arrival of new battalions from France in Mar., 1791, a revolution took place at the capital, where the newly-arrived soldiers fraternized with Mauduit's regiment and the mass of the people against the wealthy planters. After a fruitless resistance at the head of the "royal volunteers," Mauduit was massacred with them by his own grenadiers, Mar. 4, 1791.

Mauduit (Israel), b. at Exeter, England, in 1708; was educated for the ministry as a dissenter, but never preached; went into mercantile business with his brother Jasper and accumulated a fortune, and in 1763 was entrusted with representing the interests of the province of Massachusetts, of which Jasper Mauduit was the nominal agent. He became collector at Southampton 1765; wrote several pamphlets in behalf of Massachusetts and of the New England colonies generally during the ten years of negotiations before the Revolution, and afterward wrote ably in behalf of American independence. D. June 16, 1787.

Maui. See Hawaiian Islands.

Maulmain', or **Moulmein,** city of British Burmah, Farther India, at the mouth of the Salwen, in the Bay of Bengal, in lat. 16° 30′ N. It is a flourishing place, important for its exports of teak. Ivory, grain, wax, and gum are also exported, and silks and cottons, wine and beer, tobacco, arms, and sugar are imported. Pop. 51,107.

Maumee River is formed by the union of St. Mary's and St. Joseph's rivers at Fort Wayne, Ind. Its mouth is at Toledo, O. It is navigable 8 miles to S. Toledo, and in high water to Defiance, 50 miles.

Mau'na Lo'a ("great mountain"), a volcano of the Hawaiian Islands, is nearly in the centre of the island of Hawaii, and rises 13,600 feet above the level of the sea. It contains several craters, both on its summit and on the sides, among which that called Kilauea is the most remarkable. It is 3½ miles long, 2½ miles broad, and 1044 feet deep. The eruption of 1880–81 poured forth for 9 months a river of lava which ran 50 miles, varying from a few hundred yards to 3 miles in width.

Maunder (Samuel), b. in England about 1790; was brother-in-law to William Pinnock, whom he aided in compiling his educational *Catechisms*, and produced the valuable "Treasury Series," containing manuals of useful knowledge, history, natural history, biography, chronology, geography, etc. D. at Islington, London, Apr. 30, 1849.

Maundrell (Henry), b. in England in 1650, was for many years chaplain to the English factory at Aleppo, Syria, and author of a volume of travels, *Journey from Aleppo to Jerusalem* (1698), many times reprinted, and still highly prized. D. in 1710.

Maun'dy Thurs'day, so called from *mandatum novum,* the "new commandment" given by Christ to his disciples to "love one another" (John xiii. 34). On this day in Roman Catholic countries, the feet of pilgrims are washed in the church, while the *Mandatum novum* is sung, and doles are given to the poor. Maundy Thursday is the same as the Holy Thursday in Passion Week.

Maupertuis', de (PIERRE LOUIS MOREAU), b. July 17, 1698, at St. Malo, Bretagne, France; studied mathematics and astronomy; attracted much attention both in England and France by his able advocacy of the ideas of Newton in opposition to those of Descartes, and was placed in 1736 at the head of a scientific expedition to Lapland for the purpose of measuring there an arc of a meridian; which expedition he described in a very clever book, *De la Figure de la Terre* (1738). In 1740 he accepted an invitation from Frederick the Great, went to Berlin, and became president of the new Prussian Academy of Science. But although the king treated him with great kindness, his residence in Berlin was not very enjoyable. König accused him of plagiarism, and Voltaire's *Dr. Akakia* made him the laughing-stock of all Europe. D. at Bâle July 27, 1759.

Maurepas', de (JEAN FRÉDÉRIC PHÉLYPEAUX), COUNT, b. at Versailles July 9, 1701; inherited in his fourteenth year an office as minister of state, including the departments of the royal household, of the city of Paris, and of the marine. This office had belonged to his family for 170 years, and when he was twenty-four years old he took charge of it himself. In 1749 he was banished from the court on account of a sarcastic epigram on Madame de Pompadour, but on the accession of Louis XVI. he returned as prime minister, which position he held till his death, Nov. 21, 1781. His abilities consisted in business routine and an excellent talent for court intrigues. His knowledge was superficial, his character frivolous, his administration a hotbed for all kinds of abuses. He rendered some service to the French marine, but his two most famous measures were the convocation of the parliaments and the participation in the American war of independence, both of which had a decisive influence in bringing about the French Revolution. The *Mémoires de Maurepas* (3 vols.), published in 1792 by Soulavie, are considered spurious.

Mau'rer, von (GEORG LUDWIG), b. Nov. 2, 1790, at Erpolsheim, in Rhenish Bavaria; studied at Heidelberg; was appointed professor of jurisprudence at Munich in 1826; became a member of the Grecian regency 1832–34; was for a short time Bavarian minister of foreign affairs, and minister of justice in 1847, and d. at Munich May 9, 1872. His *Geschichte des Altgermanischen Gerichtsverfahrens* (1824) was crowned by the Academy of Munich. Besides a number of valuable works on jurisprudence and the history of legislation and government in Germany, he wrote in 1836 *Das Griechische Volk vor und nach dem Freiheitskampfe* (3 vols.).—His son, KONRAD MAURER, b. in 1823 at Frankenthal in the Palatinate; studied at Munich, Leipsic, and Berlin, and was appointed professor of jurisprudence at Heidelberg in 1847. He has made comprehensive studies of Icelandic language, literature, and history, and written several works on this subject, such as *Die Entstehung des Isländischen Staats und seiner Verfassung* (1852), *Gullthórissaga* (1858), *Isländische Volkssagen* (1860), etc.

Maurice', count of Nassau, prince of Orange, b. Nov. 14, 1567, at Dillenburg in Nassau, a son of William the Silent of Orange; studied at Leyden, and was proclaimed stadtholder of Holland, Zealand, and Utrecht shortly after the assassination of his father in 1584, and appointed commander-in-chief by all the provinces after the recall of Leicester by Queen Elizabeth in 1587. His military career was very brilliant. He took Zutphen, Deventer, and Nymwegen in 1591, Geertruidenberg in 1593, Groningen in 1594. In 1597 he defeated the Spaniards at Turnhout in Brabant, and in 1600 at Nieuwport, near Ostende. But from ambitious designs he opposed the armistice of twelve years which Barneveldt succeeded in concluding with Spain in 1609, and by which the United Provinces were acknowledged as an independent republic. He aspired to sovereignty, and used the hot controversy between the Arminians and the Gomarists as a means of overcoming the resistance of Barneveldt and the republican party. He did not succeed, however. After the execution of Barneveldt (in 1619) the popularity of Maurice was lost, and it was hardly regained by some new exploits in the renewed war with Spain in 1622. D. at the Hague Apr. 23, 1625. Next to Alexander Farnese, he was generally considered the greatest general of his age, and numbers of young men of royal or noble birth who wished to learn the art of war gathered in his camp. (See Motley, *History of the United Netherlands* (1860–67) and *Life and Death of John of Barneveld* (1874).

Maurice, duke of Saxony, of the Albertine line, b. Mar. 21, 1521, at Freiberg, a son of Henry the Pious, joined the Protestant Church in 1539; married in 1541 a daughter of the landgrave Philip of Hesse, and succeeded his father on the ducal throne in the same year. His relations with the emperor Charles V. were most amicable at this time. He fought in his army against the Turks and against the French, and although he was an ardent Protestant, and his father-in-law at the head of the Smalcald League, he not only did not become a member of that league, but he even helped the emperor to crush it in the battle of Mühlberg, Apr. 24, 1546. As a reward he received from the emperor the possessions of the other line of the house of Saxony, the Ernestine, whose representative, John Frederick, had been one of the leaders of the League; and with the possessions followed the rank and title of elector. As soon, however, as Maurice had reached his aim, the good relations with the emperor ceased, and he began to take umbrage at every undertaking of the latter. At last, having made a secret alliance with Henry II. of France in Oct., 1551, he suddenly marched in May, 1552, on Innspruck, where the emperor lay ill of the gout. By a hasty flight the emperor saved himself from being captured by Maurice, but by the Peace of Passau (Aug. 2, 1552) he was compelled to consent to all his demands, the first of which was full religious liberty for the Protestants. Next year, on July 9, 1553, Maurice was mortally wounded in the battle of Sievershausen against the margrave of Brandenburg, and d. two days afterwards. He was succeeded by his brother. His daughter Anne was married to William the Silent.

Maurice, count of Saxony, generally known as MARSHAL SAXE, b. at Goslar Oct. 28, 1696, a son of Augustus II. the Strong, elector of Saxony and king of Poland, and Aurora von Königsmark. In his twelfth year he fought with distinction in the armies of Prince Eugene and Marlborough, and was legitimized by his father, but his debaucheries and dissipations, in which he surpassed even his father, developed as early and as rapidly as his brilliant talents. In 1720 he went to France, bought a regiment, was appointed maréchal de camp, and studied with great energy mathematics, mechanics, and fortification. In 1726 the estates of Courland elected him duke, but the project failed on account of Mentchikof's intrigues; and when it was taken up once more in 1728 by the dowager duchess, Anna Ivanovna, who wished to marry him, it was foiled by his dissipation and lack of attention. At the outbreak of the Austrian War of Succession he offered his services to his native country, but by the fault of Count Brühl they were not accepted, and he received a French command. He took Prague by storm in 1741, and fought with great distinction in Bohemia, Bavaria, and on the Rhine. But his fame as a great general he gained chiefly by his campaigns in Flanders from 1744 to 1748. He won a brilliant victory at Fontenay May 11, 1745, and at Roucoux Oct. 11, 1746. He took Brussels, Bergen-op-Zoom, Maestricht, and conquered the whole of Belgium. The enthusiasm of the French people and king knew no bounds; honors were heaped upon him; he was made marshal-general of all French camps and armies, and presented with the palace and estates of Chambord, where he led a princely life, and d. Nov. 30, 1750. His *Rêveries Militaires,* written in 1731, but afterwards revised and much enlarged, is full of ingenious and audacious ideas; his *Lettres et Mémoires,* published in 1794, have also some interest.

Maurice (FREDERICK DENISON), b. Aug. 29, 1805, in Normanton, Suffolk, England; d. in London, Apr. 1, 1872; was the son of a Unitarian clergyman; was educated at Cambridge, and took a degree in law, his birth in a nonconformist sect obliging him to forego honors and degrees in other schools. He early took an interest in the social, political, ecclesiastical, and scientific questions that agitated thoughtful men in England, writing fervently in the *Athenæum* and other periodicals. In 1830 he joined the Established Church, having convinced himself that it was the best ground for an Englishman to stand and work on, although holding the Church responsible, through its shortcomings, not only for the degradation of the working-classes, but also for the dissent that should have found room for expression within the Establishment. By his work, *The Kingdom of Christ* (1838), his *Lectures on Education* (1839), his *Thoughts on Conscientious Subscription,* and *Reasons for not Joining a Party in the Church* (1841), he laid the foundation of the Broad Church, as it was called, a new party name which he regretted, as pointing to another division in the Church. Maurice was a preacher from the time of his ordination in 1831. His first curacy was a small village in Warwickshire that has never yet heard the whistle of a locomotive; from 1846–59 he was chaplain at Lincoln's Inn; and for the next seven years addressed intellectual audiences in De Vere street. Maurice was of fertile mind and fluent, abounding utterance. His writings, mostly publications in book-form of his copious lectures on nearly all questions of church history, social and political ethics, practical and speculative theology, and philosophy, bear the stamp of an earnest intellect, a sweet and consecrated spirit, a profoundly humane heart. His Warburtonian lectures on *The Epistle to the Hebrews*, his Boyle lectures on *The Religions of the World*, the lectures on *The Religion of Republican Rome* (1855), *The Patriarchs and Lawgivers of the Old Testament, The Ten Commandments, The Gospel of the Kingdom, The Gospel of the Word, The Epistles of St. John, Christian Ethics, The Apocalypse, a Vision, The Prophets and Kings of the Old Testament, History of Moral and Metaphysical Philosophy*, the lectures on *The Ecclesiastical History of the First Two Centuries*, on *The Unity of the New Testament*, on *The Word "Eternal,"* on *The Lord's Prayer and the Book of Common Prayer*, on *The Claims of Religion and Science, The Dialogues on Family Worship*, illustrate the variety and the vitality of his labors. His last works were on *Conscience* and *Social Morality*. Death surprised him in the fulness of his powers, while he was preparing lectures on *The Ethical Systems of Plato and Aristotle*. For twenty-five years Maurice was acting president of the Working-men's College, where he never ceased to be a personal teacher, having as counsellors and coadjutors men like Thomas Hughes, John Ruskin, Lawrence, Rossetti, Cave Thomas, and others eminent in science, history, literature, and art. His influence was exerted in favor of a relaxation of the laws respecting the Sabbath, of healthful Sunday recreations for the working people, the opening on Sunday of the Crystal Palace; all the time his labors being directed to the spiritual culture of the people. His *Life*, in two vols., edited by his son, Frederick Maurice, appeared in 1884. ELIZABETH P. PEABODY.

Maurice (THOMAS), b. at Hertford, England, Sept. 25, 1754; was educated at St. John's and University College, Oxford; became curate of Woodford, Essex, and subsequently at Epping, and vicar of Wormleighton and of Cudham, Kent. He became assistant librarian to the British Museum in 1799. He wrote a number of sermons and poems, two tragedies, and a valuable series of works on India—*Indian Antiquities* (7 vols., 1791–97), *The* (*Ancient*) *History of Hindostan* (3 vols., 1795–99), and *Modern History of Hindostan* (2 vols., 1802–04). He received from the government the pension which had been enjoyed by Cowper. D. in London Mar. 30, 1824. He published his *Memoirs* (3 vols., 1819–22).

Mauri'cius (FLAVIUS TIBERIUS), emperor of Constantinople from 582 to 602 A. D., b. at Arabissus, Cappadocia, about 539, descended from a noble Roman family, and distinguished himself so much in the wars against Persia that on his deathbed the emperor Tiberius appointed him his successor under general rejoicing of the people. But after his accession to the throne his popularity soon waned, and his long reign is distinguished only by a series of wars with Persia and the Avars, in which he did not himself command. Victories alternated with defeats, but the most prominent features in these wars were the perpetual mutinies, conspiracies, and intrigues. One of these, under the leadership of Phocas, succeeded in overthrowing the emperor, as a revolt rose at the same time both in the army and the city. Mauricius fled with his family from Constantinople, and sought refuge in the church of St. Autonomus, near Chalcedon, from which, however, he was dragged and beheaded, Nov. 27, 602, and Phocas was proclaimed emperor. He left a work on military art, published at Upsala in 1664 by John Scheffer.

Maurita'nia, the ancient name of North-western Africa, corresponding to the present Morocco and part of Algeria, and inhabited by the Mauri (Moors). After conquering it, the Romans founded many colonies here. In 429 A. D. it was overrun by the Vandals, but it was reconquered by Belisarius, and remained with Italy till the end of the seventh century, when it was taken by the Arabs.

Mauri'tia [Brazilian, *Miriti, Buriti*], an interesting genus of American fan-leaved palm trees, usually very tall and beautiful. Palm wine, edible fruits, and useful timber and leaves are produced by *M. vinifera* and *flexuosa*.

Mauri'tius, one of the Mascarene Isles in the Indian Ocean, situated 400 miles E. of Madagascar, in lat. 20° 32′ S. and lon. 57° 46′ E., and belonging to Great Britain. Area, 708 square miles. Pop. 360,847. It is of volcanic origin, surrounded with coral reefs, and covered with mountains, not very high, the Brabant Mountain being only 3000 feet, and Peter Botte 2000 feet, but which present the most extraordinary outlines. The valleys contain a very rich soil, and the climate is singularly fine, the heat seldom exceeding 90°. It was discovered in 1505 by the Portuguese, and colonized in 1598 by the Dutch, who, however, soon left it. In 1721 it was colonized a second time by the French, who kept it till 1810, when it was taken by the English. As a British possession it has become very flourishing; the value of its exports in 1881 amounted to £3,634,788. Sugar is the principal produce, cultivated by coolies who have been transferred from India for this purpose. Besides sugar, coffee and rice are extensively cultivated. The soil is of great fertility. It consists of a ferruginous red clay, but is so largely mixed with stones of all sizes that no plough can be used: the ground has to be prepared for cultivation by the hoe. The natural fertility of the soil is still further increased by a heavy application of guano. The native forests which once covered the island have mostly disappeared. It has two railways commencing at Port Louis with a total length of 87 miles. Principal town, Port Louis.

Maury (Gen. DABNEY H.), b. in Virginia about 1824; graduated at West Point 1846; entered the mounted rifles and served in the Mexican war; was professor at West Point 1847–52; published *Skirmish Drill for Mounted Troops* (1859); entered the military service of the Confederate States 1861; attained the rank of major-general, and was in command of the defences of Mobile, Ala., when that place was captured, Apr. 10, 1865.

Maury (JEAN SIFFREIN), b. at Valréas, Venaissin, France. June 26, 1746, the son of a shoemaker, prepared himself for the Church at Avignon; came in 1766 to Paris, and attracted great attention by his eloquent discourses and *éloges*. In 1785 he was chosen a member of the Academy, and in 1789 he took his seat in the National Assembly as member for Peronne. He was one of the most passionate and influential opponents of the revolutionary theories, but in 1791 he left France, went to Rome, where he was received with great distinction, and was made bishop of Nicea *in partibus* in 1794, and cardinal in 1798. In 1806 he became reconciled to Napoleon, and returned to France, and in 1810 the emperor made him archbishop of Paris. As he had not been consecrated in this position by the pope, he lost it on the restoration of the Bourbons, and was even imprisoned for some time in the castle of St. Angelo. D. at Rome May 11, 1817. His *Essai sur l'Eloquence de la Chaire* (2 vols., 1810) is still much read.

Maury (MATTHEW FONTAINE), LL.D., b. in Spottsylvania co., Va., Jan. 14, 1806; spent his childhood in Tennessee; entered the U. S. navy as midshipman Feb. 1, 1825, serving on board the Brandywine during its voyage to France to convey La Fayette thither, and afterwards on the Pacific coast in the same vessel; made a voyage around the world in the Vincennes, during which he began his *Treatise on Navigation* (1835), which has since been a text-book in the navy and a popular manual for the merchant marine. He became lieutenant June 10, 1836, and was appointed astronomer to the Wilkes exploring expedition in the same year, but resigned before sailing. In 1839, Lieut. Maury met with an accident which resulted in lameness and a consequent permanent disability for active naval service. While confined from this cause he wrote, under the pseudonym of "Harry Bluff," in the *Southern Literary Messenger*, a series of articles entitled *Scraps from the Lucky Bag*, chiefly devoted to the exposure of abuses in the navy. He had previously commenced an accumulation of hydrographical observations, and on being appointed keeper of charts and instruments at Washington was enabled to enlarge the scope of his researches. In 1844 this bureau was united with the National Observatory, of which Maury was made superintendent. In that year he communicated to the National Institute a paper upon the Gulf Stream and other oceanic currents, in connection with great-circle sailing, which was printed in the *Southern Literary Messenger* under the title *A Scheme for Rebuilding Southern Commerce*. The results of these researches were also embodied in the *Wind and Current Charts* and *Sailing Directions* issued by the observatory. At his suggestion the U. S. government took the initiative in convoking a general maritime conference, which met at Brussels in Aug., 1853, the chief object of which was the adoption of a common method of hydrographical observation and registry, which was effected by the adoption of a model for a logbook previously (1848) prepared by him. In 1855, Maury's great work, *The Physical Geography of the Sea*, was issued, and at once placed his name at the head of the great scientific department of which it treats. In 1855 he was made a commander, but resigned in 1861 to enter the Confederate service, in which he obtained the rank of commodore; spent a year or two in Europe during the war, at the close of which he took service under the archduke Maximilian in Mexico as commissioner of emigration. This position proving ephemeral, he again went to Europe, where he resided until 1868, in Russia and in England, engaged in the preparation of a series of textbooks. In 1868 he accepted the professorship of physics in the Virginia Military Institute, declined in 1871 the presidency of the University of Alabama, and d. at Lexington, Va., Feb. 1, 1873.

Mau'ser Gun, The, the common name for the rifle used by the Prussian infantry, and invented in 1871. It combines the advantages of the Bavarian Werder gun with some new improvements introduced by Mauser, a gunsmith in Kannstadt, Würtemberg. It is distinguished from the needle-gun by a longer range, a greater rapidity in firing, and a greater simplicity in loading. The charge of powder is heavier, the cartridge lighter, narrower, and longer. The whole mechanism is very simple; only four movements are required in loading and discharging. It is provided with a bayonet, which, however, is only inserted for bayonet-attacks. Without the bayonet it weighs but four kilogrammes, while the needle-gun weighed five. Its range is about 1200 mètres. Since the end of 1874 all the infantry of the army of the German empire have been provided with this gun, with the exception of the Bavarian infantry, which has retained the Werder gun.

August Niemann.

Mausole'um [Gr. Μαυσώλειον], the tomb of Mausolus, king of Caria, erected at Halicarnassus by Artemisia, his widow, in 353 B. C. It is often referred to by ancient writers as one of the wonders of the world, and it surpassed all other structures of the kind so much by its magnificence that the name of Mausoleum came to be the generic term for a costly tomb. Pliny gives a minute description of it, and it remained standing for centuries after his time. Gradually, however, it fell into decay. One part of it seems to have been destroyed by an earthquake; when in 1404 the Knights of Rhodes took possession of Halicarnassus, and built a castle there, they gathered their materials from the mausoleum; finally, the Turks disturbed the building so completely that even the site of it was forgotten. Of late, however, the excavations of Mr. Newton, undertaken under the auspices of the English government, have brought to light not only the site and fundamental outlines of the building, but so many fragments have been found that it seems possible to make a complete ideal reconstruction of the whole structure.

Maus'ton, on R. R., cap. of Juneau co., Wis. (see map of Wisconsin, ref. 6–D, for location of county), 124 miles W. of Milwaukee, on the Chicago Milwaukee and St. Paul R. R., has good educational advantages, abundant water-power, grist and saw mills, lath and shingle works, foundry and machine-shops, barrel-factory, carriage manufactory, etc. Pop. in 1870, 952; in 1880, 1013.

Mauvaises Terres [Fr.], or **Bad Lands,** a name given to various desolate tracts in Dakota, Nebraska, Colorado, and other Territories of the U. S., but especially to a tract along the White River, an affluent of the Missouri. The Bad Lands are usually treeless, broken, and utterly waste regions of Tertiary formation, abounding in interesting relics of extinct species of rhinoceros, hyæna, and other mammals. Some parts of the Bad Lands afford a scanty pasturage in the rainy season, but for the most part they are not known to have any valuable animal, vegetable, or mineral products.

Mauve. See Aniline Colors.

Ma'vor (William Fordyce), LL.D., b. in Aberdeenshire, Scotland, Aug. 1, 1758; was in early life a schoolmaster; took orders in the Church of England 1781; became vicar of Hurley, Berkshire, rector of Stonesfield, and of Bladon-cum-Woodstock, where he d. Dec. 29, 1837. He was the author of numerous educational books which enjoyed a wide circulation, but are now superseded. His most ambitious work, and the only one which retains a certain value, is *The Universal History* (25 vols., 1802).

Mavors. See Mars.

Mavrocorda'tos (Alexander), b. at Constantinople Feb. 15, 1791; received an excellent education, partly as secretary to his uncle, hospodar of Wallachia, partly in travels in Western Europe. On the outbreak of the war of independence he immediately returned to Greece, and although he soon became involved in political strifes with the parties of Colocrotonis and Capo d'Istria, which were a great hindrance to the progress of the national cause, his brilliant military achievements, the battle of Peta, the defence of Missolonghi, Navarino, and Sphacteria, rendered, nevertheless, great service. After the establishment of King Otho on the throne, Mavrocordatos was several times at the head of the government, in 1833, 1841, 1844, 1850, and 1856, and filled different positions as ambassador during the intervals. D. in Ægina Aug. 18, 1865. In his policy he represented the ideas and influence of England in sharp opposition to those of Russia. In the cause of public education he took a great interest.

Mawe (John), b. in Derbyshire, England, in 1764; went in early life to Brazil, where he was employed by the prince regent to make a scientific exploration of the mineral regions, the results of which were given in his work, *Travels in the Interior of Brazil, particularly in the Gold and Diamond Districts of that Country* (1812), which attained great popularity both in England and the U. S. Mr. Mawe subsequently became a noted practical mineralogist in London, where he d. Oct. 26, 1829. He was also author of *The Mineralogy of Derbyshire* (1802), *Diamonds and Precious Stones* (1813), and *Familiar Lessons on Mineralogy and Geology* (1816).

Max'cy (Jonathan), D. D., b. at Attleborough, Mass., Sept. 2, 1768; graduated at Rhode Island College (now Brown University) 1787; was tutor there 1787–91; became pastor of the First Baptist church, Providence, R. I.; professor of divinity in Brown University, and its president 1792–1802; president of Union College, Schenectady, N. Y., 1802–04, of the college at Columbia, S. C., 1804–20, where he d. June 4, 1820. He was an able scholar, and published, among other works, a celebrated course of sermons on the existence of God.

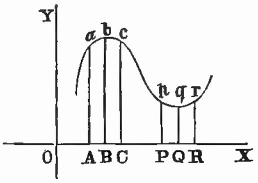
Maxcy (Virgil), brother of Jonathan, b. at Attleborough, Mass., about 1785; studied law at Baltimore, Md., under the direction of Robert Goodloe Harper; settled in Maryland and became a prominent advocate; published *A Compilation of the Laws of Maryland from 1692 to 1809* (4 vols., 1809); was a member of both houses of the legislature; solicitor of the U. S. treasury, and appointed chargé d'affaires to Belgium 1837. He was one of the victims of the explosion on board the U. S. steamer Princeton in the Potomac, Feb. 28, 1844.

Maxentius (Marcus Aurelius Valerius), Roman emperor 306–312, was the son-in-law of Galerius, but obtained nothing by the division of the empire in 305, on account of his incapacity and vices. The following year, however, an insurrection broke out in Rome, and he was elected emperor. Severus was put to death, Maximianus was banished, and in Africa he even achieved an important military success against Alexander. War was then declared against Constantine, and the reason given was Constantine's conduct against the old emperor. But the contest ended with the defeat of Maxentius at Saxa Rubra and his death by drowning in the Tiber at the Milvian bridge on Oct. 28, 312.

Maxey (Gen. Samuel Bell), b. in Kentucky about 1825; graduated at West Point 1846; served as a lieutenant in the Mexican war, after which he resigned from the army, studied law, and settled at Paris, Lamar co., Tex. He entered the military service of the Confederate States as a colonel in 1861, rose to the rank of general, resumed the practice of law after the close of the war, was elected in 1873 U. S. Senator from Texas for the term commencing Mar. 4, 1875, and was re-elected for the ensuing term.

Maxfield (Thomas), b. in England about 1720; was one of Wesley's converts at Bristol, and was subsequently appointed "to pray and expound the Scriptures, but not to preach," at the Foundry church, London, during Wesley's absence. In contravention to his instructions he soon began to preach with great fervency and success, and Wesley, after hearing one of his sermons, gave him permission to preach. He thus became the first Methodist itinerant lay-preacher. He was subsequently ordained by the bishop of Londonderry, made an advantageous marriage, attended the first Methodist conference at the Foundry June 25, 1744, and the third conference at Bristol 1746; suffered imprisonment and persecution; became separated from Wesley about 1764, in consequence of a doctrinal schism, and in company with Bell set up a congregation with 170 members, who seceded from the Foundry church. He preached for twenty years longer, was visited and comforted by Wesley many years later when sinking under paralysis, and d. at London about 1785.

Max'ima and Min'ima [Lat.]. A function of a single variable is at a *maximum* state when it is greater than the states that immediately precede and follow it; it is at a *minimum* state when it is less than the states that immediately precede and follow it. The terms greater and less are to be understood in their algebraic sense; that is, greater means nearer to $+\infty$, and less means nearer to $-\infty$. It may be shown that every function of one variable may be represented by the ordinate of some curve of which the independent variable is the corresponding abscissa; this curve is called the curve of the function. It may also be shown that the value of the first differential coefficient of the function for any value of the variable is equal to the tangent of the angle which a tangent line to the curve of the function, at the corresponding point, makes with the axis of abscissas. The tangent of this angle is called the *slope* of the curve.



Let *acpr* be the curve of any function, referred to the axes *OX* and *OY*, and suppose the ordinate *Bb* to be greater than *Aa* and *Cc*, *AB* and *BC* each being equal to dx; also suppose that the ordinate *Qq* is less than *Pp* and *Rr*, *PQ* and *QR* being equal to dx; then is *Bb* a maximum and *Qq* a minimum, the former corresponding to the abscissa *OB* and the latter to the abscissa *OQ*. For particular forms of the function we might have a cusp of the first species turned upward at *b* and downward at *q*. This would not impair the generality of the explanation now to be given. An examination of the figure shows that a tangent to the curve at *a* slopes upward, and that a tangent at *c* slopes downward; in the former case the first differential coefficient is + just before reaching a maximum ordinate, and – just after passing it; that is, it changes sign from + to – in passing over a maximum. In like manner the first differential coefficient changes from – to + in passing over a minimum ordinate. In the case represented in the figure the differential coefficient corresponding both to a maximum and to a minimum is equal to 0. In the special case alluded to, the differential coefficient changes sign as before, but at the maximum and minimum states it reduces to ∞. From what precedes we have the following rule for finding all the maximum and minimum states of any function of one variable: *Rule.* Find the first differential coefficient of the function, and place it equal to 0, and also equal to ∞, and solve the resulting equations with respect to x. The values thus found will embrace all that correspond either to maximum or minimum values of the function, and they may embrace other values. Then test each value as follows: subtract from, and also add to, the root to be tested an infinitely small quantity, and substitute these results for x in first differential coefficient; if the first result is + and the second –, the root corresponds to a maximum; if the first result is – and the second +, the root corresponds to a minimum; if both results have the same sign, the root does not correspond either to a maximum or to a minimum. As an illustration of the manner of proceeding, let it be required to find the maximum or minimum values of y from the relation $y = x^2 - 3x + 2$. By this rule we have $\frac{dy}{dx} = 2x - 3 = 0$, whence $x = 1\frac{1}{2}$; making $x = 1\frac{1}{2} - dx$, and $x = 1\frac{1}{2} + dx$ in the expression $2x - 3$, we have in the first case $-dx$, and in the second case $+dx$, which shows that $x = 1\frac{1}{2}$ corresponds to a minimum value of y; to find this minimum we make $x = 1\frac{1}{2}$ in the given expression, and denote the corresponding value of y by y'; this gives $y' = -\frac{1}{4}$, which is the required minimum. In like manner, if $y = 4 - (x-3)^{\frac{2}{3}}$, we find $\frac{dy}{dx} = -\frac{2}{3}(x-3)^{-\frac{1}{3}}$, which placed equal to ∞ gives $x = 3$. Making $x = 3 - dx$ and $x = 3 + dx$ in the differential coefficient, we find for the first supposition that it becomes $\frac{2}{3\sqrt[3]{dx}}$, and for the second $-\frac{2}{3\sqrt[3]{dx}}$; hence, $x = 3$ corresponds to a maximum, which is given by the equation $y' = 4$.

The case in which the first differential coefficient is equal to ∞ is exceptional; that is, it only corresponds to the case in which the curve of the function has a cusp of the first species at which the tangent is perpendicular to the axis of the independent variable. Setting aside this case, the rule for testing the values of x that makes the first differential coefficient equal to 0 admits of great simplification. The test in this case is as follows: substitute each root in the successive differential coefficients of the function until one is found that does not reduce to 0; if this is of an even order and *negative*, the root corresponds to a maximum, but if it is of an even order and *positive*, the root corresponds to a minimum. In all other cases the root corresponds to neither a maximum nor a minimum. Thus, in the first example above given the second differential coefficient is $+2$, which is positive for all values of x; hence, $x = 1\frac{1}{2}$ corresponds to a minimum. The practical application of the above test admits of still further simplification in certain cases, for which the reader is referred to Church's *Calculus*, pp. 90–94.

A function of two variables is at a maximum state when it is greater than all the immediately surrounding states, and it is at a minimum state when it is less than all the immediately surrounding states. In all except a few particular cases the following equations give all the values of x and y that can correspond to either a maximum or minimum state:

$$\frac{du}{dx} = 0, \quad \text{and} \quad \frac{du}{dy} = 0; \qquad (1)$$

in which u is the given function, and x and y the independent variables. The test in this case requires that $\left(\frac{d^2u}{dxdy}\right)^2$ shall be equal to or less than $\frac{d^2u}{dx^2} \times \frac{d^2u}{dy^2}$, when x and y are made equal to the values deduced from equation (1). If this condition is satisfied, and $\frac{d^2u}{dy^2}$ is negative, the corresponding value of u is a maximum, or if $\frac{d^2u}{dy^2}$ is positive, the value of u is a minimum. As an example, let it be required to find the maxima and minima of the function

$$u = x^3y^2(a - x - y).$$

Differentiating, we have

$$\frac{du}{dx} = x^2y^2(3a - 3y - 4x), \quad \text{and} \quad \frac{du}{dy} = x^3y(2a - 3y - 2x);$$

placing these results separately equal to 0, and combining, we have $x = \frac{1}{2}a$, and $y = \frac{1}{3}a$. We also have by further differentiation,

$$\frac{d^2u}{dx^2} = 2xy^2(3a - 3y - 6x); \quad \frac{d^2u}{dy^2} = x^3(2a - 6y - 2x);$$

$$\frac{d^2u}{dxdy} = x^2y(6a - 9y - 8x).$$

Substituting for x and y the values found above, we have

$$\frac{d^2u}{dx^2} = -\frac{1}{9}a^4, \quad \frac{d^2u}{dy^2} = -\frac{1}{8}a^4, \quad \text{and} \quad \frac{d^2u}{dxdy} = -\frac{1}{12}a^4.$$

These satisfy the conditions for a maximum; substituting the corresponding values of x and y in the given function, we find the maximum value to be $\frac{1}{432}a^4$. W. G. PECK.

Maximil'ian I., b. at Neustadt, near Vienna, Mar. 22, 1459, succeeded his father, Frederick III., as emperor of Germany in 1493, and d. at Wels, in Upper Austria, Jan. 12, 1519. Nearly all the most prominent events of his history are more or less intimately connected with his marriage affairs. After the death of Charles the Bold in 1477, he married his daughter and sole heiress, Mary, but Louis XI. of France laid claims to several of the possessions. An agreement was made after several years of strife, according to which his daughter Margaret should marry the dauphin Charles, and receive Artois, Flanders, and the duchy of Burgundy as her dowry; but the French government continued to stir up dissensions in the provinces of the Netherlands against the house of Austria. After the death of Mary of Burgundy in 1482, Maximilian married by proxy Anne of Brittany, another rich heiress, but this engagement was suddenly broken off; Anne married Charles VIII. of France, and he sent his affianced bride, Maximilian's daughter Margaret, back to Vienna. After his accession to the imperial throne Maximilian married Bianca Sforza, a daughter of Galeazzo Maria, duke of Milan, who had been murdered in 1476, and this marriage involved him in wars with Venice, Milan, the pope, Naples, France, and Spain. His participation, however, in the League of Cambray and in the Holy League, and his many Italian campaigns, were not of much consequence; he always lacked money and could only form a small and ineffective army. He was more successful in marrying his children, Philip and Margaret, to a Spanish prince and princess, thereby uniting Spain to the possessions of the house of Hapsburg. He also laid the foundation for the annexation of Hungary to the Austrian crown by marrying his grandchildren into the royal family of that country. His government of Germany, although disturbed by his many wars, was not altogether without fruits. By various institutions he succeeded in establishing a higher degree of public security throughout the realm, and commerce and industry, as well as science and art, made progress; but Switzerland became lost to Germany during his reign.

Maximilian II., b. at Vienna Aug. 1, 1527; succeeded his father, Ferdinand I., as emperor of Germany in 1564, and d. Oct. 12, 1576. Although he had spent several years at the court of Madrid, he was favorable to the Reformation, and it was even hoped that he might join the Protestant Church. This, however, he did not do, but he showed himself very tolerant. Protestants were appointed to government offices in Austria, and the evangelical theologian, Chytræus, from Rostock, was called to Vienna to arrange the Protestant service. On the other hand, he allowed the Jesuits free scope for their activity, and they gained great influence even in his own family.

Maximilian (FERDINAND MAXIMILIAN JOSEPH), archduke of Austria and titular emperor of Mexico, b. at the palace of Schönbrunn, Vienna, July 6, 1832, was the second son of the archduke Franz Karl and of the archduchess Sophia Dorothea, and brother of the present emperor of Austria, Franz Joseph; was carefully educated, acquiring the principal modern languages and a considerable acquaintance with science and literature; was trained in the naval service, which he entered in 1846; made several extended cruises; rose through the subordinate grades to the posts of rear-admiral (1854) and commander-in-chief of the Austrian navy; visited Greece, Syria, and Egypt in 1855; was viceroy of the Lombardo-Venetian kingdom 1857–59; married the princess Charlotte, daughter of Leopold I., king of the Belgians, July 27, 1857, and acquired great popularity at Milan by his enlightened administration and his zeal for the promotion of material improvements and industrial enterprises; retired to Venice in 1859 on the outbreak of the Italian war; visited Madeira with his wife; made a scientific tour in Brazil; visited England, where he was received with great honor by the section of liberals headed by Mr. Roebuck, and took up his residence at the beautiful palace of Miramar near Trieste, which he adorned with exquisite taste. From the period of his appointment to the Italian viceroyalty a circle began to be formed in Austria which more or less openly intrigued in his favor with the view of placing him upon the Austrian throne by revolutionary means; and although it cannot be alleged that he performed any overt act of disloyalty to his brother, it is certain that his naturally ambitious disposition was encouraged by schemers, who kept before his eyes the prospect of succession to the throne. As early as 1861, Napoleon III., when organizing the conquest of Mexico, which he designed to be "the most brilliant page in the history of his reign," conceived the idea of investing Maximilian with the future vassal crown of Mexico, believing that he would thereby propitiate public sentiment in Europe and console the emperor of Austria for the loss of Lombardy by the removal of a dangerous rival in the person of his popular brother. The varying fortunes of the Mexican campaign delayed the formal offer of the throne until the summer of 1863. As the result of an artful manipulation of the sentiments of the Mexican "Church party," which had been carried on for more than a year by the agents of Napoleon III. among the numerous Mexican exiles, generals and prelates, resident in Paris, an "Assembly of Notables," appointed by Gen. Forey upon his occupation of Mexico, met in that capital July 10, 1863, and with great unanimity declared the will of the Mexican people to be the establishment of an empire in the person of the archduke Maximilian of Austria, "or such other prince as the emperor Napoleon should designate." Similar "acts of adhesion" to the will of the conqueror were drawn up in the principal cities of Mexico as fast as they were occupied by the French, and received the signatures of the principal leaders of the Church party. The crown was formally tendered to Maximilian by a Mexican deputation at Miramar Oct. 3, 1863. He deferred his reply until he could be satisfied of being the choice of the Mexican people, but was easily induced to accept as evidence the "acts of adhesion" referred to, and on Apr. 10, 1864, signified his acceptance, and at once began to distribute offices, honors, and decorations. He was obliged, much against his will, to abdicate his eventual right of succession to the Austrian throne; visited Rome and received the papal blessing; paid farewell visits to the courts of Paris, Brussels, and London; contracted for the organization of Austrian and Belgian legions, and arranged a loan from France. He landed at Vera Cruz May 28, 1864; was received with civic festivities, flowers, poetry, and triumphal arches at the cities of Córdova, Orizaba, and Puebla; entered Mexico amid similar demonstrations of apparent popular enthusiasm June 12. A few days sufficed to prove the illusory character of the hopes that had been entertained by his Mexican partisans. Instead of frankly accepting the Church party as the only possible basis of his administration, and governing in accordance with the views of the circle to which he owed his nominal election, Maximilian quickly displayed a contempt for the wishes and advice of his officious partisans, reversed many of the acts of the regency from whose hands he received the government, and addressed himself to well-known republicans for the organization of his cabinet. Several of the statesmen consulted had sufficient force of character to decline all overtures, but enough were found who were seduced by the archduke's profession of being himself a liberal and "as much of a republican as he could be under the circumstances," to form a cabinet, and a determined effort was made to win the support of the republican masses. The hopes of the Church party for the repeal of the "laws of reform" and the restoration of the confiscated wealth of the Church were dashed, and Maximilian soon found himself without the active support of any party. A large part of the principal offices of state were filled by Frenchmen, French influence became paramount, and it was no longer doubtful that the existence of the "empire" depended upon the bayonets of his French, Austrian, and Belgian legions. During the first year of Maximilian's "reign" the arms of France were tolerably successful. All the central states were occupied, and the imperial machinery of prefects and commissioners duly set in motion; but the republican armies held their own in all the remoter states, while guerilla leaders swarmed in Michoacan, and even in the mountains surrounding the capital. The downfall of the government presided over by Jefferson Davis satisfied intelligent observers that the ephemeral "empire" established by Napoleon III. in Mexico must soon share its fate; but Maximilian persisted in believing himself able to maintain his position, even without the aid of his protector. He was soon involved in financial straits, resorted to fresh loans at exorbitant rate of interest, quarrelled with the French generals and civil employés sent to his assistance, alienated the loyalty of his original supporters, and did not succeed in winning the support of any considerable body of the republicans. No great administrative measures were accomplished to reconcile the Mexican people to the new régime; on the contrary, the civil list became extravagant and burdensome, and there was no hope of amelioration. Nevertheless, Maximilian acquired a certain personal popularity from his chivalric disposition, his winning manners, and his cultivated tastes. The greatest error of his career—one which was the immediate cause of his own tragic end—was the celebrated edict of Oct. 3, 1865, ordering the execution, as bandits, of the republican officers who should be taken prisoners. In 1866 the imperial cause rapidly declined through the vigor of the Juarist leaders in the N. and W.; and the withdrawal of the French auxiliary forces, demanded by Secretary Seward and conceded by Napoleon III., proved the signal for the advance of the republican government into Central Mexico. Yielding to the suggestions of Napoleon, Maximilian determined to abdicate, and in Oct., 1866, proceeded to Orizaba on his way to Europe, the empress having preceded him many months before upon an unsuccessful mission for support to the friendly European courts. Unfortunately, the influence of the Church party was effectually brought to bear upon the doomed prince, and he was induced to return to Mexico and throw himself upon the support of the "conservatives." A Mexican army was recruited in place of the French auxiliaries, and the two military leaders of that party, Miramon and Marquez, were advanced to high command. The effort was hopeless, and culminated a few months later in the capture of Maximilian and his principal generals at Querétaro, May 15, 1867. After a trial by a military council, lasting several weeks, Maximilian was condemned to death along with his generals, Miramon and Tomas Mejia, and, all efforts to obtain their pardon having proved unavailing, they were shot at Cerro de las Campanas, near Querétaro, June 19, 1867. Maximilian met his fate with valor. His remains were surrendered to his family in the following year, and were pompously buried in the cathedral of Vienna Jan. 18, 1868. PORTER C. BLISS.

Maximi'nus (CAIUS JULIUS VERUS), Roman emperor from 235 to 238, b. in the latter part of the second century, of barbarian parentage; attracted the attention of Septimius Severus by his strength and gigantic stature; was allowed to enlist in the cavalry, and was promoted by Caracalla; enjoyed the confidence of Alexander Severus, who entrusted him with the organization of a corps of soldiers destined for an invasion of Germany, and was proclaimed emperor by this army on the assassination of Severus. His campaigns against the Germans were successful, but his suspicion, rapacity, and cruelty knew no bounds. An insurrection in Africa and the sympathy it found in Italy threw him into a fit of frenzy. He hastened across the Julian Alps with his army, but was stopped at Aquileia, and while besieging this city was killed by his own soldiers and his head sent to Rome.

Maxims, Legal. The common law of England and of the U. S. is founded to a great extent upon general principles, either of justice, expediency, or policy, and a large part of the work done by the courts in both countries has consisted in the application of these comprehensive principles to the innumerable varieties of facts and circumstances brought before them in judicial controversies, and in the creation thereby of special rules for the decision of such disputes. The practical regulations, therefore, which form a very large and most important part of the common law were originally derived from these fundamental and all-embracing principles, and were enacted by the judges as the results of a strictly logical process. The same mode of building up the law was pursued in ancient Rome—at first by the magistrates, the prætors, and subsequently by the later school of philosophical jurists, who during the most exalted period of the empire remodeled the whole jurisprudence and put it into an orderly and scientific form. As this method of constructing the law required a constant recurrence by the judges, magistrates, or juridical writers to the first principles whence so large a portion of it was derived by logical inference, it happened that very many of these principles came to be expressed in a brief and epigrammatic form, and clothed in pithy, familiar language; in a word, they grew to be *legal maxims*, and have fulfilled the same office for courts and lawyers which the ordinary popular proverbs have subserved for the community at large. It is impossible in most cases to trace these legal maxims to their immediate authors. As Lord John Russell most aptly said of proverbs, "They are the wisdom of many and the wit of few." A considerable number of them are found in the writings of Roman jurists, and have been transmitted from that distant origin to our own jurisprudence, enriching it throughout its entire course of development. Others were struck out and put into a permanent shape by the genius of some old English judge. Since they were either thus taken directly from the repositories of the Roman law, or else were invented during that ancient period of English history in which the Latin was the common tongue of all learned men, and especially of courts and judicial proceedings, they are all expressed in that language; and as the Latin, on account of its terseness and its power of condensation, is peculiarly fitted for maxims and proverbs, they lose very much of their original force and effect when translated into English. The number of these legal maxims scattered through the opinions of courts and the works of text-writers is great. An able English author who has made them the subject of a treatise selects one hundred as the most important, and as worthy of special comment and illustration. In addition to these, he gives a list of several hundred others of minor importance and less general in their nature. The range of particular subjects over which they extend is also very wide, reaching from the fundamental principles of government on the one hand, to the practical details and affairs of every-day life and the common rights and duties of person, property, and contract, on the other. The most important of the general subjects to which these legal maxims relate, when very broadly and comprehensively classified and grouped, are the organization of society into the state; the fundamental principles and the powers, obligations, and limitations of government; the administration of justice; the essential notions or conceptions upon which the entire law is based; and, passing from these somewhat theoretical and general topics to those more common and practical, the rules of the law concerning property, including its acquisition, its use and enjoyment, and its transfer; the rules of the law as to contracts, especially those which relate to the interpretation and construction of all written instruments; the rules of evidence; and the law regulating marriage and inheritance. I shall add a few of the most important and most familiar maxims, selected from several of these divisions, which will serve to illustrate the form and nature of the whole, and will exhibit, although but partially, the vast amount of legal principle and doctrine often compressed into a single epigrammatic sentence, and the wide extent of their application. Of those which more directly pertain to the state, the government, and the administration of justice, the following have been fruitful of practical inferences: *Salus populi suprema lex*—the public welfare is the highest law, from which are derived all those doctrines which subordinate private rights to the public good; *Leges posteriores priores contrarias abrogant*—later statutes repeal prior ones to which they are opposed; *Nemo debet esse judex in propria sua causa*—no one ought to be a judge in his own cause. Of the group which embodies the essential notions of law, some of the most striking as well as familiar are, *Ubi eadem ratio ibi idem jus*—like reason makes like law, a principle constantly acted upon by the courts in the decision of cases and the announcement of legal rules; *Cessante ratione legis cessat ipsa lex*—the reason of a rule ceasing, the rule itself ceases, a principle of like importance and application with the last; *Ubi jus ibi remedium*—there is no wrong without a remedy, perhaps the most fruitful of all general maxims, in pursuance of which the courts have constantly acted in devising new forms of relief or in extending old ones to meet new cases, so that the law as a whole might keep pace with the wants of an advancing civilization; *Ignorantia facti excusat, ignorantia juris non excusat*—ignorance of the fact excuses, ignorance of the law does not excuse, or the doctrine that all persons must be presumed to know the law (see IGNORANTIA JURIS); *Nemo debet bis vexari pro una et eadem causa*—no one should be twice vexed for the same cause, a provision which in substance, but with some change in the language, is found in all our constitutions, State and national, but which was recognized by the common law from the earliest period. From the maxims relating to property one or two only will be given: *Qui prior est tempore, potior est jure*—he has the better title who was prior in point of time; *Cujus est solum ejus est usque ad cœlum*—a man's property in the soil reaches up to the sky; *Sic utere tuo ut alienum non lædas*—so use your own property as not to injure that of another, a principle of universal application, creating a just limitation upon the rights of ownership, and a maxim constantly quoted by the courts at the present day; *Domus sua cuique est tutissimum refugium*, which has passed into common speech in the form of the popular proverb, "Every man's house is his castle." The maxims which relate to contracts and to the interpretation of written instruments are very numerous, but they are, more than any other class, technical and professional, and have therefore less of general interest. A few examples will suffice as illustrations: *Certum est quod certum reddi potest*—that is certain which can be made certain; *Qui hæret in litera hæret in cortice*—he who hangs in the letter hangs in the bark; *Ex nudo pacto non oritur actio*—no right of action arises from a bare promise; *Qui facit per alium facit per se*—he who acts by another acts by himself, the basis of the whole law of agency. These examples are enough to show the peculiar nature and application of legal maxims. (Consult Noy's *Maxims* and Broom's *Legal Maxims*.)

JOHN NORTON POMEROY.

Maxwell (HUGH), b. in Scotland in 1787, and was brought to the U. S. in early childhood; graduated at Columbia College 1801; became a prominent lawyer of New York and a leading Whig; was assistant judge-advocate-general U. S. army 1814; district attorney for New York county 1819, and again 1822–29; distinguished himself in the great "conspiracy trials" of 1823; was collector of the port of New York 1849–53, and soon afterwards retired from active business. D. at New York Mar. 31, 1873.

Maxwell (JAMES CLERK), M. A., LL.D., F. R. S., b. at Edinburgh, Scotland, June 13, 1831; educated at Academy and Univ. of Edinburgh; graduated at Cambridge 1854; prof. of natural philosophy in Marischal College, Aberdeen, 1856–60, and at King's College, London, 1860–65, and became in 1871 professor of experimental physics at Cambridge. His writings on physics are of a very high order, and include an *Essay on the Stability of the Motion of Saturn's Rings* (1859), *Theory of Heat* (1871), and a *Treatise on Electricity and Magnetism* (2 vols., 1873). The last-named work proceeds upon the basis of Faraday's *Experimental Researches in Electricity*. After reading them through with the greatest admiration and attention, he proceeded to translate their ideas into the truly scientific language, the precise mathematical notation. D. Nov. 5, 1879.

Maxwell (Sir MURRAY), C. B., F. R. S., b. in Lancashire, England, in 1766; entered the naval service in childhood; became lieutenant 1796 and captain 1803; distinguished himself in the West Indies in the capture of the French and Dutch colonies of St. Lucie, Tobago, and Guiana; accompanied the Jamaica squadron to the Mediterranean 1805; captured seven Spanish vessels from under the batteries of Cadiz, and subsequently took many French prizes on the coast of Italy; was shipwrecked on the coast of Ceylon 1813, losing his vessel, the Dædalus; was made commander of the Alceste, in which he conveyed Lord Amherst's embassy to China, 1816; surveyed for the first time the Gulf of Pecheli, the coasts of Corea, and explored the Loo Choo group of islands; forced a passage to Canton after a sharp engagement with the Chinese forts; lost the Alceste by shipwreck on a reef in the Philippine Archipelago Feb. 18, 1817, for which accident he was tried on his arrival in England, but acquitted of all blame; knighted and pensioned by the East India Company; was an unsuccessful candidate for Parliament at Westminster 1818; subsequently commanded a squadron in American waters; was appointed governor of Prince Edward's Island May, 1831, but before proceeding to his post d. at London June 26, 1831. Interesting narratives of Maxwell's voyages, explorations, and shipwrecks were written by his companions, Capt. Basil Hall (1817) and Dr. John McLeod (1818). He furnished several memoirs to the *Transactions* of the Royal Society.

Maxwell (ROBERT), LORD, b. in Scotland about 1480; was steward of Annandale 1514, warden of the West Marches 1517, provost of Edinburgh 1524; made extraordinary lord of session 1533, lord of regency 1536; negotiated the marriage of James V. to Mary of Lorraine 1537; escorted James to Caerlaverock Castle 1542; had a share in the mutiny at Solway Moss Nov. 25, 1542; embraced the principles of the Reformation, and caused the passage of an act in Mar., 1543, authorizing the reading of the Scriptures in the vulgar tongue, in spite of the opposition of the lord chancellor, the bishops, and the priests. D. July 9, 1546.

Maxwell (Gen. WILLIAM), b. probably in Ireland about 1735; entered the army in America in 1758, during the French war; remained in constant military service until and during the Revolution; was colonel of a New Jersey battalion in the Canadian campaign of 1776; appointed by Congress brigadier-general Oct. 23, 1776; commanded the New Jersey brigade at Brandywine and Germantown; pursued Clinton in New Jersey; took a leading part in the battle of Monmouth; was engaged in Sullivan's expedition against the New York Indians 1779, and in the battle of Springfield, June 23, 1780; soon after which he resigned. He was highly esteemed by Washington. D. Nov. 12, 1798.

Maxwell (WILLIAM), LL.D., b. at Norfolk, Va., Feb. 27, 1784; graduated at Yale College 1802; studied law, and practised with distinction at Norfolk; was long the secretary of the Virginia Historical Society; became in 1827 literary editor of the New York *Journal of Commerce*; was a member of the Virginia house of delegates 1830, and of the State senate 1831–37; was president of Hampden-Sidney College 1838–44; published a *Memoir* of Rev. John H. Rice, D. D. (1835), and edited the Virginia *Historical Register* 1848–53. D. at Richmond, Va., Jan. 9, 1857.

Maxwell (WILLIAM HAMILTON), b. at Newry, Ireland, in 1794; graduated with high honors at Trinity College, Dublin, at the age of nineteen; visited the British army in Spain; studied theology; took orders in the Church of England, and in 1820 was presented with the prebend and rectory of Ballagh in Connaught. As there was not a single Protestant in the parish, the rector enjoyed abundant leisure, which he devoted to field-sports and to literature. He wrote many successful sketches of country life and adventure, and was the chief originator of the prolific school of military novels. Among his numerous works were *Stories of Waterloo* (1829), *Wild Sports of the West* (1833), *The Dark Lady of Doona* (1836), *Stories of the Peninsular War* (1837), *Life of the Duke of Wellington* (1839–41), *Victories of the British Army* (1839), *Rambling Recollections of a Soldier of Fortune* (1842), *Wanderings in the Highlands and Islands of Scotland* (1843), *The Fortunes of Hector O'Halloran* (1844), *History of the Rebellion in Ireland in 1798* (1845), and *Bryan O'Lynn* (1848). Maxwell was a frequent contributor to *Bentley's Miscellany* and to the *Dublin University Magazine*. D. Dec. 29, 1850. (See biographical sketch prefixed to *Rambling Recollections*.)

Maxwell (Sir WILLIAM STIRLING), BART., LL.D., b. at Kenmure, near Glasgow, Scotland, in 1818; was known by the name of STIRLING until 1866, when by the death of Sir John Maxwell, his maternal uncle, he succeeded to a baronetcy and assumed the name of Maxwell. He graduated at Cambridge (1839), and devoted several years of residence and research in Spain and France to the history, literature, and art of Spain at the close of the mediæval period. He was the author of the valuable works, *Annals of the Artists of Spain* (3 vols., 1848), *Cloister Life of Charles V.* (1852), and *Velasquez and his Works* (1855); was elected to Parliament for Perthshire 1852, and represented that borough most of the time for more than twenty years; was rector of the University of St. Andrew's 1863, of that of Edinburgh 1872, and elected chancellor of that of Glasgow Apr. 28, 1875. D. in Venice, Jan. 15, 1878.

May [Lat. *Maius*], the fifth month of the year in the Gregorian calendar, consisting of 31 days, was by the ancient Saxons called *threo-meolee*, "three-milk month," because in this season cows were milked three times a day. The derivation of the Latin name is doubtful. Ovid, in his *Fasti* (v. 483–490), gives three, of which that from *Maia*, the mother of Mercury, seems the most probable. Modern philologists, however, generally explain *Maius* as a contraction of *Magius*, derived from a root *mag*, Sanskrit *mah*, to "grow." During the Middle Ages the month of May was generally ushered in by some popular merriment, but it is not clear whether this custom, which was found among all European nations, had any connection with the Roman festival of *Floralia*, beginning Apr. 28 and continuing for several days, or whether it sprang up spontaneously from joyous feelings on the arrival or approach of spring. In England the going out a-Maying was a very common custom in former days; Chaucer and Shakspeare mention it; Henry VIII. and Queen Catharine of Aragon followed it. On May 1, before sunrise, all the young folks repaired to the groves to gather flowers and branches with young foliage. With these the doors and windows of the houses and the Maypole of the village were adorned, and the day was spent in dancing around the pole. To preside at the festival a queen of May, the most beautiful girl of the village, was elected in England; in Germany, a count of May, the wittiest and handsomest youth; and the life at court and in the castle was imitated in the village streets by the peasants, probably not altogether without satire. With the Puritans the Maypoles and all the merriment connected with them disappeared in England. In Germany and Scandinavia the custom is dying out, though in Denmark the peasants still turn out on the 1st of May early in the morning to see "the sun dance," and in Stockholm great popular rejoicings take place in Djurgården. In the Highlands of Scotland the day was formerly celebrated as *Bel-tein* day; a fire was made, and certain ceremonies were performed which were supposed to have had a reference to the worship of Baal who was regarded as a personification of the sun. In Vienna the emperor, the empress, and the court take a drive through the Prater, and the whole city turns out to look at the spectacle.

May (CAROLINE), daughter of Rev. E. H. May, b. in England about 1820; published *American Female Poets, with Biographical and Critical Notices* (Philadelphia, 1848), *Treasured Thoughts from Favorite Authors* (1850), *The Woodbine, a Holiday Gift* (1852), a volume of *Poems* (1864), and *Hymns on the Collects* (1872). Miss May's poems were highly commended by competent critics (see Hart's *Female Prose Writers* and T. B. Read's *Female Poets*), and she enjoys the reputation of being an accomplished musician and painter. She has resided for some years at Pelham, Westchester co., N. Y.

May (Col. CHARLES A.), b. in Washington, D. C., in 1818; was appointed second lieutenant in the 2d Dragoons 1836; did efficient service in the Florida war; became captain, and was highly distinguished in Gen. Taylor's campaign in Northern Mexico in command of a squadron of his regiment. He was brevetted major for gallantry at Palo Alto, and colonel for similar conduct at Buena Vista. He resigned his commission in the army 1860; took up his residence in New York City; became vice-president of the Eighth Avenue R. R., and d. Dec. 24, 1864.—His father, FREDERICK MAY, M. D. (b. at Boston, Mass., Nov. 16, 1773; d. at Washington, D. C., Jan. 23, 1847), was a distinguished physician and surgeon; was professor of obstetrics in Columbian College 1823–39, and at the time of his death president of the District of Columbia Medical Society.

May (EDWARD HARRISON), b. at Lynn Regis, England, Jan. 28, 1795; studied for the ministry at Hoxton College, near London; was ordained in 1815 pastor of the Independent church at Bury, Lancashire; preached subsequently at Rochford and Croydon; settled in the U. S. in 1834; connected himself with the Dutch Reformed Church; was pastor of a church at Schuylerville 1836, and of the 21st street church, N. Y., 1839; became in 1848 secretary to the Pennsylvania Colonization Society, and in 1849 of the Pennsylvania Seamen's Friend Society, which post he retained until his death at Philadelphia in Aug., 1858.

May (EDWARD HARRISON), son of the above, b. in England in 1823; accompanied his parents to the U. S. in 1834; was noted in childhood for skill in mathematics, as well as for a talent for drawing; became a civil engineer, and was employed for some years upon railroad surveys, but, yielding to his artistic instincts, began to paint portraits, and soon proceeded to ideal and historical experiments; became favorably known to the public by a panorama illustrative of *The Pilgrim's Progress*, which he painted in union with other artists; studied under Daniel Huntington in New York, and in 1851 entered the studio of Couture in Paris. He has since resided chiefly in Paris, though making frequent visits to Italy and England; took high rank as a portrait-painter; made a series of fine copies from the "old masters" in the Louvre, and executed many imaginative pictures covering a wide range of subjects. He has taken prizes at several French exhibitions, and his works are justly popular with American art-patrons and critics. (See *Annales Historiques*, vol. xxxviii., Paris, 1864, and Tuckerman's *Book of the Artists*, 1867.)

May (SAMUEL JOSEPH), b. in Boston, Mass., Sept. 12, 1797; educated at Harvard College in the class of 1817; studied for the ministry with Henry Colman at Hingham, and Henry Ware, Andrews Norton, and Prof. Frisbie at Cambridge; was ordained in Chauncy Place church, Boston, Mar. 14, 1822; was settled immediately at Brooklyn, Conn.; was installed pastor of the church at S. Scituate Oct. 26, 1836; in 1842 accepted the charge of the State Normal School at Lexington; in 1845 removed to Syracuse, N. Y., to become pastor of the Unitarian society there, and there remained till his death, July 1, 1871. In 1859, Mr. May visited Europe for his health, which continued so feeble that in the autumn of 1867 he resigned his ministry, but became a missionary throughout Central New York for the American Unitarian Association. From early life Mr. May was a constant friend of civil liberty, popular education, and social equality. He was one of the first and one of the most uncompromising advocates of the abolition of slavery, an ardent and enlightened philanthropist; soldierlike in his courage, saintlike in his humility and tenderness; a cordial supporter of his country during the war, though a believer in the gospel of peace; a diligent and efficient worker in behalf of the sanitary commission and in aid of the Freedmen's Relief Associations; a man everywhere venerated and beloved. Gerrit Smith said of him, "He was the most Christlike man I ever knew." Not eminent either as preacher or as author, or shining in intellectual gifts, he was great in moral qualities of the rarest kind. As a writer he is chiefly known by a series of papers recording his *Recollections of the Anti-slavery Conflict.* A memoir of Mr. May, prepared by T. J. Mumford, was published in Boston in 1873. O. B. FROTHINGHAM.

May (THOMAS), b. at Mayfield, Sussex, England, in 1594; educated at Sidney College, Cambridge, where he graduated 1612; commenced the study of the law at Gray's Inn, London, but was never admitted to the bar; inherited a considerable estate on the death of his father, Sir Thomas May (1616), when he began to figure at court and in literary circles as a wit and a brilliant genius; became a favorite of Charles I.; published poetical translations of Virgil's *Georgics* (1622) and Lucan's *Pharsalia* (1627), to which he added a *Continuation* (1630), also in verse, bringing the history down to the death of Cæsar, and afterwards translated this continuation into Latin hexameters, published under the title *Supplementum Lucani, Libri VIII.* (Leyden, 1640; frequently reprinted), a work which brought him great repute on the Continent, where it was considered the first Latin poetry from an English author worthy of notice. During his period of favor at court he produced five dramas, and by request of Charles I. wrote the historical poems, *The Reign of King Henry II.* (1633) and *The Victorious Reign of King Edward III.* (1635). For some unknown reason, May abandoned the royal cause at the outbreak of the great rebellion, offered his services to the "Long Parliament," and obtained the double office of secretary and historiographer. In the latter capacity he published *The History of the Parliament of England which began Nov. 3, 1640; with a Short and Necessary View of some Precedent Years; published by authority* (1647), which concludes with the battle of Newbury in 1643; but in a Latin translation May brought down the narrative to the death of Charles I., and afterwards wrote an English epitome with the title *A Breviary of the History of the Parliament of England* (1650). This work has been differently judged; Clarendon pronounced an extremely unfavorable opinion, but the great earl of Chatham considered it "a much honester and more instructive book of the same period of history than Lord Clarendon's," and it was highly commended by Warburton, Allen, Hallam, and Macaulay. (See citations in Allibone's *Dictionary of Authors.*) A good edition of May's history was published by Baron Maseres in 1812, and another appeared in 1853, and it was translated into French by Guizot (1823). May was also the author of several political tracts, translated by request of Charles I. the poetical portions of John Barclay's famous allegorical romance, the *Argenis* (1628), and left in MS. a tragedy entitled *Julius Cæsar.* D. at London Nov. 13, 1650, and was buried in Westminster Abbey, but at the Restoration his monument was destroyed and his remains were removed to St. Margaret's churchyard.

May (Sir THOMAS ERSKINE), K. C. B., b. in England in 1815; educated at Bedford School; entered the civil service of the Crown in 1831 as assistant librarian of the House of Commons; called to the bar at the Middle Temple 1838; published *A Treatise on the Law, Privileges, Proceedings, and Usage of Parliament* (1844), which was adopted as a parliamentary textbook, and as such translated into German and Hungarian; reduced to writing for the first time in 1854 the *Rules, Orders, and Forms of Proceeding of the House of Commons*, adopted and printed by command of the House; wrote other tracts on legal and parliamentary subjects; contributed biographies and articles on political economy to the *Penny Cyclopædia*, and published a *Constitutional History of England since the Accession of George III.* (3 vols., 1861–63; 3d ed., revised, 1871), reprinted in America and translated into French and German. He has continued more than forty years in the service of the House of Commons in different capacities; was knighted 1866, and became clerk of the House 1871. His last work is a *History of Democracy in Europe* (2 vols., 1877).

Ma'ya, a term employed in different senses in the Puranic mythology, in the Booddhistic legends, in the Vedanta philosophy, and in some of the modern sectarian theologies of India. Originally it was the name of a goddess, the wife of Brahma, who, through her, created the universe; hence, when the universe came to be regarded as unreal, its creation was necessarily the work of illusion, which being personified in the goddess, her name became in late Sanskrit a synonym for "illusion," and it has preserved nearly the same mythical sense in the modern theologies. Gotama Booddha, according to the legendary narrative, was the son of a queen named *Maya*; whether she may be identified with either of the other Mayas is disputed.

Mayans' y Siscar' (GREGORIO), b. at Oliva, Valencia, Spain, May 9, 1699; graduated at the University of Salamanca; published several dissertations on Roman law, and afterwards devoted himself to the collection and publication of materials for the early literary history of Spain. In 1733 he became librarian to Philip V.; published *Cartas Morales* (1734), a *Life of Cervantes* (London, 1738), *Origines de la Lengua Española* (2 vols., 1737), a treatise on rhetoric (2 vols., 1757), editions of the works of Vives, Fray Luis de Leon, and Montaloo, and many literary treatises once deemed authoritative, but now neglected. D. at Valencia Dec. 21, 1781.

May-Apple, the common name of the *Podophyllum peltatum*, a perennial herb, indigenous to the U. S., once referred to the Ranunculaceæ, or thought to be the type of a separate natural order, now recognized as belonging to the Berberidaceæ. It has also received the popular name of *mandrake*, but improperly. From a perennial creeping rhizome a slender stem about a foot high rises, which forks near the top into two petioles, each surmounted by a large peltate leaf. At the crotch of the division appears a solitary white flower. The fruit of the may-apple is yellowish and fleshy, and about the size of a pigeon's egg. It is somewhat acid and mawkish in flavor, but may be eaten freely. The dried rhizome constitutes the drug *podophyllum*. Its virtues depend on a duplex resin improperly called *podophylline*, which is obtained in the form of a light brownish-yellow powder. This resin is a rough and harsh drastic purgative, which seems, like calomel, to include the upper part of the small intestine in its action, and thus to bring away a good deal of bile in the dejections. Hence it has been called "vegetable mercury." In overdose, like all the drastic cathartics, it may cause serious irritation, and even inflammation of the intestinal canal, with severe purging, nausea, and vomiting. Resin of podophyllum is used in small dose in many digestive derangements with constipation and clay-colored stools, and in full dose as an active purge. In the latter case some anodyne extract is commonly combined with it to correct the griping. EDWARD CURTIS.

May'as, a race of Indians inhabiting the peninsula of Yucatan and the adjoining regions of Guatemala and Tabasco. They are generally regarded as the descendants of the builders of the massive ruins of Uxmal, Chichen-Itza, Palenque, and Copan, which have excited the admiration of archæologists in a high degree; and this opinion is thought to be confirmed by the Maya traditions. The origin of the race is usually referred to the Toltecs, who were driven from the table-land of Mexico by the Aztecs in the eleventh or twelfth century A. D. A residuum of words in the Maya language seems to indicate some connection with the aborigines of the Antilles, from which it is probable that the Toltecs conquered and absorbed an earlier people. Tradition ascribes the origin of civilization in Yucatan to one Kukulkan, a prophet from the W., who is almost certainly identical with the Mexican Quetzalcoatl. The northern central region of the peninsula was called Mayapan, or the "home of the Mayas," and more than forty ruins of cities described by Stephens still attest its former splendor. The royal dynasty of Mayapan, according to tradition, was overthrown about A. D. 1400, from which period the decay of the cities may be calculated. A large number of the Mayas migrated at that time to the islands and shores of Lake Peten, where they are now known as Itzaes. The kingdom was about the same time broken up into numerous petty chieftaincies, in which condition the country remained at the time of the Spanish discovery, though the cacique of Mani seems then to have exercised a kind of suzerainty over the neighboring chiefs. The Mayas of that period could scarcely be called civilized, though they retained some vestiges of an earlier culture, especially a knowledge of a system of hieroglyphics and a calendar consisting of eighteen months of twenty days each, with five days and six hours over. They practised many barbarous and bloody religious ceremonies, flattened the heads of infants, tattooed the person, painted the face and body, wore nose-rings, were addicted to intemperance, had only the rudest musical instruments, used arrowheads of fishbone or obsidian, and manufactured light garments of cotton with considerable skill. They were Christianized during the latter half of the sixteenth century, and led the lives of peaceful and loyal agriculturists until the year 1848, when a terrible outbreak took place in Southern Yucatan; the citizens of Spanish descent were massacred by hundreds, several flourishing towns were laid in ashes, the Mexican rule over the greater part of Central and Southern Yucatan was annihilated; the Mayas asserted and have maintained their independence to the present day, carrying on a constant and devastating warfare upon the frontier settlements. They are on friendly terms with the English settlers of Belize, from whom they obtain arms and ammunition. They are rapidly relapsing into heathenism, but still retain some vestiges of Christian ceremonies, especially a reverence for the cross. They are governed by a queen, who resides at Chan Santa Cruz, not far inland from Belize. Many expeditions sent against them from Mérida have been successfully resisted, only one having penetrated to their capital; and becoming bolder year by year, they have advanced their frontiers northward, ravaging *haciendas* and villages, and even cities like Valladolid (1871). The language of the Mayas constitutes the chief stock of the Huaxteco-Maya-Quiché family, with which that of the Natchez of Mississippi has been affiliated by a recent inquirer (Brinton). The Huaxtecos reside upon the Gulf of Mexico, at the junction of the three states of Vera Cruz, Tamaulipas, and San Luis Potosi; the Quichés are a tribe of Guatemala, where are also spoken the Kakchikel, Izutuhil, and other dialects belonging to the same family. The Maya language is still spoken by a majority of the people of Yucatan, and has some religious literature. It is copious, melodious, and regular in its grammatical forms, and lacks the letters *d, f, g, q, r,* and *v.* Maya hieroglyphics are now rarely found in Yucatan, where all knowledge of the characters became extinct soon after the Conquest as a consequence of the religious zeal of the Spanish bishop Fray Diego de Landa, who destroyed all the manuscripts that could be accumulated as instruments of idolatry! Fortunately, the zealous bishop took the trouble to learn something of this "doctrine of devils," and in a *Relacion de las Cosas de Yucatan* which he sent to Spain gave the phonetic alphabet of the Mayas, all knowledge of which was soon after lost in Yucatan; and it was not recovered until about 1865, when Abbé Brasseur de Bourbourg, a distinguished French archæologist who had spent several years in Mexico and Central America, discovered the bishop's MS. in a Spanish library, and soon afterwards published it. The alphabet was reproduced in a pamphlet published by Dr. D. G. Brinton at Philadelphia in 1870. Several Maya MSS. preserved in European libraries have since been published, with translations by Abbé Brasseur, and seem to contain important notices of ancient Maya history, but the accuracy of the translations is not deemed sufficiently established to warrant their use as authorities. A grammar, dictionary, and chrestomathy of the Maya language was published by the same scholar in 1872, and a copious dictionary prepared by Dr. Berendt, a scholar who has devoted many years to the study of this group of languages in 1875. The other principal grammars of the Maya language are those of Gabriel de San Buenaventura (Mexico, 1560) and Beltran de Santa Rosa (Mexico, 1746; reprinted Mérida, 1862). PORTER C. BLISS.

May-Bug. See COCKCHAFER.

Mayence. See MENTZ.

Mayenne′, department of France, in the basin of the Loire, along the Mayenne. Area, 1966 square miles. Pop. 344,881. The ground is a plain, swelling towards the S. E. into a range of low hills. The soil is fertile, producing corn, flax, hemp, and apples, and yielding coal, iron, marble, and slate. Of the entire area, two-thirds are arable and one-twentieth is under wood. Agriculture is in a very flourishing condition. Linens and cider are the principal manufactures. Cap. Laval.

Mayenne, town of France, department of Mayenne, on the Mayenne. Its manufactures of linens and calicoes, its bleach-fields and dyeworks are important. Pop. in 1881, 11,180.

May′er (ALFRED MARSHALL), b. at Baltimore, Md., Nov. 13, 1836; was educated at St. Mary's College, Baltimore; devoted his attention to the physical sciences, in which department he became professor in the University of Maryland 1856–58, in Westminster College, Mo., 1859–61, in Pennsylvania College, Gettysburg, 1865–67, in Lehigh University, Pa., 1867–70, and in the Stevens Institute of Technology, Hoboken, N. J., since 1871. He spent a year (1863–64) in scientific studies at the University of Paris. At Lehigh University he superintended the erection of an observatory, from which he made a series of observations of Jupiter; was at the head of the expedition which observed the total eclipse of the sun at Burlington, Ia., Aug. 7, 1869, securing forty-one perfect photographs; began at Hoboken an important series of researches in acoustics, which led to several curious discoveries; was in 1873 one of the editors of the *American Journal of Science and Arts*, but was forced by weakness of sight to abandon that occupation. He has published numerous scientific papers.

Mayer (BRANTZ), b. at Baltimore, Md., Sept. 27, 1809; was educated at St. Mary's College, Baltimore; travelled in China and the Indies; became a lawyer in 1832; went in 1841 to Mexico as secretary of legation; became editor of the Baltimore *American;* author of *Mexico as it Was and Is* (1844), *Mexico, Aztec, Spanish, and Republican* (1851), *Captain Canot* (1854), *Mexican History and Archæology* (1856), *Mexican Antiquities* (1858), and other works. D. at Baltimore, Md., Feb. 23, 1879.

Mayer (CHARLES), b. at Clausthal, Hanover, in 1799; came in 1812 to Russia; was educated in Moscow; studied in 1818–19 in Paris; returned to Moscow, and d. at Dresden July 2, 1862. He was a very prolific composer for the piano-forte, and his pieces have a certain kind of superficial elegance which made them very popular at one time; they are seldom heard now.

Mayer (JOHANN FRIEDRICH), b. at Leipsic in 1650; studied theology in his native town and at Strasbourg; was appointed superintendent at Leissnig in 1673, and at Grimma in 1679, and became in 1684 fourth professor of theology at the University of Wittenberg. He was a man of great mental vigor and possessed of a powerful eloquence; his lectures attracted large audiences, but his ambition and greed and certain scandalous disturbances in his domestic life made it difficult for him to remain in Wittenberg, and in 1686 he accepted a position as preacher at St. Jacob's church in Hamburg. He had received his first religious inspiration from Spener, but even while in Wittenberg a certain coolness arose between them, and when Mayer came to Hamburg and found his three colleagues in the ministry, Horbius, Winkler, and Hinckelmann, all more or less impregnated by the pietism of Spener, he at once assumed a polemical attitude against this religious movement, and became in a short time famous, or rather notorious, on account of his polemics. By his singularly impressive eloquence he roused the mob of Hamburg to such a pitch of fanaticism against everything which looked like pietism or Spenerism that Horbius fled for his life and his house was razed to the ground, the senate being unable to defend either his life or his property; the emperor himself had to interfere. In 1701, Charles XII. appointed him first professor of theology at the University of Greifswalde, and superintendent-general of Pomerania and Rugen; and in this position he d. at Stettin in 1712. His works, numbering in all 378, have no theological worth, but give an interesting picture of the circumstances and characters of the time. It deserves to be mentioned that he was professor of theology at the University of Kiel at the same time he was preacher at St. Jacob's church in Hamburg, though the distance between the two places where he had to preach and to lecture could not be traversed in one day.

Mayer (JOHANN TOBIAS), one of the most celebrated astronomers of the eighteenth century, b. Feb. 17, 1723, at Marbach, Würtemberg; was principally self-educated; at twenty-two published a treatise on curves for the construction of problems in geometry, and in the same year an *Atlas mathématique;* contributed largely to the Cosmographic Society of Nuremberg, of which he was one of the founders, one of his contributions relating to the librations of the moon having been translated and incorporated almost entire by Lalande in the 20th book of his *Astronomy;* in 1751 was appointed professor in the university and director of the observatory at Göttingen, where during the Seven Years' war, the French troops made the basement of his observing tower a powder-magazine. Every evening Mayer passed through this magazine with a lantern. At the other extremity of the town the Saxons had established a similar magazine in a similar tower; and this one evening blew up with a frightful explosion, in which seventy persons perished. Mayer continued, nevertheless, his observations, disregarding the danger so startlingly illustrated; and it was under circumstances so unfavorable that he prosecuted the work of preparing his catalogue of zodiacal stars which has been of such value to modern astronomy. This catalogue embraced the positions of 998 stars, observed from four or five to twenty-five or twenty-six times each, with others not so important observed less frequently. He published also tables of the sun and of the moon, in the latter of which the errors were reduced to less than 2′, the tables previously in use being uncertain to 8′ or 10′. These tables, published in 1755, were sent to London in competition for the prize offered by the British Parliament for a satisfactory method of finding the longitude at sea. They were tested by Bradley, astronomer-royal, and pronounced worthy of the attention of the admiralty; but it was only after his death, in 1762 (Feb. 20), that the merited recompense was awarded: the sum of £3000 sterling was paid to his widow. Mayer was the author of many able memoirs not here enumerated, and of some very ingenious inventions, among them the repeating circle. F. A. P. Barnard.

Mayer (Joseph), F. S. A., b. at Newcastle-under-Lyme, England, Feb. 23, 1803; settled as a jeweller at Liverpool in 1822, and devoted himself to the formation of a private museum of art, in which he gathered a surprising variety of coins, gems, ivories, etc. from Greek, Egyptian, Abyssinian, Etruscan, and mediæval sources, which he recently presented to the city of Liverpool, the citizens of which as a mark of gratitude erected in 1869 a colossal statue of Mr. Mayer in St. George's Hall. He has been a liberal patron of antiquarian literature, and has made a vast collection of materials for a *History of the Rise and Progress of Art in England from 1550 to the Present Time.*

Mayer (Julius Robert), physicist of Würtemberg, originator of the doctrine of the conservation of force, b. at Heilbronn Nov. 25, 1814; studied medicine in Tübingen, Munich, and Paris; practised medicine and surgery in Heilbronn; sailed in 1840, on a Dutch freighting-vessel, to Java, and remained in Batavia through the summer. While there, in bleeding a patient ill of fever, he was surprised to find the color of the venous blood much more brilliantly red than he had observed it to be in Europe; and further observation satisfied him that the case was not exceptional. He explained the phenomenon by the supposition that the amount of oxidation in the blood necessary to maintain the natural temperature of the body is less in hot countries than in cold, the difference of tint between arterial and venous blood being attributed to such oxidation. This observation turned his attention to the study of the laws of heat, and through this to a consideration of the nature and relations of all the physical forces. His first publication on the subject, which appeared in Liebig's *Annalen der Chemie und Pharmacie,* under the title *Bemerkungen über die Kräfte der unbelebten Natur,* though brief, contained a clear announcement of the theory of force to which his celebrity is mainly due, and which it was the object of later labors to develop and apply. Setting out with the postulate, "Forces are causes," and with the proposition, *Causa æquat effectum,* he argues that the effect is but the cause in a new form, quantitatively undiminished, and capable of being a cause in its turn. Thus, there may be a chain of causes and effects indefinite in length, no term of which can ever be zero, but of which the last shall be for ever equal to the first. This first property of causes he calls their indestructibility. But as every cause, in producing its effect, itself disappears, and continues to exist only in the effect produced, the second property of causes is their convertibility. Physical forces are distinguished from matter in being without the properties of weight and impenetrability. The three distinctive characteristics of these forces are therefore indestructibility, convertibility, imponderability. This was the first announcement of a doctrine which has revolutionized the modes of philosophizing in physics, and which has greatly simplified the solution of a multitude of difficult questions. In the close of this remarkable paper the writer presented a determination of the mechanical equivalent of heat, derived from observation of the elevation of temperature in air compressed by a descending column of mercury. The value thus obtained involves as a factor the specific heat of air, a constant which was not then accurately known. By substituting for this constant the specific heat as established by the later admirable investigations of Regnault, Mayer's result is found to accord very nearly with that obtained in the long-continued and elaborate researches of Mr. Joule, conducted independently and in part simultaneously, but published later. The doctrine thus put forth found prompt acceptance with the most eminent physicists of the age, and was advocated and illustrated by Liebig, Seguin, Faraday, Helmholtz, Grove, Carpenter, and others. It is now universally received. Dr. Mayer's second publication, which was much more extended than the first, appeared in 1845, and embraced a bold extension of the principles of his theory to the phenomena of organic nature, thus reducing physiology to the form of an exact science. It was published under the title *Die organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel.* His *Celestial Dynamics* (*Beiträge zur Dynamik des Himmels*) made its appearance in 1848, and in 1851 he published a somewhat extended memoir entitled *Bemerkungen über das mechanische Aequivalent der Wärme.* In the former of these papers he discusses the sources of heat, and demonstrates the inadequacy of combustion, chemical action, or any other cause except mechanical force, to create or maintain the intensely-elevated temperature of the sun, which he regards as being fed by cosmical matter constantly precipitated upon its surface. He considers also the effect of the tides in retarding, and of terrestrial refrigeration in accelerating, the velocity of rotation of the earth upon its axis; holding that, in the earlier stages of a planet's history, the balance will be in favor of acceleration, and in the later, of retardation; there being an intermediate period of long duration in which, as at present in the earth, these opposing influences will sensibly compensate each other. Three of these important memoirs of Dr. Mayer, the first, third, and fourth above mentioned, have been published in English by Prof. Grove as an appendix to his work on the *Correlation of Forces.* In 1867, Mayer's collected works were published at Stuttgart under the title *Die Mechanik der Wärme.*

During the political troubles of 1848, Dr. Mayer incurred the hostility of the revolutionary party, and was subjected to a degree of annoyance which, in combination with domestic affliction, seriously impaired his health. In May, 1850, in a paroxysm of delirium, he threw himself from a window thirty feet above the ground, and received injuries from the effects of which he was long a sufferer. His physical health was restored, but the mental vigor which marked his early investigations was sensibly diminished. D. Mar. 20, 1878. F. A. P. Barnard.

Mayer (Simon), b. June 14, 1763, at Mendorf, near Ingoldstadt; studied music under his father, and afterward in Bergamo and Venice, where he composed his first opera, and was appointed chapel-master in 1805. He composed about 70 operas, serious and comic, some of which had a great success, and are distinguished by the gracefulness and freshness of their melodies, though there is no originality or depth. The instrumentation of his operas is richer and more conscientious than was common in the Italian opera of his time; but in spite of their success and real merits, they all disappeared from the stage when Rossini began to compose, and in 1816 Mayer retired. He also composed a great quantity of church music, which, however, has not proved more enduring than his operas. D. at Bergamo Dec. 2, 1845.

Mayersville, cap. of Issaquena co., Miss. (see map of Mississippi, ref. 6–E, for location of county). Pop. in 1880, 355.

Mayfield, city, cap. of Graves co., Ky. (see map of Kentucky, ref. 5–C, for location of county), situated 26 miles S. of Paducah, on the Chesapeake Ohio and Southwestern R. R. and on Mayfield Creek, has an institute, a park, a large flouring-mill, woollen-mill, and tobacco-houses. Pop. in 1870, 779; in 1880, 1839.

May-Fly is the common name of several species of Ephemeridæ. (See Ephemera.) The entire period of the preparatory stages the May-fly passes in the water, during which time the larvæ and pupæ make themselves little burrows in the sides of the pond or stream in which they live. The emerging of these insects from the water seems always to take place in the evening, and they generally make their appearance in such countless swarms for two or three evenings that the effect produced by one species with white wings as they are blown by the wind has been compared to a heavy fall of snow. By the next morning the majority of these insects are found lying dead in heaps upon the shore.

May'hem [Late Lat. *mahainium, mahemium*]. By the common law of England, mayhem consists of violently depriving a person of the use of any of his limbs or members which may be used in fighting, so that he is rendered less capable of protecting himself against assault or injury. But an injury which merely causes disfigurement, but does not lessen the capacity for fighting, is not a mayhem. Thus, it is mayhem to disable or injure a man's arm or leg, his hand or foot, to deprive him of a fore tooth, or to destroy his eye; but to cut off his ear or nose, to injure the lip, or to knock out a back tooth would not be mayhem, as these are not considered defensive members. In modern times, however, this common-law rule has been changed in some States by statute, and injuries merely causing disfigurement have been declared acts of mayhem. Thus, in New York it is enacted that it shall be mayhem to cut out or disable the tongue, to slit the lip, or slit or destroy the nose, or to cut off or destroy any limb or member. Mayhem at common law is a criminal offence, and was in ancient times punished by a mode of retaliation, the person inflicting the injury being deprived of the same member of which he had deprived another, or being disabled in a like manner. But this practice went out of use at an early period, and the offence was punished by fine and imprisonment, until it was declared by various statutes to be felony. In the U. S. mayhem is usually declared to be a felony. (See Felony.) A civil action for damages may also be maintained for an injury of this kind by the person maimed, since it is an act of assault and battery. (See Assault, Battery.)

George Chase. Revised by T. W. Dwight.

May'hew (Experience), son of John, and great-grandson of Gov. Thomas Mayhew, b. in Martha's Vineyard Jan. 27, 1673; succeeded his ancestors in the pastoral charge over the Indians in Mar., 1694, and was employed by the Society for Propagating the Gospel to translate the Psalms and the Gospel of John into the Indian language, which he had learned in childhood. He published in 1727 *Indian Converts*, being the lives of thirty Indian preachers and eighty other converts, and a volume entitled *Grace Defended* (1744). D. Nov. 29, 1758.—His son, Zachariah, was missionary at Martha's Vineyard from 1767 to his death, Mar. 6, 1806.

Mayhew (Henry), b. in London, England, Nov. 25, 1812; was educated at Westminster School; made a voyage in his boyhood to Calcutta, and served an apprenticeship to his father, a solicitor. He commenced a literary career by bringing out at the Queen's Theatre, in conjunction with Gilbert à Beckett, the farce of *The Wandering Minstrel;* founded a comic paper, *Figaro in London;* was one of the promoters of *Punch* (1841), and for some years' its chief editor, and in association with his brothers Horace and Augustus wrote numerous popular humorous novels, fairy-tales, and farces. His chief achievement, however, has been in making known the every-day life of the lower classes of the British metropolis in his work, *London Labor and the London Poor* (1851; new ed. 1868), originally contributed to the *Morning Chronicle*. He has written largely for magazines, is author of *The Mormons* (1852) and of the valuable juvenile books, *The Wonders of Science* (1855), *Young Ben Franklin* (1858), *Boyhood of Martin Luther*, and *The Story of a Peasant-Boy Philosopher*.—His brother Horace, b. in London in 1819, was for some years on the staff of *Punch*, published several humorous works in his own name, and d. at London Apr. 30, 1872. Three other brothers, Thomas (b. in 1810), Edward (b. in 1813), and Augustus, aided Henry and Horace in some of their literary undertakings. Thomas was a pioneer in the publication of penny grammars, dictionaries, etc., as part of a "Penny National Library," and lost £10,000 by the undertaking; he was also editor of the *Poor Man's Guardian*, and was a conspicuous advocate of reform measures; Edward was theatrical manager and writer of farces in youth, and has published standard works on horses and dogs, especially on their diseases; while Augustus is known as the author of several successful romances.

Mayhew (Ira), b. at Ellisburg, N. Y., in 1814; received a careful education; removed to Michigan in youth; became a successful teacher and author of educational works. He was for many years superintendent of public instruction in Michigan; did much to increase the efficiency of the public-school system, and prepared, at the request of the legislature of Michigan, his valuable *Treatise on Popular Education, for the use of Parents and Teachers*. Among his other publications, a *Practical System of Bookkeeping by Single and Double Entry* (1851) deserves special mention.

Mayhew (Jonathan), D. D., son of Experience, b. in Martha's Vineyard Oct. 8, 1720; graduated at Harvard College 1744; became minister to the West church, Boston, June, 1747, retaining that position until his death, July 9, 1766. He was a man of learning and literary ability; took part in the political questions of the day as a friend of Otis and advocate of colonial liberty; and in his theological opinions inclined to the views afterwards termed Unitarian. He published many occasional discourses, one of which was a *Thanksgiving Sermon for the Repeal of the Stamp Act* (1766). His writings were republished in 1838, with a *Memoir*, by Alden Bradford.

Mayhew (Thomas), b. in England Mar., 1592; was a merchant at Southampton; came to New England in 1631; resided several years at Watertown; obtained in 1641 from the agent of Lord Stirling a grant of a considerable portion of the island of Martha's Vineyard, with the title of governor; began the colonization in 1642, aiding his son Thomas in converting the Indians, and proving himself so true a friend that through his influence they not only abstained from joining in Philip's war, but protected the white settlers against the savages. Gov. Mayhew founded Edgartown in 1647, preached in his old age to the Indians, as well as to the English, in place of his deceased son and grandson, and d. in Mar., 1682. From him was descended a remarkable series of missionaries to the Indians of Martha's Vineyard.

Mayhew (Thomas), son of Gov. Thomas, b. in England in 1621; was well educated; went with his father to Martha's Vineyard in 1642 as minister to the settlers; learned the Indian language, began in 1646 to preach to the natives, and in 1650 had 100 converts among them. He undertook in Nov., 1657, a voyage to England for the purpose of obtaining aid for more extended Indian missions, but the vessel was lost at sea and all on board perished. Four of his letters on the Indians of Martha's Vineyard were published in London.—His sons, Matthew and John, also preached to the Indians, the latter as a regular missionary, but d. before his grandfather, who became his successor.

May Laws. See Falk Laws.

Maynadier (Gen. William), b. in Maryland in 1806; graduated at West Point, and appointed brevet second lieutenant of artillery 1827; served on duty at the school of practice at Fort Monroe, and of which he was subsequently adjutant; during the Black Hawk war was selected by Gen. Scott as one of his aides, and for similar duty by Gen. Macomb during the early part of the Florida war. Frequently assigned to ordnance duty while in the artillery, he was, in 1838, on the increase of that corps, appointed captain of ordnance, and assigned to the Pikesville (Md.) Arsenal, where he remained in command, acting also as inspector of ordnance, until 1842, when he was selected by the chief of ordnance as his principal assistant; from which date he was associated in close official connection with the successive chiefs of that bureau, and by whom his eminent abilities, sound judgment, and valuable experience were freely acknowledged. Major and lieut.-col. 1861; col. in 1863; brevet brig.-gen. 1865. D. July 3, 1871.

Maynard (Horace), LL.D., b. in Westborough, Mass., Aug. 30, 1814; graduated in 1838 at Amherst College; was tutor and afterwards mathematical professor in East Tennessee University; admitted to the bar in 1844, and became a successful lawyer; represented Tennessee in Congress 1857–63; suffered much from loss of property and exile during the war of 1861–65, he having immediately on the outbreak of the war declared his loyalty to the government; was in Congress again 1866–75, representing the Knoxville (2d) district until 1873, when he was chosen Representative at large. In 1862 his alma mater gave him the degree of LL.D. In 1875 he was sent as minister to Constantinople, and in 1880 became U. S. postmaster-general. D. May 3, 1882.

Maynard (Sir John), b. at Tavistock, England, in 1602; was educated at Oxford; studied law at the Middle Temple; was elected to Parliament in 1625; called to the bar 1626; was distinguished in the Long Parliament as one of the prosecutors of Strafford and Laud, and afterwards as an opponent of the encroachments of the army and of the assumption of supreme power by Cromwell, for which conduct he was twice sent to the Tower; became serjeant-at-law 1654, serjeant to the Commonwealth 1658; made king's serjeant and knighted 1660, refusing to accept a judgeship; took an active part in the "Convention Parliament" (1689) in obtaining the formal acceptance of the resignation of James II., and in the same year was made first commissioner of the great seal. When waiting upon William III., that prince, struck with his great age (eighty-seven years), observed that he must have outlived all the lawyers of his time, upon which Maynard replied that "he had like to have outlived the law itself if His Highness had not come over." Serjeant Maynard was a firm friend of liberty and of Presbyterianism, and is ranked by Sir James Mackintosh with Lord Somers as one of the greatest constitutional lawyers of England. Some of his *Reports* were printed, as well as a number of speeches and political tracts. D. at Gunnersbury, near Ealing, Oct. 9, 1690.

May'nardville, cap. of Union co., Tenn. (see map of Tennessee, ref. 6–I, for location of county), is situated 20 miles north of Knoxville. Pop. in 1870, 155; in 1880, 178.

Mayne (Jasper), b. at Hatherlagh, Devonshire, England, in 1604; studied theology at Oxford; was elected vicar of Cassington and Pyrton; lost his benefices during the Revolution, but received them back after the Restoration; was appointed archdeacon of Chichester and chaplain to the king, and d. at Oxford Dec. 6, 1672. Besides translations from Lucian and others, he wrote *The City Match*, a comedy (1639), and *The Amorous War*, a tragi-comedy (1648).

Mayne (John), b. at Dumfries, Scotland, in 1761; was apprenticed in a printing-office; worked for some time on the Dumfries *Journal;* settled in London; became proprietor of the *Star*, and d. there in 1836. The first outline of his well-known poem, *The Siller Gun*, was published in 1777, and consisted of twelve stanzas printed on a quarto page. In 1780 the poem was published in *Ruddiman's Magazine*, embracing three cantos; in the final edition of 1836 it contains five cantos. Among his other poems are the ballad of *Logan Braes, Halloween, Helen of Kirkonnel*, etc.

May'nooth, a v. of Ireland, in the county of Kildare, has a celebrated Roman Catholic college or ecclesiastical seminary, with endowments for 500 students destined to become priests in Ireland. It was founded in 1795. Several attempts have been made to repeal the act of endowment, though it is the only state endowment for religious purposes which the Roman Catholic population ever received in Ireland. The last attempt was made in 1858, but was defeated by a majority of fifty-five votes.

May'o, county of Ireland, in the province of Connaught, comprising an area of 2131 square miles, and bounded N. and W. by the Atlantic. It consists of a large and fertile plain enclosed by two ranges of mountains, whose highest peaks, Muilrea and Nephin, reach 2680 feet. As the climate is moist and windy, the soil is better adapted for pasturage than for tillage; many cattle and sheep of a good breed are reared. Next to agriculture, fishing is the chief branch of industry. Excellent marble is quarried. Pop. in 1881, 245,212, of whom 119,421 were males and 125,791 females. The number of emigrants from 1851 to 1881 was 85,431; the number of emigrants in 1881 was 4469. Chief towns, Castlebar, Ballina, Ballinrobe, Bellmullet, Claremorris, Swineford, and Westport.

Mayo (Amory Dwight), b. in Warwick, Franklin co., Mass., Jan. 31, 1823; educated at Deerfield Academy and Amherst College; studied for the ministry with Rev. Hosea Ballou, president of Tufts College (Universalist); from 1846–54 was pastor of the Independent Christian society in Gloucester, Mass.; from Oct., 1854, to Jan., 1856, preached in Cleveland, O.; from Jan., 1856, to Jan., 1863, was minister to the Division street church at Albany, N. Y.; from Jan., 1863, till July, 1872, was settled in Cincinnati, O., at the Church of the Redeemer (Unitarian); since Nov., 1872, has been pastor of the Church of the Unity in Springfield, Mass. Mr. Mayo has always been engaged in public-school work; was an active member of the board of education at Cincinnati, as he is now in Springfield, and has written many tracts and addresses on that and related subjects; has been a strong advocate of the importance of the Bible as an element of moral instruction in the schools, and took decided ground in favor of the "Christian amendment" to the U. S. Constitution. For several years he has been professor of ecclesiastical polity in Meadville Theological School, where he annually delivers a course of lectures. His published volumes are *The Balance; Memoirs of Mrs. S. C. E. Mayo*, his wife, who was also an authoress; *Graces and Powers of the Christian Life;* and *Symbols of the Capitol*, a volume of discourses on the elements of Christian civilization. Mr. Mayo received the title of A. M. from Amherst College. O. B. Frothingham.

Mayo (Herbert), professor of anatomy and physiology at King's College, London; was a fellow of the Royal Society, and d. at Bad-Weilbach, near Mentz, Aug. 15, 1852. His principal works are *Outlines of Human Physiology* (1827), *Outlines of Human Pathology* (1836), *The Nervous System and its Functions* (1842), etc.

Mayo (Richard Southwell **Bourke**), Earl of, b. at Dublin, Ireland, Feb. 8, 1822, was the eldest son of the fifth earl, and was known during his father's life by the courtesy title of Lord Naas. He was educated at Trinity College, Dublin; published a narrative of travels in Russia under the title *St. Petersburg and Moscow* (1845); was elected member of Parliament for the county of Kildare 1847, and for Coleraine 1852; was chief secretary for Ireland in Earl Derby's three administrations (1852, 1858–59, and 1866–68), and was a member of the cabinet during the third period; succeeded to the earldom Aug. 12, 1867; was appointed viceroy of India in 1868; arrived at Calcutta Jan., 1869, and became noted for executive ability and the reform of abuses. While on a tour of inspection through India he was stabbed in the back by a Mohammedan (Wahabee) convict in the penal settlement of Fort Blair, Andaman Islands, killing him instantly, Feb. 8, 1872.

Mayo (William Starbuck), M. D., b. at Ogdensburg, N. Y., Apr. 20, 1812; studied at Potsdam Academy; graduated in medicine at the New York College of Physicians and Surgeons 1833; practised his profession for several years; visited Spain for his health; passed over to Morocco with the design of penetrating into the interior of Africa, but found his project impracticable. Several years after his return to the U. S., Dr. Mayo published *Kaloolah, or Journeyings to the Djebel Kumri* (1849), in which he utilized his knowledge of Northern Africa in presenting the adventures of his fictitious hero, Jonathan Romer, who was supposed to meet with a series of very extraordinary adventures, culminating in marriage to a black princess. A portion of the work contains a satirical view of some of the customs of civilization. He has since published *The Berber, or the Mountaineer of the Atlas* (1850), *Romance-Dust from the Historic Placer* (1851), and after a silence of more than twenty years issued in 1873 *Never Again*, a romance which has elicited high praise from the English critical journals.

May'or (John Eyton Bickersteth), b. at Baddagamme, Ceylon, Jan. 25, 1825; educated at Shrewsbury School and St. John's College, Cambridge, of which he became a fellow 1849; was assistant master at Marlborough College 1849–53; college lecturer 1853; took orders in the Church of England 1855; was librarian of the University of Cambridge 1863–67, and was appointed professor of Latin in that university 1872. Prof. Mayor has edited the *Satires of Juvenal* (1853), Cicero's *Second Philippic* (1861), Homer's *Odyssey*, books ix.–xii. (1872), *Quintilian*, book x. (1872), and numerous Early English historical, biographical, and antiquarian publications, and has published several textbooks of Latin grammar. He was one of the editors of the *Journal of Classical and Sacred Philology* and of the *Journal of Philology*.

Mayor'ga, de (Martin), forty-seventh viceroy (1779–83) of Mexico or New Spain. At the time of his arrival in Mexico the smallpox was an epidemic, from which as many as 8000 persons died in a few days, infesting the streets of the capital with corpses. He had all the people inoculated, a precaution the value of which had only become very recently known in Europe. Mayorga was an able, energetic executive of the better class of viceroys, whose usefulness, however, was much obstructed and impaired by the intrigues of enemies. He founded an academy of the arts in Mexico, and during his viceroyalty gold and silver to the value of $74,866,054 were coined. He died on the voyage back to Spain from the effects of poison. Thos. Jordan.

May'ow (John), M. D., LL.D., b. in Cornwall, England, in 1645; was educated at Wadham and All Souls' Colleges, Oxford; took degrees in both law and medicine; became a distinguished physician at Bath; wrote several learned medical works, published together in his *Opera Omnia Medica Physica* (Leyden, 1681), and propounded in his chapter on chemical affinities doctrines so far in advance of the science of that day that Dr. Beddow republished a great part in 1790 under the title *Chemical Experiments and Opinions extracted from a Work published in the Last Century*. It was claimed that the chief discoveries of Priestley and Scheele were known to Mayow a century earlier. D. in London Sept., 1679.

May's Landing, R. R. junction, cap. of Atlantic co., N. J. (see map of New Jersey, ref. 7–C, for location of county), in Hamilton tp., on Great Egg Harbor River, 48 miles by rail S. S. E. of Philadelphia. Pop. in 1880, 744.

Maysville, city, cap. of Mason co., Ky. (see map of Kentucky, ref. 2–I, for location of county), on R. R. and the Ohio River, has several academies, factories, and a large hemp-trade. Pop. in 1870, 4705; in 1880, 5220.

Maysville, cap. of De Kalb co., Mo. (see map of Missouri, ref. 2–D, for location of county), 30 miles E. N. E. of St. Joseph. Pop. in 1880, 418.

Mayville, Dak. See Appendix.

Mayville, cap. of Chautauqua co., N. Y. (see map of New York, ref. 6–B, for location of county), on R. R., at the head of Chautauqua Lake, contains a fine school. Pop. in 1870, 701; in 1880, 362.

Maywood, on R. R., Cook co., Ill. (see map of Illinois, ref. 2–C, for location of county). Pop. in 1880, 716.

Mazamet', town of France, in the department of Tarn, on the Arnette, has extensive wool-spinning factories and manufactures of cloth. At the beginning of the present century Mazamet was only an insignificant village, but the introduction of the manufacture of a peculiar kind of woollen fabric brought immediate and great prosperity to the place. The factories, which are driven by water-power, have 45,000 spindles and annually produce goods to the value of about 18,000,000 francs. Pop. in 1881, 14,429.

Mazanderan', province of Persia, bounded N. by the Caspian Sea, W. by Ghilan, and S. by Irak-Ajemi, from which it is separated by the Elbrooz Mountains. The ground is low along the shore of the sea, but farther inland it rises, covered with spurs of the Elbrooz. The soil is fertile; rice, cotton, mulberry trees, sugar-cane, and fine fruits are grown. The climate is cooler and more equable than that of the rest of Persia. Firdousi called Mazanderan the "land of roses," and Shah Abbas the Great often resided here. The province abounds in iron ores, and in mineral pitch in every state of transition from pure petroleum to the finest naphtha. The numerous rivers which from the Elbrooz Mountains flow to the Caspian Sea are well stocked with trout, mullet, carp, and sturgeon, which supply large quantities of caviare to the Russian market. The domestic animals are noted for their small size, and include among the most important the black humped cattle similar to the Indian variety, also horses, sheep, and goats. Area estimated at 10,000 square miles; pop. at 200,000. Cap. Sari. Bárfarósh, Mashhad-i-Sar, Ashraf, and Farah-ábád are also important towns.

Mazarin′ (Jules), [It. Giulio Mazarini], b. July 14, 1602, but his birthplace, whether Rome or Piscina in the Abruzzi, as well as the condition of his family, are uncertain, some saying that his father was a Sicilian nobleman of good standing, others that he was a merchant of Jewish descent and in humble circumstances. Young Mazarin was educated in the schools of the Jesuits at Rome, but refused to enter their order; studied law at Alcalá and Salamanca, where he led a very gay life; entered the military service of the pope, and was employed in some political missions in which he evinced great diplomatic skill; was introduced in 1628 to Richelieu, who entertained so high an opinion of his abilities that he had him appointed vice-legate of Avignon in 1634, made a cardinal in 1641, though he had never taken holy orders, naturalized as French citizen in 1639, and appointed his successor as minister; and after the death of Richelieu (Dec. 4, 1642) Mazarin governed France for eighteen years with absolute power, though not without some violent interruptions. He was as crafty a diplomate as Richelieu, but he was far inferior to him as an administrator, and having no other ideas than those inherited from Richelieu, and no other aims than those dictated by his own vanity and rapacity, his subtlest intrigues sometimes turned out gross blunders. The aversion of Anne of Austria—who, after the death of Louis XIII., May 14, 1643, became regent during the minority of her son, Louis XIV.—he conquered by his bland manners and elegant flattery; she became his firm friend, and the contemporary gossip was that they were secretly married. But the rich dotations he made in order to gain the goodwill of the princes, the prodigality of the court, and his own lack of thorough capacity as a financier exhausted the treasury. The Parliament of Paris refused to register the new tax-edicts. He answered by throwing its president and several of its members into prison. The next day (Aug. 27, 1648) Paris rose in rebellion, and the wars of the Fronde (which see) began. A peculiar feature of this whole movement were the so-called *Mazarinades*—pamphlets, about 4000 in number, published against the cardinal, and speaking in a very unrestrained manner of his life at Alcalá, his relation to Dame Anne, his foreign birth, his rapacity, and his nieces. He was intensely hated, and the hatred was not tempered with awe. Twice between 1651 and 1653 he had to resign his office and retire from the court—the first time to Brühl, near Cologne, the second time to Sedan, where Turenne and his army were. He was arraigned as a traitor and enemy of France; his property was confiscated; his library, furniture, and statues were sold. But after the end of the wars of the Fronde and the flight of the prince of Condé to Spain, Mazarin re-entered Paris (Feb. 3, 1653) in triumph, and was received not only by the king and the court, but even by the people, with great ovations. The subsequent years of his government were more quiet. He could now prosecute the war against Spain, commenced in 1635, with undisturbed vigor, and by the Peace of Westphalia (Oct. 24, 1648) and of the Pyrenees (Nov. 7, 1659) he succeeded in curbing both branches of the house of Hapsburg, and procured for France the foremost place in the political system of Europe. Another idea of Richelieu's, the establishment of the absolute authority of the crown in France, he carried out with considerable success, but the interior administration, the finances, commerce, industry, agriculture, etc., were in confusion and decadence when he d. at Vincennes Mar. 9, 1661. He left an enormous fortune, 200,000,000 livres, which he presented to the king a few days before his death, probably because he considered this manœuvre the only means of securing it for his family; the king returned it graciously, and his nieces inherited it. (See the two works on the subject by Cheruel, Paris, 1879–82.) Clemens Petersen.

Mazarre′do y Salazar (José Maria), Admiral, b. at Bilbao, Spain, in 1744; entered the navy 1760; participated in the campaign against Algiers 1775; was instrumental in saving the remnant of the army from destruction; negotiated peace with the regency; was appointed major-general of naval forces; took part in the naval operations against the English 1780–83; made lieutenant-general 1789; appointed commander-in-chief of the Spanish navy, which he reorganized, 1793; defended Cadiz against the English July, 1797; was ambassador to Paris 1799, and again 1804; was a partisan of Joseph Bonaparte, by whom he was made counsellor of state and minister of marine, which offices he held until his death at Madrid in 1812. He was considered one of the most scientific seamen whom Spain has produced; published *Rudimentos de Tactica Naval* (1785), and built the naval observatory at Cadiz.

Mazatlan′, a port of Mexico, state of Sinaloa, at the entrance of the Gulf of California. Its harbor is not safe against the south-western wind; its climate is extremely hot, and its drinking-water poor; but the town is important for the exports from the mining districts, much silver and copper being shipped thence. In the year 1872–73 the value of exports amounted to $2,797,385, of which $2,435,450 was gold and silver bullion; and that of imports to $1,276,000, and in 1878 the value of its exports had increased to $3,000,000, while that of its imports had risen to $2,500,000. Its population, which, however, contains a large element of rather a floating description—miners, smugglers, and adventurers of every sort—is estimated at about 13,000.

Mazdak, a Persian religious enthusiast and founder of a sect, b. at Persepolis about A. D. 470; became *mobed* or chief priest at Nishapur, and on the occasion of a pestilence and famine in 500 presented himself to King Kobad as a prophet sent for the regeneration of mankind. His system was based upon the dualism of Manes, and his practical teaching was a form of communism. He succeeded in converting the king, and his projects became law, causing great commotions. Under Khosru Nushirvan, Mazdak was put to death at Nahrvan between 530 and 540, with thousands of his followers, but his ideas took deep root after the rise of Islam in the following century.

Mazeppa (John), b. in 1645, descended from a noble family in Podolia; was educated as a page at the court of John Casimir of Poland. Surprised in an adventure with a Polish lady, her husband stripped him naked, bound him stretched along the back of his half-wild horse, and put the frightened animal to flight. It carried its owner to his own estate, but Mazeppa fled for shame into the Ukraine, and joined the Cossacks. He soon made himself very popular among them, and became secretary to their hetman, Samvilowich, whom he overthrew in 1689, becoming hetman himself. In this position he soon gained the confidence of Peter the Great, who made him prince of the Ukraine. After the Peace of Altranstadt (Sept. 24, 1706) he opened negotiations with Charles XII. for the purpose of throwing off the Russian authority. Peter the Great was informed of this treachery, but did not believe it; he sent the informers to Mazeppa, and Mazeppa had them put to death. The czar afterwards obtained indubitable proofs, and Mazeppa was now compelled to join Charles XII. openly. He took part in the battle of Pultowa, June 27, 1709, and fled to Bender, where he d. 1710.

Mazeres′, more correctly **Maseres** (Francis), M. A., b. in London Dec. 15, 1731, of a French family who settled in England on the Revocation of the Edict of Nantes; educated at Kingston and at Cambridge, where he was made B. A. 1752 and M. A. 1755; published *A Dissertation on the Negative Signs in Algebra* (1758), denying the propriety of such expressions as negative roots, etc.; called to the bar, and appointed attorney-general of Quebec; returning to England, was made cursitor baron of the exchequer Aug., 1773, also agent to the Protestant settlers of Quebec. His friendship for America led him to urge conciliatory measures towards the colonies, and his deep interest in the laboring classes resulted in the publication of his *Principles of the Doctrine of Life Annuities* (1783). Besides many mathematical works, he edited or wrote *An Account of the Proceedings of the British and other Protestant Inhabitants of Quebec* (1775), *The Canadian Freeholder* (1779, 3 vols.), *Enquiry into the Extent and Power of Juries* (1792), *Essays on Various Subjects, chiefly Historical and Political* (1809), *The Curse of Popery and Popish Pains* (1807), and *Select Tracts relating to the Civil Wars in England* (2 vols., 1815). D. at Reigate May 19, 1824.

Mazur′ka [Polish], a dance in $\frac{3}{4}$ or $\frac{3}{8}$ time, having a peculiar and pleasant rhythm. From four to eight couples join in the mazurka, which is lively and sometimes rather grotesque. It was originally a Polish dance, but was by the music of Chopin spread over the whole of Europe. Thereby, however, it lost its martial and elegant character, and was transformed into a peculiar kind of waltz.

Mazza′ra del Vallo, town of Sicily, in the province of Trapani. It is a walled town, lying on the sea-shore, with a good harbor overlooked by a castle, but the roadstead is unsafe. The streets are narrow and crooked, and there is but a single square—that on which stands the cathedral containing interesting old inscriptions. The first landing of the Arabs on the island was made here in 827. About 600 vessels of different sizes enter this port annually. Pop. 13,505.

Mazzari′no, town of Sicily, in the province of Caltanissetta, situated on the river Terranuova. It contains large churches, a theatre, and some fine private edifices, among them the palace of the Branciforte, princes of Buteria. Not far from the town stands the castle of Grassuliato on a rocky hill surrounded by crenellated walls, with vast cisterns and a subterranean passage connected with the valley below. Pop. 11,951.

Mazzei (Philip), M. D., b. in Tuscany in 1730; resided for some years as a physician at Smyrna; was engaged in mercantile business in London from 1755 till 1773, when he came to Virginia with a number of Italians for the purpose of introducing the cultivation of the olive and other European fruits; became an intimate friend and correspondent of Jefferson; went to Europe in 1783 on a secret mission from the State of Virginia; published at Paris in 1788 *Récherches Historiques et Politiques sur les Etats-Unis de l'Amérique Septentrionale* (4 vols.); was subsequently in the service of the kings of Poland and Russia, and d. at Pisa, Italy, Mar. 19, 1816.

Mazzi'ni (Giuseppe), the son of a physician, b. at Genoa on the 28th—or, according to some of his biographers, on the 22d—of June, 1805. His first master was Giuseppe Patroni, a colonel of artillery and a cousin of his mother. This man had the insight to divine the future greatness of his pupil, and when Mazzini was scarcely seven years old Patroni wrote from Pavia to the boy's mother, "This dear child is a rising star of the first magnitude, beaming with native light, and one day to be proclaimed as such by cultivated Europe. For this reason we ought all to regard him as our own, and to interest ourselves, at the same time, in everything that may concur to turn to the best account the extraordinary gifts which prodigal nature has lavished upon him. The highest geniuses who, appearing at wide intervals, have done honor to their century, have generally manifested at an early age those special intellectual qualities that distinguish your son. An astonishingly tenacious memory, unbounded talent, and an extraordinary aptitude for study are his most decided characteristics. Having an innate and insatiable desire for knowledge, he will pass easily from one occupation to another without risk of confounding previously received ideas, without physical weariness, and without any overtasking of his mental powers." The Piedmontese revolution of 1821, and the sight of his banished fellow-citizens embarking from Genoa for the land of exile, made the deepest impression upon Mazzini, then a boy of sixteen; and from that time he devoted himself wholly to the liberation of his country. Ugo Foscolo's *Ultime Lettere di Jacopo Ortis* inflamed his imagination still further. He studied at the university, became acquainted with the brothers Ruffini, and confided to them his bold designs. Giovanni Ruffini—afterwards distinguished in England as a romance-writer, and the author of *Doctor Antonio* and of *Benoni*—describes the young conspirator, Mazzini, in his *Memorie d'un Cospiratore* under the name of Fantasio, representing him as something very like a utopist. At the age of twenty-one—that is, in the year 1826—Mazzini began to be known as an author, and he then commenced his political warfare with his pen. Mazzini's first essay treated of Dante's love of country, but he was only able to publish it about the year 1831 in a Genoese journal entitled *Il Subalpino*. Mazzini felt that in order to have a free country it was necessary first to liberate the literature from arcadian and academic shackles, and make it a political instrument. Mazzini began his politico-literary conflicts in the journal *L'Indicatore Genovese*, where appeared his articles upon Manzoni, Botta, Guerrazzi, Monti, and Schlegel in the year 1828. These writings form a part of the Mazzinian collection published at Milan in 1847 under the title of *Scritti d'un Italiano vivente*, and which were reproduced in the edition of the complete works of Mazzini commenced by Daelli in Milan, and continued by Robecchi. Mazzini at an early age took part with the Carbonarists, and in consequence he was arrested in Genoa in 1830, and imprisoned at Savona. While there he became convinced that Carbonarism was no longer suited to the times, and he conceived while in prison the idea of *La Giovine Italia*. Acquitted by the tribunal, he retired to Marseilles, and was afterwards condemned *par contumace* to the gallows for conspiracy by Charles Albert. At Marseilles he united with Garibaldi in planning the insurrection of Genoa. When this plot failed, Mazzini withdrew to Switzerland, and there formed a conspiracy to invade Savoy: this was the unfortunate expedition of 1834. After its failure he did not give himself up for vanquished, but continued his machinations, proceeding first to Paris, and afterwards to London, where in 1839 he established a revolutionary committee. From London, which then became his head-quarters, he instigated various attempts at revolution in Italy—attempts that cost the lives of many noble victims, among others, of the brothers Bandiera, betrayed by the British post-office in 1844, but which were not without fruit for the future. The moderate Guelph school turned to its own advantage the agitation created in Italy by Mazzini and his followers, and thus it may be said that the Italian revolutionary movements of 1848 were in great part the work of this active conspirator. In the spring of 1848, Mazzini established and edited in Milan *L'Italia del Popolo*, in which he manifested a strong opposition to King Charles Albert and the moderate monarchical party. The Guerrazzian triumvirate being formed in Tuscany, and Mazzini chosen member of the Tuscan assembly, he hoped to secure the proclamation of a republic. Not succeeding in this, he withdrew to Rome, where the republic was proclaimed, and he himself became the first of the triumvirs. After the fall of Rome he first took refuge in Switzerland, then once more returned to London. There he incited the Italians to fresh insurrectionary movements, which proved unfortunate, disastrous, and fruitless—that of Mantua in 1852, that of Milan in 1853, and that of Genoa in 1859. He co-operated in the expedition of Carlo Pisacane in Southern Italy, which also was unfortunate in its termination, but which served in some degree as pioneer of the glorious and fortunate expedition of Gen. Garibaldi in Sicily (see Garibaldi), made with the consent and encouragement of Count Cavour. In the events which transpired in Italy in 1859 and 1860, Mazzini took no part; he was a mere spectator. What he desired above all things was the expulsion of the foreigner and the unity of Italy. These two objects were being accomplished; he did not applaud nor did he interfere. He was willing to see the kingdom of Italy put to the proof. When it seemed to him that the Italian monarchy had failed to satisfy the requirements of the people, he recommenced his conspiracies with a purely republican aim. But in this last period of his revolutionary labors his desire to separate republicanism from socialism and atheism is most noteworthy. He was neither Catholic nor Christian, but he had taken for the motto of his banner "God and the People!" and in the last years of his life he struggled energetically against everything which implied the negation of a God. For this reason, before his death he emphatically condemned the Commune of Paris and the objects and the acts of the Internationals. With the same zeal Mazzini opposed the ultra doctrines of the pontifical syllabus. Some of the last months of his life Mazzini passed at Lugano, being already seriously ill, and finally, in search of a milder climate, he went to Pisa under an assumed name—a precaution altogether unnecessary, as from 1866 full liberty had been allowed him to return to Italy. Here he d. on Mar. 10, 1872. His obsequies were celebrated with great solemnity, both at Pisa and at Genoa, on Mar. 17, and it is said that the bier was followed to the cemetery of Staglieno by ten thousand persons. Mazzini often wrote in English and in French, and his works in both these, as well as in his native language, are remarkable for ability, for purity and vigor of style, and for an elevation of sentiment which, in spite of great political indiscretions, distinguished him through life. Of his collected works there are two editions, *Life and Writings of Joseph Mazzini* (6 vols., 1864–70), not complete, and *Scritti editi e inediti di Giuseppe Mazzini*, begun by himself and continued by Satti (10 vols., 1861–80). His two principal works (*Thoughts on Democracy in Europe* and *On the Duties of Man*) are in *Joseph Mazzini*, a memoir (1875). Angelo de Gubernatis.

Mead [Gr. μέθυ, "wine"], an alcoholic drink made by fermenting a mixture of honey and water or the washings of honeycomb. It is sometimes flavored with aromatic substances. It is the same as hydromel and metheglin. It was a favorite drink among the Norse peoples of antiquity, and was not unknown in ancient Greece and Rome. It is very heady and intoxicating. According to Brande, it contains but 7.32 per cent. of alcohol, but the percentage is of course variable.

Mead (Charles Marsh), b. at Cornwall, Vt., Jan. 28, 1836; graduated at Middlebury College 1856, and at Andover Theological Seminary 1862; studied at German universities 1863–66; became professor of Hebrew at Andover 1866; has written several essays in periodicals, theological and literary; delivered two of the lectures in the Boston course on *Christianity and Skepticism* 1870–71, and prepared an edition of Lange's *Exodus*.

Mead (Larkin Goldsmith), b. at Chesterfield, N. H., Jan. 3, 1835; removed in childhood with his parents to Brattleboro', Vt., where he was educated, and first made known his artistic genius by modelling in snow a colossal figure of an angel, which excited great admiration and was mentioned in the newspapers. The story having met the eye of Mr. Nicholas Longworth of Cincinnati, he wrote to Brattleboro', offering young Mead inducements to pursue the study of sculpture. He accordingly became a pupil of Henry Kirke Brown at Brooklyn, N. Y., for three years, after which he produced in marble his *Recording Angel* (1855), executed the colossal statue of *Vermont*, now placed over the dome of the State-house at Montpelier (1857), and a statue of Ethan Allen (1861), which stands in the portico of the same building. In the same year he sent to a New

York paper from the encampment of the Army of the Potomac some graphic sketches of battle-scenes. In 1862 he went to Florence, where he was welcomed by Hiram Powers, and produced several fine statuettes. He returned to the U. S. some years later, bringing his celebrated *Returned Soldier*, *La Contadinella*, *The Thought of Freedom*, and *Echo*, as well as a model for a monument to Lincoln, which was ordered for his tomb at Springfield, Ill., and inaugurated there Oct. 15, 1874. He has since executed several admired works.

Mead (Matthew), an English theologian who played quite a conspicuous part in the history of the English Church in the seventeenth century, was born in 1629 and educated at Cambridge University. He was rapidly promoted, but the two benefices he held he lost in 1662 as nonconformist. He soon after left the country, and for some time resided in Holland. Having returned to England in 1674, he was elected pastor of the dissident congregation of Stepney, near London, where he died Oct. 16, 1699. He seems to have been implicated in the Rye-House conspiracy, and was for some time imprisoned, but was set free by the king. He wrote *Almost a Christian*, etc.

Mead (Richard), M. D., F. R. S., b. at Stepney, near London, Aug. 11, 1673; educated under Grævius at Utrecht; studied medicine at Leyden and at Padua; settled at Stepney 1696; became physician to St. Thomas's Hospital 1703, anatomical lecturer at Surgeons' Hall 1711; attended Queen Anne in her last illness; removed to London 1714; was admitted fellow of the College of Physicians 1716; was consulted by the government in 1719 as to the means of preventing the spread of the plague to England; wrote a treatise on the subject which ran through seven editions in that year, and was charged in 1721 with conducting experiments as to the effects of inoculation upon criminals condemned to death, which resulted so favorably that the princesses Amelia and Caroline were soon afterwards inoculated. In 1727, Dr. Mead became physician-in-ordinary to George II. The extraordinary reputation which Dr. Mead enjoyed for half a century as the highest English medical authority dated from his work, *A Mechanical Account of Poisons* (1703), and was strengthened by his intimacy with Boerhaave. He attained a practice which produced over £5000 per annum; was intimate with the great authors of the day, a liberal patron of letters, and collected a library, a gallery of pictures, and a museum of antiquities which were renowned through Europe. Several of his medical works were written in elegant Latin; of these the most known was *Medicina Sacra* (1749), a treatise on the principal diseases mentioned in the Bible, notable for taking the position (then a novel one) that the demoniacal possessions of the Gospels are to be considered cases of lunacy and epilepsy. D. at London Feb. 16, 1754. His *Medical Works*, which had appeared in Latin, French, and Italian, were published in English in 1762. His *Life* was written by Maty (*Authentic Memoir of the Life of Richard Mead*) and appeared in London in 1755.

Meade (Gen. George Gordon), b. in Cadiz, Spain, Dec. 30, 1815, his father being at the time U. S. navy-agent at that port. After receiving a careful education he entered the U. S. Military Academy at West Point in 1831, from which he was graduated June 30, 1835, and appointed in the army a brevet second lieutenant of artillery, receiving his full rank the same year. Remaining in the army but little more than a year, during which time he was engaged in Florida against the hostile Seminoles, he resigned Oct., 1836, and entered upon the profession of civil engineer, which he followed for about six years, being employed by the government to assist in an elaborate survey of the mouths of the Mississippi River, where he made some original experiments which elicited facts leading to important consequences in the improvement of that river. He was next engaged in the survey of the boundary-line of Texas, and subsequently in the survey of the N. E. boundary-line between the U. S. and Great Britain, where we find him in 1842, in which year he was reappointed in the army a second lieutenant of topographical engineers, and retained for some time upon the same duty; then in river and harbor improvements. In the Mexican war he served with distinction on the staffs of Gen. Taylor and of Gen. Scott in the battles of Palo Alto, Resaca de la Palma, and Monterey, winning the brevet of first lieutenant for the latter battle. In 1851 he was promoted to be first lieutenant in his corps, captain in 1856, and major in 1862. After the close of the Mexican war he was engaged upon lighthouse construction, and during the four years preceding the civil war had charge of the geodetic survey of the great lakes, in which he added largely to his scientific and engineering reputation. In Aug., 1861, he was appointed a brigadier-general of volunteers, and placed in command of the second brigade of the Pennsylvania Reserve Corps, which constituted a division in the Army of the Potomac, with which army he remained prominently identified until the close of the war, and a full history of his conspicuous services would be to repeat the history of that army. In the Virginia Peninsular campaign of 1862 he took an active part in the battles of Mechanicsville, Gaines's Mill, and Glendale, being severely wounded in the latter. Returning to the field as soon as his wound would permit, he was assigned to the command of a division, and distinguished himself in the battles of South Mountain and Antietam, being placed in command of the 1st corps when Gen. Hooker was wounded at the last-named battle, where he was later himself slightly wounded. For these services he was promoted to be major-general of volunteers in Nov., 1862. Upon the recovery of Gen. Hooker he returned to the command of his division, and in Dec., 1862, at Fredericksburg, he led the attack which broke through the right of Lee's line and penetrated far to the rear, but being at length outnumbered, was driven back with heavy loss. In the latter part of this month he was promoted to the command of the 5th corps, and at Chancellorsville (May, 1863) his sagacious advice and soldierly bearing so impressed Gen. Hooker that upon requesting to be relieved, two months later, he designated Gen. Meade as his successor, and on June 28, 1863, he was appointed by Pres. Lincoln to command in chief the Army of the Potomac, then scattered and moving hastily through Pennsylvania to the great battlefield of Gettysburg, at which he commanded, and on the 1st, 2d, and 3d days of July won a victory with whose glory and decisive results his name will for ever be identified. From that time he commanded the Army of the Potomac until the close of the war. For his skill and valor at Gettysburg he received the thanks of Congress, and was promoted in the regular army to the rank of brigadier-general. The operations of the army during the winter of 1863–64 were unimportant, and before the return of the season for active operations Gen. Grant had been placed in command of all the armies with the rank of lieutenant-general, and had taken up his head-quarters with the Army of the Potomac. During the extraordinary campaign which opened in May, 1864, with the battle of the Wilderness, and only terminated with the surrender of the army of Northern Virginia, Meade's ability as a commander was conspicuous; and though his position was a delicate one, by reason of the presence of his superior in command, he discharged his duties in such a manner as to command the respect and esteem of the lieutenant-general, and his services were recognized by his promotion to the rank of major-general in the regular army in Aug., 1864. After the close of hostilities Meade was (July 1, 1865) assigned to the command of the military division of the Atlantic, with his head-quarters at Philadelphia; which post he held, with one short period of detached service in Georgia, till his death, which occurred at Philadelphia Nov. 6, 1872. G. C. Simmons.

Meade (Col. Richard Kidder), b. in Nansemond co., Va., in 1750; was educated at Harrow School, England; entered the Revolutionary army in 1775; took part in the battle of Great Bridge, near Norfolk (Dec., 1775), the first fought in that State; became aide-de-camp to Washington (1777–83), whom he attended in the principal battles of the war; attained the rank of colonel, and superintended the execution of Major André. He became a farmer in Frederick (now Clarke) co., Va., where he d. Feb., 1805.

Meade (Richard Kidder), son of Col. R. K. Meade and brother of Bishop Meade, b. in Frederick co., Va., about 1795; was liberally educated; became a lawyer and a prominent Democratic politician; was a member of Congress from 1847 to 1853, chargé d'affaires to Sardinia 1853–57, and minister to Brazil 1857–61. He returned to Virginia in 1861, supported the Confederate movement, and d. in Apr., 1862.

Meade (Richard Worsam), b. in Chester co., Pa., June 23, 1778; was son of George Meade, a wealthy merchant of Philadelphia, distinguished for his patriotism, who on one occasion subscribed £5000 in gold for the support of the government during the war of the Revolution. He settled at Cadiz, Spain, as a shipping merchant in 1803; rendered good service to the cause of Spanish independence during the war with the French by importing from the U. S. immense supplies of flour into Cadiz when besieged, and was from 1805 to 1816 naval agent of the U. S. On May 2, 1816, he was imprisoned in the castle of Santa Catalina on account of charges emanating from hostile individuals in the council of war, but was released in 1818 upon the demand of the U. S. government. The ruin of Meade's business gave rise to a claim against the Spanish government, which was fruitlessly prosecuted for many years by the aid of counsel which included Clay, Webster, and Choate. Mr. Meade was said to be the first importer of sherry wine and of merino sheep into the U. S., and formed a gallery of paintings and statuary unrivalled by any private collection in the country. D. at Washington, D. C., in 1828.

Meade (R. W.), U. S. N., b. Oct. 9, 1837, in New York; entered the navy as a midshipman Oct. 2, 1850; became a passed midshipman in 1856, a lieutenant in 1858, a lieutenant-commander in 1862, a commander in 1868, captain Mar. 13, 1880; was very actively employed during the civil war on the Mississippi River and in the S. Atlantic and W. Gulf blockading squadrons, and highly commended in official despatches for "skill and gallantry."
FOXHALL A. PARKER.

Meade (RICHARD W.), COM., U. S. N., b. in Cadiz in 1807, a brother of George Gordon; entered the navy in 1826, and successively rose to be commander at the commencement of the civil war; in 1864 took command of the steam sloop-of-war San Jacinto, on the loss of which he was retired with the rank of captain. D. Apr. 16, 1870.

Meade (WILLIAM), D. D., b. in Frederick (now Clarke) co., Va., Nov. 11, 1789, and graduated at New Jersey College 1808. As at that time there were no theological seminaries in the country, he was prepared for the ministry under Rev. Walter Addison of Maryland, and by Bishop Madison he was ordained in the Protestant Episcopal Church in 1811; for many years he preached gratuitously near his home, besides contributing freely to educational and missionary work. His first charge was Christ church, Alexandria, where his preaching attracted so much attention that even members of Congress were drawn from Washington to attend services at his church. He became in 1829 assistant bishop and in 1841 bishop of Virginia; was a recognized Low-Church leader; opposed earnestly the secession of 1861; was author of valuable devotional works, and of *Old Churches, Ministers, and Families in Virginia* (2 vols., 1856). He contributed very much to revive the Episcopal Church in Virginia, and in 1823 founded the Protestant Episcopal Theological Seminary of Virginia, a flourishing institution, which has sent out more than 750 ministers. D. at Richmond, Va., Mar. 14, 1862.

Mea'dow [Ang.-Sax. *mæd, mädu*], the general name for any tract of grassland in which the natural herbage is permanent and frequently made into hay, but more especially applied to the low grounds on the banks of rivers, which are kept moist by their situation and occasionally flooded by the rise of the waters. In the low, wet meadows the herbage is coarser and less nutritious than in those which lie higher and to which the floods never rise. For this reason upland meadows are very valuable wherever there is a demand for good hay, but as they are not recruited by annual flooding, some pains must be taken to keep up their natural fertility. The best means of preventing them from degenerating is, of course, a frequent application of rich animal and vegetable manure, spread over the surface either early in spring or immediately after midsummer, when showers are abundant and able to wash the nutriment down to the roots of the grass. Whether the hay is taken off by mowing or by the grazing of cattle, the effect is nearly the same with respect to the formation of a closer sward; but it is a mistake to suppose that pasturing can replace manuring. The urine of cattle greatly promotes luxuriant vegetation in rainy weather, but in hot and dry weather it does more harm than good. The dung when dropped on the grass is of little value compared with what it would be if mixed with straw, earth, or peat, or diffused through water in a tank. If a natural meadow deteriorates and the grass becomes mixed with rank weeds and mosses, the shortest method of restoring it, and in most cases also the best, is to plough it up clean, and manure it during a course of tillage, without taking very exhaustive crops from it, and then to lay it down again in a clean and enriched state by sowing the best sorts of grass-seed. Another remedy is inoculation; small tufts of grass from some rich meadow are planted, and they will soon increase and produce a new and improved sward. Where the sward is thin it is prudent to mow before the seeds of the grasses are formed, contrary to a common notion that in a thin meadow the seed should be allowed to shed in order to increase the number of plants. Such an increase should be effected by sowing seeds produced on other ground, as the ripening of the seed tends to exhaust the soil.

Meadow Lark. See LARK.

Meadow Mouse. See ARVICOLA.

Meadows (ALFRED), b. at Ipswich, England, June 2, 1833, was educated at King's College, London; studied medicine, and while still a young student gained the prize of the Medical Society for an essay on *The Influence of the Imagination in the Production and Cure of Disease.* In 1857 he was appointed house-physician and physician-accoucheur at King's College; in 1859 he became a member of the College of Physicians, and in 1873 a fellow. In 1871 he was appointed physician-accoucheur to St. Mary's Hospital, and lecturer on midwifery and the diseases of women and children in the medical school of that hospital. He has published *A Manual of Midwifery, Diseases of Infancy and Childhood, Medical Ethics*, etc.

Meadows (THOMAS TAYLOR), b. in England about 1810; entered the civil service of the British government in the East; was employed in various capacities in China, chiefly as interpreter; obtained an extensive acquaintance with the Chinese and Manchu languages and literature; published *Desultory Notes on the Government and People of China* (1847), *Translations from the Manchu, with Original Texts* (1849), *The Chinese and their Rebellions* (1856), and other valuable works upon China. D. in China in the summer of 1875.

Meadow-Saffron, the common name of the *Colchicum autumnale*, a small perennial bulbous herb of the natural order Melanthaceæ, growing wild in moist soil in England and Middle and Southern Europe. The mode of growth is peculiar. From the corm of one year there sprouts a new one, from which, late in the summer, a stem grows bearing for that season only flowers. These are from two to six in number, and are of a lilac or light-purple color. The following spring the young plant matures, bearing leaves and fruit, and the old corm shrivels. The leaves are large, broad, and lanceolate; the fruit is a three-celled capsule, containing small brown seeds about the size of black mustard-seeds. The corm and seeds are used in medicine. Their virtues depend upon a crystallizable principle called *colchicine.* Colchicum is an acrid irritant, producing when taken internally a general increase of the secretions of the intestines, kidneys, and skin, and in fuller dose active purging with colic, nausea, and vomiting. In large dose it is a violent poison, producing inflammation of the stomach and intestines, with dysenteric purging, incessant vomiting, great feebleness of the heart's action, extreme prostration, collapse, and death. The action of colchicum is too violent and poisonous to permit it to be used in full dose as an emetic or purge, and its principal use is in smaller dose in gout, where in some unknown way it has great power in subduing for the time the pain and fever of a gouty "fit." Some use it also in acute rheumatism and certain inflammations. EDWARD CURTIS.

Mead'ville, cap. of Franklin co., Miss. (see map of Mississippi, ref. 8–E, for location of county), 35 miles E. by S. of Natchez, on the Homochitto River. Pop. of beat in 1880, 1791.

Meadville, city and R. R. centre, cap. of Crawford co., Pa. (see map of Pennsylvania, ref. 2–A. for location of county), on French Creek, has graded schools, a high school, a public library of 2500 volumes, an opera-house, State arsenal, a large trade with the oil-regions, several machine-works, paper and woollen mills, and is the seat of Allegheny College (M. E.) and Meadville Theological School (Unitarian). Pop. in 1870, 7103; in 1880, 8860.

Meagher (Gen. THOMAS FRANCIS), b. at Waterford, Ireland, Aug. 3, 1823; studied at the Jesuit college of Clongawes, Kildare, and at Stonyhurst College, England; became a favorite orator with the Young Ireland party of 1846–48; was sentenced to death for sedition, but the sentence was commuted to transportation for life; escaped from Tasmania in 1852, and came to New York; lectured with success in various parts of the country; became a lawyer, and wrote for the press; became editor of the *Irish News* in 1856; became in 1861 a captain, and then major, of the 69th New York Volunteers; raised a brigade of Irish volunteers in 1862; commanded this brigade as brigadier-general 1862–63; left the brigade after the battle of Chancellorsville; was assigned in 1864 to the command of the district of Etowah; in 1865 became secretary of Montana, and was drowned by falling from a steamer into the Missouri River at Fort Benton, Mont., July 1, 1867.

Meal-Worm. See TENEBRIO.

Mealy Bug. See COCCUS and ENTOMOLOGY (section HEMIPTERÆ).

Mean [Lat. *medius*]. The mean of two quantities is a quantity lying between them, and connected with them by some mathematical law. There are several kinds of mean values, the principal ones being the *arithmetical mean*, the *geometrical mean*, and the *harmonic mean.*

(1) The *arithmetical mean* of two quantities is one-half their sum; the arithmetical mean of several quantities is equal to their sum divided by their number; it is the same as their average. Thus, we say that the mean temperature of a day is equal to the sum of the temperatures at every hour (or minute) of the day, divided by the number of

hours (or minutes) in the day; and the mean temperature of a year is equal to the sum of the mean temperatures of every day in the year, divided by the number of days in the year.

(2) The *geometrical mean* of two quantities is the square root of their product; if several quantities form a geometrical progression, the first and last are called extremes, and all the others are said to be geometrical means between them. The ratio of the progression is equal to the nth root of the quotient of the last term by the first, $n+1$ being the number of terms. Thus, any ordinate of a circle is equal to the geometrical mean of the corresponding segments of the diameter; the radii vectores of a logarithmic spiral, corresponding to equal increments of the directing circle, are in geometrical progression, and each is a geometrical mean between the one that precedes and the one that follows it.

(3) The *harmonic mean* of two quantities is the reciprocal of the arithmetical mean of the reciprocals of the two quantities. Thus, the harmonic mean of 6 and 12 is $1 \div \frac{1}{2}(\frac{1}{6}+\frac{1}{12})$, or 8. The harmonic mean of two quantities is a third proportional to their arithmetical and geometrical means; that is,

$$\frac{a+b}{2} : \sqrt{ab} :: \sqrt{ab} : \frac{2ab}{a+b}.$$

The method of arithmetical means is employed in finding the probable result of several discrepant observations of the same quantity when there is no reason to suppose that an error of observation is more likely to be in one direction than in the other. Thus, if a body is weighed several times under the same circumstances, the arithmetical mean of the results is more likely to be true than any single result taken at random. This method is also used to determine the effects of several causes when we know their joint effects, and are certain that each cause acts in like manner at one time to increase and at another time to diminish the joint effect. Thus, the spring tide is equal to the sum of the lunar and solar tides, and the neap tide is the excess of the lunar over the solar tide; in this case the lunar tide is the arithmetical mean of the spring and neap tides. In like manner, the latitude of a place, or the altitude of the elevated pole of the heavens as seen from a place, is equal to the arithmetical mean of the true altitudes of a circumpolar star at its upper and lower culminations.

The method of geometrical means is used in solving many practical problems. Thus, to find the rate per cent. at which a sum of money will double in a given number of years, we regard the amounts at the ends of the successive years as terms of a geometrical progression, and then find the value of the corresponding ratio; this ratio (which is the annual amount per cent.), diminished by 1, is the required rate. Let it be required to find the rate per cent. at which a given sum of money will double in 10 years: here there are 9 geometrical means to be inserted between 1 and 2, and by the rule we find the ratio equal to $\sqrt[10]{2}$, or to 1.0717; hence, the required rate is .0717.

The geometrical problem of the insertion of two geometrical means between two given lines has called forth a great deal of ingenuity, but thus far it has not been solved by the processes of elementary geometry, but it can easily be solved by higher geometry by means of the logarithmic spiral. (See Squares, Least, Method of.) W. G. Peck.

Meandrinæ. See Coral.

Means (Alexander), M. D., D. D., LL.D., b. in Statesville, Iredell co., N. C., Feb. 6, 1801: received a classical education at the academy at Statesville; removed to Georgia about 1822, taught school for four years, then attended medical lectures at Transylvania University, Ky., and commenced the practice of medicine in Covington, Ga., 1826. In the same year he was licensed to preach by the Methodist Episcopal Church. In 1834 he was called to the superintendency of the manual-labor school near Covington. On the organization of Emory College at the same place (now known as Oxford) in 1838, he was chosen professor of the physical sciences, which position he held for eighteen years; in 1840 was appointed professor of chemistry and pharmacy in the Medical College of Georgia, located at Augusta; delivered regular courses of lectures there during the winter season, continuing at the same time for eight months in each year to fill his chair in Emory College; in 1853 presided over the Masonic Female College in Covington (a few miles from Oxford). In 1854, Dr. Means was called to the presidency of Emory College, but shortly after accepted the chair of chemistry in the Atlanta Medical College, which position he held for twelve years, including the period of the war, lecturing during the summer season. In 1851 he travelled extensively through Europe. As a member of the State convention of 1861 he spoke eloquently and voted against the ordinance of secession, but when it was carried he promptly and thoroughly identified himself, his family, and fortunes with his native South. After the war he held the position of agricultural chemist for the State at the port of Savannah, retaining also his time-honored connection with Emory College. He wrote the *Centennial of Chemistry*. D. June 6, 1883. A. H. Stephens.

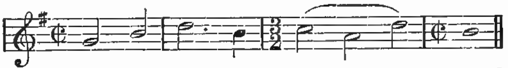
Means (John H.), governor of South Carolina 1850–52; became a colonel in the Confederate service, and was killed at the second battle of Bull Run, Aug. 28, 1862.

Meares (Capt. John), b. in England in 1746; became a sailor, and made many voyages to Newfoundland, Labrador, and Greenland; entered the navy in 1776; served against the French in the West Indies; became captain in the merchant service after the Peace of 1783; went to India; formed at Calcutta the "North-west America Company" for opening trade with Russian America; sailed from Calcutta in the Nootka, a vessel of 200 tons, Mar. 12, 1786, with which he explored a portion of the coasts of the present Territory of Alaska, and fought with the Indians, but had little success in trading with the Russians; returned to the coast of China *viâ* the Sandwich Islands; fitted out a new expedition of two vessels, with which he sailed from Typa Jan. 22, 1788; explored Nootka Sound, which he entered May 11, 1789; reconnoitred the neighboring coasts, of which he took possession for the crown of England, and reached Macao Dec. 5, 1789. He published *Voyages made in the years 1788–89 from China to the North-west Coast of America* (2 vols., London, 1790). Capt. Meares's discoveries form the chief basis upon which the British title to Oregon and British Columbia was based. D. in London in 1801.

Mearns, The. See Kincardineshire.

Mea'sles [Lat. *morbilli*], one of the most frequent of the eruptive fevers. It is met with in the young (rarely in the first half year of life) and old, more so in the former, as the opportunities for communication are very great in our social relations. Most people are affected but once in a lifetime, but the cases of second, third, and even fourth attacks are not excessively rare. Its contagion is most effective about the time when the eruption first shows itself, but it remains active until the skin has been restored, by peeling (desquamation) and successive development, to its normal state. The eruption consists of small elevated reddish spots (like a raspberry), which merge into each other, and form discolorations of the size of a pea to that of a dime-piece, interrupted by normal white skin. It makes its appearance in from a few to thirteen days after contagion has taken place, and after a number of premonitory symptoms, such as cough (loose or barking), sore eyes, nasal catarrh, headache, fever, have shown themselves. It appears first on temples, forehead, and cheeks, progresses downward a day or two, and disappears in about four days. The skin will peel off in very small scales (not in flakes as in scarlet fever), and be in a normal condition after a week. Meanwhile, the cough will become looser, the discharge from nose and bronchial tubes less, and fever subside. The large majority of cases run this mild and normal course with a very small mortality. But there are cases and epidemics accompanied with great danger in consequence of complications. The main danger lies in the accompanying inflammation of the bronchial tubes and lungs, which may prove fatal in a short time, or result in chronic inflammation and consumption. Besides these, inflammation of throat, ear (not so frequently as in scarlatina), eyes, kidneys may remain behind. As these affections are very serious, every case, no matter how mild, ought to be seen once or twice by a physician. The usual treatment of mild cases consists in rest in bed from three to eight days, moderate darkness, and cool temperature (67–68° F.) of the room, cooling beverages. Where cough is obstinate a child of two years may take twenty-five drops of paregoric or one grain of Dover's powder at bedtime. In some cases there is a difficulty in regard to distinguishing measles from scarlet fever, especially where the former is also complicated with sore throat of a simple or diphtheritic character. The ushering-in symptoms belonging to the *respiratory* organs, such as described above, are characteristic for measles, while scarlet-fever symptoms take hold of mouth, throat, and the digestive tubes in general. A. Jacobi.

Meas'ure [Lat. *mensura*], or **Bar,** one of the small regular portions into which written or printed music is divided by "bar-strokes." These measures mark and regulate the time, accent, and rhythm of the notes included in them. In every regularly constructed melody or train of notes the ear observes a certain rhythmical order, under which the melody seems to form itself into clauses, phrases, sections, or periods. In the performance of each of these portions there will also be noticed a constant series of pulsations or accents recurring at equal distances or lapses of time. These smaller divisions, marked out and defined by the periodical strokes of the accent, are the "measures" or bars of modern music; and the first note of each such measure always bears the principal accent. Measures or time-divisions are of various kinds and capacities, according to the nature, accent, speed, or other qualities of the music expressed in them. But with one or two exceptions they may all be regarded as varieties or modifications either of "common" or "triple" time. In common time the natural progression as marked by accent is as | 1′, 2, 3, 4 | 1′, 2, 3, 4 | , etc., and in triple time as | 1′, 2, 3 | 1′, 2, 3 | , etc. (In both these times there is also an inferior accent on the third beat of each measure.) The radical difference between these two forms—the triple and the twofold or quadruple—renders it both easy and convenient to group all time-values into two distinct families, notwithstanding the introduction of the triple element into what is called "compound common time." The measures, portions, or divisions into which music is thus set off by bar-strokes are not to be considered as determining the *rate* or speed of the music by clock-time, but as the means whereby the degree of slowness or rapidity chosen by the performer shall be regulated and uniformly preserved, the accentuation properly expressed, and all the beauties of form and phrase developed with clearness. In any given strain or movement the time-value of the first measure is the standard of speed for all the measures following, except in passages where the composer specially directs that the time shall be accelerated or retarded, or otherwise changed. In ancient music, and occasionally in modern, an interruption of the regular time-movement occurs by the introduction of one or two measures different in quality from the current time of the piece; as, for instance, when a measure of triple time is inserted in a common time movement, or *vice versâ*. Such cases are generally (but not always) indicated by a temporary change of the time-mark, thus:



(For further observations on the varieties of time and measure see MUSIC and TIME.) WILLIAM STAUNTON.

Measure of Damages, in law. By this phrase is meant a collection of the rules which govern the award of damages in courts of justice. The subject is one which in actual practice runs out into great complexity and forms the topic of extensive legal treatises. All that can be done in this article is to state a few of the principal rules that are applied by the courts, and to refer the reader to leading textbooks and other sources of knowledge for detailed information.

It is necessary in the outset to notice the settled distinction that prevails in English and American jurisprudence between courts of law and equity. (See EQUITY.) It is the principal province of courts of law to award damages as a compensation to an injured party for breach of contract or other invasions of private right. Courts of equity, on the other hand, seek to prevent threatened or apprehended injury, or to compel a party in case of a contract to perform it, instead of causing him to pay damages for its violation. Still, in special cases, the equity courts, as auxiliary to other relief, entertain the matter of damages. It is not necessary in this general survey to consider these special cases, and the residue of the discussion will be confined to the examination of rules concerning damages prevailing in courts of law, without referring to special instances recognized in courts of equity. A preliminary remark is, that courts of justice do not seek to give an injured party compensation for all the damages that he may, by a strict course of reasoning, be supposed to have sustained. Thus, no compensation is given for mental anxiety or suffering, nor is full and adequate indemnity necessarily made for the costs and expenses to which a party is unjustly subjected in the course of a groundless litigation. The courts adopt rules of practical convenience which, while they may not supply the demands of an ideal system of jurisprudence, work out substantial justice. The principal propositions recognized in the law of damages will now be stated in the form of rules.

Rule I. The great general principle governing the law of damages is to give *compensation* for the right violated, and nothing more. If a party to a contract plainly stipulates for a larger sum in case of its breach than compensation, he will not be allowed to recover it. The stipulation will be regarded as a "penalty," and will not be enforced. This is well shown by the case of an ordinary bond for the payment of money. This is so drawn that it would appear that the debtor would forfeit twice the amount of his debt if he did not pay with punctuality on the appointed day. Still, no more can be collected than the actual debt with interest. The great point of inquiry in regard to the fact whether a stipulation is a penalty is, whether the amount of damages can be ascertained by a numerical calculation or its equivalent. If so, an agreement to pay more will not be enforced. On the other hand, if the damages are uncertain in amount, and the parties choose to enter into an agreement as to the sum to be paid in case the contract is broken, the courts will not interfere with it.

Rule II. Exemplary or vindictive damages are allowable in certain cases, notwithstanding the general principle that the damages must be compensatory. "Exemplary" or "vindictive" damages mean such as are not in their nature compensatory, but are awarded with a design on the part of the court to punish a wrongdoer. The rule respecting them must be regarded as exceptional in its nature, and founded to a certain extent on theories of public policy. There is a certain class of injuries (mainly wrongs or torts) in which the bad intent of the wrongdoer is allowed to enter as an element in fixing the damages. So the absence of an intent may lead to their reduction, as where the act was accidental or committed by an irresponsible person—*e. g.* a lunatic. Both of these cases may fall within the rule of compensatory damages, since the presence or absence of an evil intent may increase or diminish the injury sustained. Vindictive damages go still further, having in them no element whatever of compensation, but are strictly punitive. The cases in which such damages, among others, are allowed are aggravated cases of trespass upon property or upon the person, slander, libel, seduction, cases of fraud, etc. The theory adopted, as already suggested, is, that over and above all compensatory damages the wrongdoer should be made to pay a sum of money as a punishment for his *quasi* criminal act. This is but a rude and imperfect kind of justice, and not reconcilable with sound principle; for if there is to be an amercement of this kind, reason would dictate that the amount should be paid to the state in the course of some appropriate proceeding, rather than to the injured party. The rule has, however, become too well settled in the practical administration of justice to be shaken. Public convenience is promoted by it, since the law in a number of these cases permits no criminal proceeding, and without the doctrine of "vindictive" damages the wrongdoer would escape all punishment.

Rule III. In making up an estimate of compensatory damages, there are various circumstances to be taken into account, lessening or increasing their amount. Among them are bodily pain caused by a personal wrong. The law distinguishes between bodily pain and mere mental suffering. Damage is assumed to be derived from the former, and not from the latter. In some cases damages enter as an element into the cause of action itself. Some forms of slander are only made actionable by affirmative proof that actual damages of a pecuniary nature have been sustained. Thus, a charge of unchastity against a female is not by the common law an actionable slander. It may be made so by proof of consequent loss of employment. So in certain cases of slander actual malice or ill-will on the part of the defendant is proper to be taken into account. The fact that a slander known to be false has been deliberately repeated may be used for the purpose of enhancing the damages in an action simply for the first utterance, as it tends to characterize the intent of the defamer. No damages can be given for the repetition of the slander in that action, since that may be the foundation of a subsequent proceeding, and it would be unjust to award damages twice for the same violation of right.

Rule IV. From a violation of right the law assumes, as a rule, that damage will follow. If no actual damage is proved, "nominal" damages will be recoverable, such as a farthing or a penny. It has been said by high authority that "every injury imports a damage." It might at first thought be regarded as an idle and foolish thing to bring an action when it must be known in advance, from the circumstances of the case, that only nominal damages are recoverable. Such actions, however, are frequently instituted for the purpose of establishing a right. Thus, if inspectors at a public election should wilfully and improperly reject a vote, the right to vote might be vindicated by an action for damages, though it may be difficult to say that the elector has sustained any appreciable damage. A judgment in his favor would at least establish his right. So, if one should assert a right of way over another's land, the owner might establish the non-existence of the right by bringing an action against the claimant for its exercise, even though the trespass was really nominal. A judgment to this effect might be highly important, since an unmolested exercise of the asserted right for twenty years might give the claimant a way by prescription. (See PRESCRIPTION.) There may perhaps be cases where no possible present or prospective damage would be sustained by an invasion of right, thence called cases of *injuriâ sine damno* (invasion of a right without damage), and accordingly no recovery even of nominal damages can be had.

Rule V. The damages must not be too remote. This is a rule of great importance, and one in respect to which it is easy for inexperienced persons to err. The damage complained of must have been the natural and reasonable result of the act of the wrongdoer, or, in cases of contract, must have been within the contemplation of the parties. Simple as these statements are, they are found in practice to be quite difficult of application. A wide range of inquiry is open as to the point when the result is natural and reasonable. It is plain that no recovery should be had if the damages are really attributable not to the wrongful act of the defendant, but to some intermediate cause. If A were slightly injured by B, and the medical treatment of the wound thus occasioned were so unskilful as to lead to a dangerous result, the damage is not to be imputed to the act of B, but to the want of skill on the physician's part. On the other hand, if the intermediate act be in no sense a cause, but only an attendant upon the injury, the author of the primary act is liable for all the damage sustained. There is a well-known case in which a squib was unlawfully thrown by one person at another, who warded it off so as to direct it towards a third, and so on until the plaintiff, a remote person in the series, was so injured by it as to lose his eye. It was decided that the true author of the plaintiff's injury was the person who first cast the squib, the intermediate parties not having acted deliberately, but involuntarily and by way of self-defence. There is an important distinction to be observed in certain cases between actions of tort and upon contract. In the former case any one directly or consequentially injured by the act of the wrongdoer may bring his action. In the latter, the plaintiff must be substantially a party to the contract. Thus, if a person should lend to another for use a tool or machine which he knew to be dangerous and unfit to be used, and did not give notice of the defect to the borrower, he would be liable to him for resulting damages, but not to a mere stranger who might casually make use of the machine, as he would have no connection with the contract of lending.

One of the most important cases that arises under a contract is whether in an action for its breach profits that might have been realized if it had been fulfilled may be recovered as damages. Sometimes the question concerns the right to a rise of price occurring between the time of the making of the contract and of its fulfilment. At other times it relates to the profits to be gained from the use of an article, such as a steamboat running for hire, or a manufactory. The inquiry is to be solved by determining whether the profits can in a just sense be said to have been within the contemplation of the parties. Thus, if a seller had merely contracted to sell a chattel, as, for instance, a steamboat, as a mere article of merchandise, supposing, perhaps, that the purchaser intended himself to sell it again, it could scarcely be claimed that anything more could be recovered for breach of contract than the rise in price of the steamboat. On the other hand, if one contracting to repair such an article for an owner had been informed that it was to be used for a season to carry passengers on a particular line, and that for the use of it a large rent could be obtained, and he failed without cause to perform his contract, it might be just to hold him for loss of *rental value*. It would be necessary to distinguish between profits that are in their nature conjectural and arbitrary, and such a price as that for which the thing in question would rent in the market, since the latter would be reasonably certain. The true line of distinction is between that which is uncertain, fluctuating, and therefore not ascertainable, and that which is capable of being measured and ascertained. The same general line of argument must be adopted as to losses sustained. If a common carrier, to whom had been entrusted by an owner a broken shaft of a mill to have it repaired at a distant point and then returned, should neglect to perform his contract, and the mill should consequently lie idle, loss of rental value could not be charged to the carrier unless when the contract was made he was informed of the relation of the broken shaft to the mill, and thus had the means of knowing the consequences that would naturally result from his want of diligence. Without such information he might suppose himself liable simply for the piece of iron considered as a chattel, and might for that reason fail to exercise the extreme diligence that he would have observed had he known all the facts of the case. Similar questions will arise where one is deprived of his property by wrong. The damages should be the legal, direct, and necessary result of the act. Conjectural profits can no more be recovered than in the case of contract. Thus, if one should unlawfully deprive another of the use of a manufactory, compensatory damages (as distinguished from vindictive, already explained) would consist in awarding the rental value to the party injured. In the case of personal injuries, disqualifying a person from labor or diminishing his productive power, the question has arisen whether account can be taken of the personal profits of a business in which the injured party is engaged. This will depend upon the point whether the profits are reasonably certain. Thus, it has been decided that the past professional income of a physician can be considered in such a case. The New York court of appeals has recently refused to extend this principle to the past profits of a commercial business (such as importing teas), as being too uncertain. (*Masterton* v. *Mount Vernon*, 58 New York Reports, 390, 1875.) A good illustration of the general principle is to be found in the case where a sale of goods is made with a warranty of their quality. They turn out to be defective, and loss is sustained. No recovery can be had except for losses directly attributable to the defects within the scope of the warranty. Accordingly, if one should purchase with warranty seeds of grass simply as an article of merchandise, without informing the seller that he intended to sow them in his field, and he should sow them accordingly, and, owing to their want of germinating qualities, should lose the use of his soil for a season, he could only recover the market value of the grass-seed, and not for the loss of the use of the ground. Another conclusion would be reached if the dealer in seeds had been informed that growing seed was wanted for the purchaser's use, to be sown upon his farm. On a like principle, if one should buy a ship's cable under a warranty that it was a good cable, it would appear, notwithstanding a questionable decision to the contrary, that he could not recover for the loss of an anchor which it failed to hold owing to its poor quality, unless he had informed the seller, or that person had reason to know, that it was to be used in and about a ship. It should be added that damages are deemed to be too remote when they are produced or aggravated by the plaintiff's own act or negligence. Under this salutary rule an injured party is not by his own remissness and inattention to allow the damages to become unnecessarily swollen, and then charge them to the wrongdoer. If a trespasser should open the gate to my farm, and I become aware of it, I should not leave the gate open for cattle to despoil my field, and then hold him responsible. So, if a servant is hired for a definite period, and is wrongfully discharged by his master before the time has elapsed, he is not to lie idle if opportunities to work present themselves and charge his master for an amount equivalent to his wages. He should have accepted an offer to labor in the same business, received such wages as he could obtain, and only have held the master for the deficiency. This rule is one of general application in all branches of business, and dictates that an injured party should use reasonable efforts to confine the damages for a wrongful act within as narrow limits as possible. Damages will also be too remote in a class of cases where the defendant may have set another person in motion who was the immediate author of the wrong, and yet the loss sustained could not reasonably have been within the defendant's contemplation. Still, if the damages could have been foreseen by the defendant, and were the natural result of his act, the modern view is that he ought to be responsible. It was at one time supposed that if the injured party had an action against the direct author of the wrong, the instigator of it, being more remotely related to the occurrence, was not liable. An illustration of the correct principle will be found in the case where a manager of a theatre had induced a singer for a rival theatre to break her engagement for the theatrical season. In this case the injured party had an action against the singer for violating her contract, and yet the court, after full discussion, held the manager also liable, as the damage sustained was the natural result of his act. The following may serve as an illustration of a case where no liability would attach: A person defames another, who is a servant, in general conversation. One of the listeners repeats the conversation to the master, who wrongfully discharges the servant, so as to make himself liable to an action. In such a case it is plain that there is no natural connection between the slander and the master's wrongful act. It may be that the slanderer did not even know that the person defamed was a servant, or, if he did, had no expectation that the conversation would be repeated to the master.

Another important question in the law of remoteness is whether the costs of an action growing out of or incident to the claim in respect to which damages are demanded can be recovered. For instance, suppose that A is a surety for B. The latter makes default in payment, and the former is sued, incurs a bill of costs, and finally pays the creditor. Should he be allowed his costs? This will depend upon the point whether his resistance to the action was reasonable or not. Perhaps it was wholly useless and unnecessary. In such a case the costs cannot be regarded as derived from the principal's default, but from the surety's own obstinacy or pertinacity. It is a wise course when a surety or other person is sued, who, in case he is made to pay, has a claim over against another, to notify that person to make a defence to the action. If he neglects to attend to this notice, and the party sued acts reasonably and in good faith, he may compel the party notified to repay him such costs and expenses as he was obliged by the rules of law to pay. Even in this case of notification there must have been some reasonable ground of defence, otherwise costs cannot be recovered. It has been well said "that no person has a right to inflame his own account against another by incurring additional expense in the unrighteous resistance to an action which he cannot defend."

Rule VI. Losses not yet accrued may be included in damages, provided that they are naturally derived from the wrongful act, and do not themselves supply a separate cause of action. If a man were wounded in the skull, and at different times fresh pieces of the skull should come out, he would not have a separate action for each piece, but only one for the whole. Accordingly, whenever he brought his action he should recover damages for the entire injury sustained, both present and prospective. Where an injured party may recover the entire damage in one action, in general he must do so. If he fails to demand the whole amount, the judgment will be a bar to all further proceedings. It is sometimes extremely difficult to determine whether the entire damages can be recovered in one action, and the law upon the subject seems to be in a provisional and unsatisfactory condition. Reference must be made for precise information to the decisions of the courts. The rule now under consideration bears a close relation to the statute of limitations (see Limitations, Statute of), since, if the damages are all recoverable when the wrongful act is done, that statute will begin to run from the time when the wrong was committed, rather than from the period when substantial loss is actually sustained. Thus, if an attorney who was employed to examine a title should do his work in such a negligent manner as to induce his client to pay a price for encumbered land while he only intended to pay for unencumbered, the statute begins to run from the time of the breach of duty, rather than from the foreclosure of the encumbrance.

Rule VII. Interest is frequently to be paid by way of damages. (See Interest.) In some cases, there is a distinct contract to pay interest; in others, the duty to pay interest has no relation to contract, but it is allowed as a compensation for the detention of property unlawfully withheld, or is imposed upon a wrongdoer as a punishment for his wrongful or fraudulent conduct. It is only necessary to refer to this topic, it having been sufficiently considered under the topic of Interest.

Rule VIII. An important rule applicable to the subject of pleading must be adverted to. For this purpose a distinction is taken between general and special damages. The former are such as the law implies or presumes to have occurred from the act complained of. Special damages are such as are not necessarily implied by the law, but in the particular case do in fact arise, and are sufficiently proximate to be recognized by the rules of law. In this case the law of pleading requires that such special damages should be set forth in the plaintiff's declaration and as a part of his claim. The particular cases to which this rule applies must be sought in the special treatises upon damages and in works upon pleading. One or two instances may be referred to. In an action for a personal injury damages for an interruption of the plaintiff's occupation must be specially stated. The same remark may be made of a loss of rent in an action for injuries to real estate.

Rule IX. The rules concerning the measure of damages are matters of law, to be decided by the court rather than by the jury. The amount of damages is frequently in the discretion of the jury. This is the case in many actions for wrongs and in personal actions upon contract, such as a breach of promise to marry. Still, over these cases the court exercises a superintending power, and may set aside verdicts for excessive damages, showing, as they frequently do, undue prejudice or passion on the part of the jury. This power is sparingly exercised, and only in extreme cases. In extraordinary cases verdicts may be set aside where the damages are too small. This is mainly the case where no damages are allowed by the jury when some ought to be given.

The cases to which the general rules thus referred to are to be applied are very numerous, and require careful consideration on the part of the courts. Among them may be mentioned actions to recover possession of real property or for wrongful interference with it; actions for the breach of covenants for the conveyance or use of land; also upon bills of exchange or promissory notes, upon policies of insurance, upon the sale of goods, contracts growing out of the carriage of goods, including bills of lading; also between special parties, such as principal and agent or principal and surety. Actions for wrongs involving damages are among others for specific goods wrongfully taken (replevin), for their value (trover), for injuries immediate and direct, to person or property (trespass), for injuries indirect and consequential (trespass on the case). Underlying all these actions will be found the rules already stated. For example, if a principal should bring an action against an agent for violating his instructions in selling merchandise below a fixed price, the measure of damages is the loss sustained, and not the difference between the price received and the instruction price. The former rule supplies complete compensation, since the principal could obtain equivalent goods by means of the sum awarded to him. So, if goods be wrongfully taken or "converted," the general rule of damages is their value at the time of conversion, with interest, though, according to some authorities of inferior weight, a much wider range is allowed, so as to include the highest price down to the time of the trial.

A peculiar rule prevails in most of the States, as well as in England, in case of a contract to convey land. In the absence of fraud or of knowledge, or reasonable means of knowledge, on the vendor's part that his title is defective, only nominal damages can be recovered if he fails to make a good title to the property which he has contracted to convey. The principal reason of this rule is that in an ordinary covenant for title in a deed the utmost amount of damages allowed by the law of most of our States is the consideration-money and the interest. If no consideration has been paid, nothing can be recovered, so that rise of price does not enter in as an element in an action upon a covenant for title in a deed. It would not be reasonable that in a contract to convey, any higher rate of damages should be allowed than would be given in case an actual deed had been delivered and the title had proved defective. The law of damages in real-estate transactions is therefore somewhat anomalous and exceptional, and differs widely from that which prevails in the case of the sale or contract to sell personal property.

Distinctions affecting this subject cannot be further pursued, and reference for additional information must be made to the excellent treatises of Mr. Sedgwick and of Mr. Mayne, as well as to the leading works on contracts and torts, and to the digests and cases in the law reports.

T. W. Dwight.

Measures. See Weights and Measures.

Meat or Flesh, Extract and Juice of. This is a subject which, besides its great and obvious scientific importance, has of late years assumed a practical aspect from the introduction into dietetics, medicine, and hence into commerce, of condensed extracts from flesh-meat—an introduction due to the great Liebig. Several chemists throughout the world have lately given attention to points of chemical theory involved in the processes of formation and destruction of flesh which constantly go on in the animal body. As yet comparatively little progress has been made, owing to the immensity and complexity of the subject. Liebig himself many years since laid the foundation of these investigations by studying several important definite crystalline principles in the juice of flesh, which are no doubt intermediate products of the breaking up of the organic molecules of the proteid bodies in the process of their ultimate transformation into carbonic acid, water, urea, and other constituents of the various animal excreta. *Sarcolactic* acid (already described under the head Lactic Acid) is one of these; also Leucine (which see), although the latter was long before discovered by Proust. Among the substances studied and discovered by Liebig may also be mentioned *creatine* (previously discovered by Chevreul), *sarcine*, and *inosinic acid.* Doubtless some remain yet to be isolated.

Besides these crystalline organic principles, the juice of flesh contains some proteid bodies coagulable by boiling, together with various salts, organic and inorganic, of potash, and, to a less extent, of soda and other bases. Among the inorganic salts the predominant acid is the phosphoric, and next to this hydrochloric. In the making of *beef-tea,* so largely used as a food for invalids, all the soluble ingredients of the flesh are, in the first instance, communicated to water, inclusive of the soluble proteid bodies; and on subsequent boiling the latter will be converted into an insoluble coagulum, just as white of egg would be if dissolved in the water. Much will then depend, no doubt, upon the subsequent steps of the operation. If the beef-tea be merely strained through a cloth, as is usual, this coagulum will chiefly pass through and become an ingredient of the preparation, and doubtless, in consequence of its fine state of division, will be to those capable of digesting it a highly nutritious ingredient, one which furnishes food of a "plastic" character, capable of building up new muscle and tissue. There appears no reason to suppose that beef-tea, if first clarified and freed from ingredients of the proteid class—whether condensed subsequently or not into meat-extract—would furnish a *complete* food, either for the sick or the well. At the same time, the entire absence of value, in a dietetic point of view, which is imputed by some is entirely unreasonable. There is every reason to believe that the organic, and particularly the nitrogenous, principles found among the soluble ingredients, perform, as claimed by Baron Liebig, some precious functions, as yet not understood, in the process of nutrition; and the weight of testimony is strongly in favor of the great value, at least, of these beef-extracts in assisting nutrition, and even in stimulating the same into a greater degree of rapidity, in such manner as to prove in many cases of the greatest value. It has even been asserted that by reason of the excess of potash salts present in these meat-extracts they may exert a really poisonous action. This no doubt is true also, as of almost any other special nutritive agent if taken exclusively and to excess. Such is actually the case with *sugar*, for example, when constituting too large and continuous an ingredient of the food. Such is the case with fatty substances also, even of the most digestible kind, like butter.

We may quote here some recent very instructive analyses of two kinds of beef-extract, made by C. F. Chandler and F. A. Cairns, which are especially valuable as distinguishing between the ingredients soluble and insoluble in *alcohol*, as well as in water:

	Liebig's Fray-Beutos extract.	San Antonio meat-extract factory.
Water (expelled at 212° F.)	17.21	14.78
Ash	13.01	18.16
Substances soluble in 88 per cent. alcohol, dried at 212° F	33.09	44.57
Fat, etc., soluble in ether	0.14	0.18
Total nitrogen	8.18	9.12
Nitrogen in portion soluble in alcohol	3.19	4.75
Soda	2.44	2.35
Potassa	9.20	7.55
Lime	0.05	0.06
Magnesia	0.56	0.50
Oxide of iron	0.02	0.07
Chlorine	2.98	1.95
Sulphur	0.29	0.22
Sulphuric acid (SO_3)	0.03	0.03
Phosphoric acid (PO_5)	8.20	5.64

HENRY WURTZ.

Meath, county of Ireland, in the province of Leinster, bordering on the Irish Sea. Area, 906 square miles. It forms the eastern portion of the great limestone plain which occupies the whole central part of Ireland. The ground is level or gently undulating; the soil consists of a rich loam, and is very fertile. The occupations are almost exclusively agricultural, chiefly grazing and dairy-farming. Of the total area, about 92 per cent. (582,708 acres) are arable land, while 9599 acres are under plantations, 11,209 are bog and marsh, and 201 mountain-wastes. The coast is about 10 miles long, low, and shelving, but has no important harbor. The beautiful river Boyne divides the county into two nearly equal parts. In 1882 the country possessed 176,121 cattle, 146,749 sheep, 19,709 pigs, 15,316 horses, 6398 goats, and 318,968 poultry. Pop. in 1881, 87,469, of whom about 22 per cent. were unable to read and write. From 1851 to 1881, 49,375 persons emigrated. Irish is still spoken to a large extent in the county. Principal town, Trim.

Meaux, town of France, in the department of Seine-et-Marne, on the Marne. It is the see of a bishop, and has a fine cathedral with a monument of Bossuet, who was bishop here. It has large manufactures of cottons, calicoes, sailcloth, vinegar, and saltpetre, and numerous flour-mills on the Marne from which great quantities of flour are sent to Paris. Pop. 12,525.

Mec'ca, city of Arabia, the capital of the province of Hedjaz, in lat. 21° 30′ N. and lon. 40° 8′ E., 65 miles E. of Jiddah, its port on the Red Sea. It is situated in a narrow and barren valley enclosed by naked hills, but although it has no trees, no public places, and only one public building of importance, and although its streets are unpaved, dusty in the summer and muddy in the rainy reason, Mecca is handsomer and better built than most Eastern cities. The streets are wide and the houses solidly built of brick, granite, and sandstone, two or three stories high, and with windows opening into the streets. The city is comparatively modern, built about 450 A. D. Its peculiar character as a city corresponds to the peculiar circumstances which have made it not only a large city, but the most celebrated city of all Islam. It is the birthplace of Mohammed, and it contains the KAABA (which see). It has no manufactures and (properly speaking) no trade. It depends wholly on the pilgrims who annually gather here to the number of 100,000. It is not exactly an absolute duty, but it is a sacred obligation, of every Mohammedan to visit Mecca at least once in his life, to make his prayers in its mosque, El-Haram, and to kiss the black stone of the Kaaba. And the inhabitants of Mecca live by hiring rooms to the pilgrims and supplying them with the necessaries of life during their sojourn in the city. The natives, however, of this sacred place are generally described as cold, irreligious, shrewd, avaricious, and addicted to debaucheries of all kinds; they often amass princely fortunes, which they spend in the most extravagant manner. Of late, however, the number of pilgrims to Mecca has decreased considerably. Pop. about 45,000, with lodging-room for three times that number. (See Richard F. Burton's *Personal Narrative of a Pilgrimage to Mecca and Medina*, 1855.)

Mecca Balsam, called also **Balm of Gilead.** The class of substances called *balsams* are, chemically, mixtures of solid resinous matters proceeding from the oxidation of essential oils, with some of the essential oils themselves from which they proceed. Common *crude turpentine* and *Venice turpentine* are familiar examples. The balsam of Mecca, when pure and genuine, is the resinous exudation from a plant that grows on the banks of the Red Sea, known to botanists as *Balsamodendron Gileadense*, a small evergreen shrub. In the East it is much employed in medicine and perfumery, but the inferiority and spurious character of the material sent under its name into Western commerce have led to the almost entire abandonment of its use. Trommsdorff found in it 30 per cent. of volatile oil, 64 per cent. of hard and 4 per cent. of soft resin, and a minute quantity of a bitter substance. Bonastre found only 10 per cent. of fragrant volatile oil. The essential oil is no doubt a terpene, but no special examination of it has been made. H. WURTZ.

Mechanical [Gr. μηχανικός] **Art** is most easily distinguished from fine art by the character of its products: those of fine art represent ideas, those of mechanical art answer purposes; the former result in a gratification of the æsthetical sense, the latter are made for practical use. The painting of a flower so as to represent a certain effect of color or form characteristic of vegetable life, and thereby symbolical of life in general, is a work of art; the painting of a flower so as to show to the student the structure and correlation of its organs is a work of mechanical art. There is, nevertheless, much that is mechanical in all fine art, even in a lyrical poem or a symphony; and when the artist is not thoroughly trained in this, the mechanical part of his work, no inspiration can save the æsthetical effect from being blurred. On the other hand, there is much that is æsthetical in all mechanical arts—in carpentry, coach-making, etc.; and if the artisan is without taste or has a bad taste, no smartness of contrivance or skill of workmanship can ever make his work completely satisfactory. Yea, in certain fields—as, for instance, in architecture—the fine and the mechanical arts are mixed so closely together that the dominion has become disputed. Here, too, however, the above-given distinction will suffice. A building, whether a court-house, bank, or church, is a work of mere mechanical art if it is made only to answer its practical purposes, but if it is also made to represent in its forms the ideas of worship, government, or enterprise which underlie those purposes, it is also a work of art. (See ART and FINE ART.)

Mechanical Calculation. The employment of simple mechanical devices for assisting arithmetical computations dates from the very origin of the science, as is shown, in fact, by the etymology (Lat. *calculus*, "a pebble"), which indicates that the earliest "calculations" of a rude people were effected by means of an actual counting of grains or bits of stone, each representing a unit of the staple of traffic. They would not be employed, however, until the number of the fingers on the two hands, which forms the basis of the decimal notation, was exceeded. The second step in the development of arithmetic must have been to make a single pebble or grain represent a group of 5 or 10 units. The third step would be reached at a much later period by making a pebble or grain (of larger size or different color) represent 100, when a problem of addition involving many thousands of units could be mechanically performed by the aid of a small number of pebbles of three different kinds, the operation of "carrying ten" being mechanically represented by the substitution of a unit of the larger denomination for 10 of the smaller. This was the principle from which originated the abacus. It is thus seen that mechanical methods of computation preceded the perfection of mental arithmetic and the use of writing for the same purpose. Plato invented a sliding square to solve the problem of two mean proportionals, and Nicomedes in the first century B. C. devised a conchoid curve for the solution of the same problem, as well as for trisecting an angle. The Greeks and Romans employed the abacus for their ordinary problems of arithmetic, and the same or similar instruments continued in common use in Southern Europe till the end of the fifteenth century, and in England still later, until they were superseded by the progress of written arithmetic. Gunter's Scale and Napier's Bones (which see), invented in the seventeenth century, were extremely ingenious contrivances, but of little practical use from the limited nature of their operation. Blaise Pascal, one of the most sublime geniuses whom the world has ever seen, constructed in 1642, at the age of nineteen, a machine for performing the routine operations of arithmetic. It consisted of a group of wheels and cylinders. On the convex surfaces of the latter were inscribed the numbers with which the operations were to be performed, consisting of the ten figures of the decimal system, and the numbers adapted for the addition and subtraction of livres, sous, and deniers. These cylinders were connected by wheels in such manner that a single revolution of one wheel produced, according to the character of the desired operation, ten, twelve, or twenty revolutions of the other wheels. The first cylinder was turned by hand, and the others were moved in conformity to the desired arithmetical rule. In 1673, Leibnitz described a machine for a similar purpose, said to have been superior to Pascal's in practical operation, but too complicated and expensive to be brought into use. In 1822, Mr. Charles Babbage read two papers before the Royal Astronomical Society descriptive of a machine he had invented for solving mathematical problems of some complexity, and at the same time printing its own results by means of types. This would evidently have been of incalculable service in the tedious toil of computing astronomical tables, and the society therefore memorialized the government for pecuniary aid in constructing a machine. The subject was referred to the Royal Society, and a committee, of which Herschel, Davy, Young, and Wollaston were members, reported in favor of the invention. The government thereupon made a liberal grant, but the plan of the machine was extremely complicated, and was more than once modified, so that artisans had to be specially educated to understand it. Large sums were advanced from time to time for many years, but the machine was never completed, and in 1843, after twenty years' labor and a fruitless expenditure of $85,000, the government refused to countenance any farther outlay, and the unfinished "difference engine," as it was called, was placed in the museum of King's College, London. Had the plan of the inventor been successfully carried out, this machine would perform all the operations of simple arithmetic on any numbers whatever; combine quantities algebraically or arithmetically in an unlimited variety of relations; use algebraic signs according to their proper laws, and develop the consequences of those laws; arbitrarily substitute any formula for any other; effect processes of differentiation and integration on functions in which the operations take place by successive steps; execute the operations of the combinatory analysis, and compute the numbers of Bernouilli. The cardinal principle of Babbage's machine is the fact that if we begin with a table of logarithms or sines, then make a second table consisting of the differences between the successive numbers of the first, then a third from the differences of the second, etc., we ultimately reach a table in which all the numbers are the same. Reversing the process, and the first number of each table being given, the first table could be recovered by a series of additions starting from the table of equal numbers. Moreover, the machine stamps each figure as fast as calculated upon a stereotype plate, so that no errors of the press could be made in the publication of tables thus calculated. A machine for effecting the same object upon a different principle was commenced by two Swedish brothers, George and Edward Scheutz, in 1834, and successfully completed in 1853. It was exhibited in London in 1854, and in Paris in 1855, and purchased by the Dudley Observatory at Albany in 1856. It calculates to fifteen places of decimals, impressing upon lead the result to eight places, at the rate of twenty-five figures per minute. By taking out certain wheels and putting in others it will calculate and record in pounds, shillings, and pence; in degrees, minutes, and seconds; in tons, hundredweights, and pounds, and in many other modes of notation. It is undoubtedly the most perfect instrument of its kind ever completed, and has been successfully employed at Albany in delicate astronomical calculations.

Porter C. Bliss.

Mechan'ical Powers, certain elementary forms of mechanism in which the simplest possible material connection between two points or surfaces is such that the action of a force applied at one point in a given direction is caused to overcome a resistance at another point in any required direction. In its general acceptation the term "mechanical power" implies also the condition that an "advantage" is gained by the use of one of these elementary machines; or, in other words, that a small force acting through a given space may be made to overcome a greater force acting as a resistance through a less space. When increase of motion is the principal object, a force acting through a given space may overcome a less resistance acting through a greater space. Where a simple transfer of the direction or point of application of a force takes place, without any possible "advantage" in either of these respects, the material connection between the points of application of the power and resistance does not necessarily involve the employment of one of the elementary machines or mechanical powers.

In discussing the motions which are transmitted by means of elementary machines it is unnecessary to take into account the nature of the forces which act upon them. These may be any of the ordinary forms in which forth exhibits itself or is employed by men and animals, such as gravity, inertia, friction, etc.; one general principle being sufficient for all—viz. that in any elementary machine the product of the force or effort into the distance passed over by its point of application must be equal to the product of the resistance multiplied by the distance passed over by its point of application. If the force or effort be a liquid pressure acting on a surface, the resistance being a corresponding liquid pressure acting on a different surface, then the volumes through which the two surfaces move under the influences of the action and reaction must be equal. This latter enumeration of the general principle is applicable especially to hydrostatic machines.

Under these general definitions and conditions all the elementary machines which are met with in mechanical constructions, or which are employed by man and animals in locomotion, may be arranged under four heads, each depending, for the calculation of the work performed by the moving force and the resistance, upon certain elementary theorems of mechanics. The classifications are the *lever*; the *inclined plane*; the *jointed links* (called also the funicular machine, and also the "toggle-joint"); and the *hydrostatic press*. All machines of artificial construction and all movements of animals in locomotion depend on the action of these simple machines or mechanical powers, either in their elementary forms or in various combinations.

The lever is based on the theorem of *moments of forces*, and involves a rotation of a material, rigid bar or form about a point called the fulcrum. The moment of a force is the product of the force measured in units of force (pounds), multiplied by the perpendicular distance from its line of action to the centre of rotation, the fulcrum. Whatever be the directions of the effort or power, and the resistance, applied to two points of a lever, the products obtained by multiplying each by the perpendicular distance from its line of action to the fulcrum must be equal. The pressure upon the point of rotation in the fulcrum acts as a third force, which at any instant maintains the other two in equilibrio. To find this pressure in any given direction, it is only necessary to find the components of the other two forces, which act in directions parallel to the given direction, and the equilibrium is established by the general theorem of parallel forces—viz. the resultant of two parallel forces is always equal to their sum if they act in the same direction, and to their difference if they act in contrary directions. This resultant in the case of the lever is the pressure upon the fulcrum, acting in the direction of the greater force if the parallel components of the forces act in opposite directions, and in the common direction of the forces if they act in the same direction. All problems of levers, whether they be straight or bent, and whether the forces applied to them are parallel or oblique, may be solved by the application of the preceding rules.

The wheel-and-axle and the movable pulley are elementary machines, depending for their action on the principle of the *lever*, although sometimes classed as separate mechanical powers. The fixed pulley merely changes the direction and point of application of the force applied to the cord passing over it, but no other advantage results from it. In the case of the movable pulley the fulcrum is movable, and acts as an instantaneous axis, the resistance acting between the power and the fulcrum.

The *inclined plane* and the *jointed links* depend for their action on the theorem of the parallelogram of forces. Representing the relations between the height, length, and base of an inclined plane by the altitude, hypothenuse, and base of a right-angled triangle, the relation between the forces which cause a sliding of a body on an inclined plane is as follows: If the effort or power be applied parallel to the length of the plane, and the resistance parallel to the height, the effort will be to the resistance as the height of the plane to the length. When a man rolls a barrel up an inclined plane into his wagon, he obtains not only the advantage of the inclined plane, but also the advantage of rolling over sliding friction. The total useful work performed, leaving friction out of consideration, is the work of elevating the weight of the barrel from the ground to the wagon; and this total work can in no way be avoided. It is, however, accomplished by a small muscular effort exerted through a greater space than the height of the wagon, the diminution of the effort necessary depending on the length of the plane.

The wedge is an example of an inclined plane. When a pressure is exerted against the end of a wedge to force it forward, the resistance against the face of the wedge will be to the pressure applied to the end as the distance through which the wedge moves is to the distance, perpendicular to the face, through which the material yields to the action.

The screw is an inclined plane in the form of a helix wound around a cylinder, and its action is determined by the same laws.

The jointed links, in which the relation between the power and resistance is found by the application of the parallelogram of forces, is not so often found in artificial constructions as some of the other elementary machines, but it possesses especial interest in being found applied in the mechanism of all walking or leaping animals. A few artificial constructions, among which may be named Hicks's press, are based on this mechanical power, the elements of which are two rigid bars or *links* jointed together, the effort being applied at the joint in such a manner as to enlarge the angle between the bars. If one bar rest against an immovable point of resistance, and the other be guided in a given direction, when the two bars approach a straight line the action of the force at the joint is to overcome a much greater resistance at the end of the guided bar. A succession of jointed links, as in the hinder legs of leaping animals, not only multiplies motion, but enables the animal to exert the greatest effort in the direction of the terminal motion.

The *hydrostatic press* is an elementary machine which depends for its action on the principle of distribution of pressures through the medium of a liquid. If a closed vessel filled with a liquid be tapped at any point, and a small piston be inserted in such a manner that an external pressure may be applied to the piston, no liquid being allowed to escape,—when such a pressure is applied, every part of the internal surface of the vessel, equal in area to the piston, will feel the additional pressure independently of all the other parts. If one end of the vessel be closed by a tight piston movable outward, the total additional pressure upon the surface of this larger piston will be equivalent to the sum of all the additional pressures upon its parts, each of these small parts being equal to the area of the smaller piston. The force required to resist the total additional pressure on the large piston will then be as many times greater than the force applied to the small piston as the surface of the larger is greater than the surface of the smaller piston. If motion take place, the extent of motion of the two pistons must follow the inverse of this rule. The distance passed over by the two pistons will be inversely proportional to their areas.

Ordinary machines, whether they be *prime movers—i. e.* whether they receive directly and utilize the action of muscular force, the force of gravity acting through falling water, the wind, or the moving force of heat—or whether they be secondary machines driven by prime movers, are elementary machines, or combinations of the elementary machines which have been named. They consist generally of a framework for sustaining and supporting the moving pieces, and certain connections between the moving pieces by which motion is communicated from one moving piece to another, or from the driving point to the working point. The principles according to which such motions are communicated are based on the laws of motion (see MOTION), and have been fully developed for all ordinary machines in modern works on the principles of mechanism. Prof. Robert Willis, M. A., F. R. S., of the University of Cambridge, is entitled to the credit of having been the first to develop this interesting and useful branch of practical mechanics into a special science.

W. P. TROWBRIDGE.

Mechan'ic Falls, or **Mechanic's Falls,** R. R. junction, Androscoggin co., Me. (see map of Maine, ref. 9–B, for location of county), 33 miles N. of Portland, on the Grand Trunk and the Rumford Falls and Buckfield R. Rs., has an academy, 6 paper-mills, a rifle-factory, shoe-factory, cheese-factory, excellent water-power, a corn-canning establishment, and manufactories of harness, organs, and furniture. Pop. in 1880, 622.

Mechan'ics [Gr. μηχανικά]. The term "mechanics" was originally employed to designate the principles of action of machines; the science which embraces the laws of motion and force, commonly called the *science of mechanics*, having derived its origin principally from practical operations rather than from theoretical abstractions. The proficiency of the ancients in practical mechanics is sufficiently evinced by the descriptions of machines which have been preserved in their writings. In the construction of temples, pyramids, bridges, aqueducts, and other great works, the elementary machines must have performed an important part; and indeed some ideas of modern physics seem to have entered into the conceptions of the old Greek philosophers; such as that of the elements or atoms, the æther, and the idea that all things are in incessant motion. Archimedes (287–212 B. C.) may even be said to have laid the foundation of theoretical mechanics in his investigations in regard to the lever, centres of gravity, etc. The theory of Aristotle, that a body contains in itself the principles of rest and motion, uninfluenced by external causes, continued, however, to be received until the time of Galileo (1564–1642). Galileo disputed the ideas of Aristotle, and by experiments on falling bodies showed the existence of a force independent of the falling body which produced a velocity of motion dependent on the time of descent, and not on the mass of the body. After this the science made slow but gradual progress, and was extended in its signification beyond the principles of mere mechanical contrivances to embrace the laws of force and motion as exhibited in universal phenomena. With this signification the science became enlarged and subdivided, some writers on mechanics dividing the subject into two parts—*statics*, embracing the principles or theorems which apply to bodies at rest under the action of natural forces; and *dynamics*, embracing the principles of equilibrium and action of bodies in a state of motion. Other writers subdivide the subject into two—the *mechanics of solids* and the *mechanics of fluids;* and others, again, into *kinematics* or the laws of motion, geometrically considered, without reference to the causes of motion, and *dynamics*, the laws of motion and force.

A brief summary of the laws and principles of the science of dynamics under this broad acceptation has been given under the head DYNAMICS, and it only remains to follow a little further the enunciations of these general principles, and to give a brief history of their discovery or development. The principles of kinematics, or the abstract theory of motion, will be found under the head MOTION. Benedetti (1530–90) was the first to discover the true *cause* of acceleration in falling bodies in properly considering the principle of inertia, it having been previously supposed that every movement was due to an independent and additional exercise of force.

Of the principles which form the foundation of the science of mechanics or dynamics—viz. the principle of inertia, the equality of action and reaction, the non-dependence of the effect of a force on the previous motion acquired by a body, and the independence of the effects of forces which act simultaneously upon the same body—the first was recognized by Descartes (1596–1650), who, observing the acceleration of bodies moving in straight lines, called the force of continuance the indwelling force of the matter, a property called by Newton (1642–1726) *inertness*, while the resistance to change due to the body alone he called *inertia*.

According to Lagrange, Guido Ubaldi (1545–1607) was the first to make an exposition of the principle of *virtual velocities*. The virtual velocity of a point due to a force is the motion of the point in a right line to a position infinitely near, projected upon the line of the force; and the *virtual moment* is the product obtained by multiplying the virtual velocity by the intensity of the force. This principle has been useful in investigating the analytical conditions of equilibrium of a system of forces.

Galileo announced the principle that two forces are in equilibrio if their moments are equal and opposed, the moments being proportional to the products of the forces by their virtual velocities. The conception of the parallelogram of forces is due to Galileo, and its subsequent applications to motions and velocities to Descartes, Wallis, Roberval, and others.

A theorem which has been most useful in analytical investigations, called the "Theorem of D'Alembert," is found in most textbooks. It was first announced by D'Alembert (1717–83), and is especially useful in the investigations connected with dynamical engineering. It is as follows: "If at any instant the forces of inertia of the different parts of a material system are joined to the other forces which act upon the system, a system of forces is obtained which will produce, at that instant, a condition of equilibrium in the material system."

The term "living force" is due to Leibnitz (1646–1716), who made a distinction between living and dead force; living force being such as causes motion, and dead force such as opposed by an immovable obstacle causes no motion.

A contention arose between the followers of Descartes and Leibnitz in regard to the measure of force, the former contending for the principle that the force is proportional to the velocity, while the latter made the mass multiplied by the velocity the measure of force. The apparently conflicting views were reconciled by D'Alembert. Definitions were so arranged that by "quantity of motion" was to be understood the product of the mass into the velocity, and by "living force," the mass multiplied by the square of the velocity. The term *momentum* is at present usually employed, instead of *quantity of motion*. Newton (1642–1726) conceived the idea that the proper measure of the *motive* force is the mass multiplied by the acceleration, and Helmholtz as late as 1847 announced a new principle, that all motive forces are *central* forces. All forces of attraction or repulsion between two masses affect only the relative positions of those masses. Helmholtz introduced the idea of other forces of a system acting towards a fixed point, these being the real motive forces, which, combined with the other forces, determine the paths and velocities of the points.

The property called inertness—viz. that if there be no continuous action of forces upon a mass or material point, it either remains at rest or moves uniformly in a straight line—was announced by Descartes, Huyghens, and Newton. D'Alembert observed that if the acting forces upon a mass or material point are constant, and tend always in the same direction, the mass will move as if free. (For a discussion of the principle of areas see INVARIABLE PLANE.) This principle was discovered separately by Euler (1707–83), D. Bernoulli (1736–1813), and D'Arcy.

The following are general theorems relating to any system whatever:

1. The centre of gravity of any system acted upon by exterior force moves in the same path as if the whole mass of the system were concentrated at that point, and as though the exterior forces were transported parallel to themselves to that point. This theorem shows that the motion of a material system may be traced by referring it to the motion of its centre of gravity regarded as a material point. As a familiar application of this general theorem, suppose a shell to be fired from a cannon. Its path will at first be approximately a parabola. If it explodes in its course, the resistance of the air being left out of consideration, the paths of the separate pieces will diverge, but the path of the common centre of gravity of all the pieces will remain unaltered. The explosion of the powder, being only an exertion of internal forces, cannot alter this path: it is only when one of the pieces strikes an obstacle that the path of the centre of gravity of the whole is changed, a new external force being thus introduced. Applied to the planetary system, this theorem shows that if the influence of the fixed stars be disregarded, the centre of gravity of the system must be either at rest or moving in some path due to forces external to the system.

2. The theorem of moments of quantity of motion or moments of momentum may be enunciated as follows: "The increase in the sum of the moments of momentum of a system in reference to any axis during a given time is equal to the sum of the moments of all the impulses of the exterior forces with reference to the same axis in the same time."

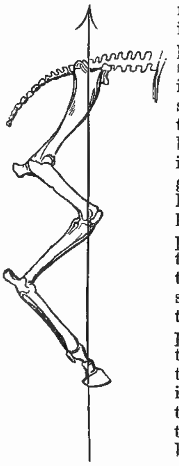
3. The theorems of living force and of inertia have been noticed under the head DYNAMICS. It results from this theorem, and from the constitution of bodies, that the general analytical expression for the living force of a system of material points or masses contains three terms—one giving the living force of the system, supposing the whole mass concentrated at the centre of gravity, and partaking of the motion of that point; another giving the living force due to *rotation* about a line passing through the centre of gravity; and a third, the living force due to the separate motions of the masses under the action of the central or internal forces of the system.

These general theorems are sufficient to solve in a simple manner some of the practical questions which present themselves to ordinary observation. An invariable solid, for instance, abandoned to itself after having received an impulse, will generally have two motions, one of translation of the centre of gravity, and another of rotation about a line passing through the centre of gravity—movements the laws of which have been distinctly and beautifully demonstrated by Poinsot. A circus performer in accomplishing the difficult feat of throwing two somersaults in the air is incapable of controlling the rotation of his body by any muscular effort while in the air; the number of turns depending only on the original impulse and the elevation and length of path described by the centre of gravity before he reaches the ground.

The principle of the indestructibility of force or the conservation of force is of recent development, although discussions of the subject may be found in the works of the older writers. Some modern authorities give Newton the credit of anticipating the more recent discoverers. The investigations of Carnot, Clapeyron, Mayer, Colding, Joule, Clausius, Helmholtz, Rankine, and Thompson have served to definitely establish the principle.

The more recent establishment of the principle that the laws of dynamics embracing motion and force hold true as well for the minute invisible motions of the particles of bodies as for the great masses of the solar system, has had a most important effect on the development of the physical sciences. The living force or energy of a body is no longer confined to its sensible movements as a whole, but embraces the living force due to molecular motions which give rise to the phenomena of heat; and the sciences of heat, electricity, magnetism, chemistry, and even astronomy, have derived new interest and experienced a great expansion from a knowledge of the above principle. W. P. TROWBRIDGE.

Mechanics, Animal. In animal mechanics the muscular force is utilized through either one of the elementary machines or mechanical powers (see MECHANICAL POWERS), or through a simple combination of two or more of them. The employment of these elementary machines supposes a resistance or point of support which by its reaction enables the machine to act. In walking or leaping on the ground the "jointed links" or "knee-joint" is the simple machine employed when the body is raised from the ground, and the lever when a limb only is raised or moved, the earth furnishing the resistance in the first case, and the body in the second. The greatest effort of an animal is required in leaping or in hauling a load. The application of the principle of the lever involves the consequence that the bones of the limbs in these efforts sustain great cross-strains, which from their structure they are not calculated to bear. The bones of the hind leg of the horse, for instance, are arranged as in the engraving, and whether in leaping or in hauling a load (or rather pushing a load, because the principal effort is a pushing operation, the load being attached to the shoulder), the action of the muscles of the hinder parts is to straighten out the links which form the hind legs. The ground gives a point of support, but not a fulcrum in the sense of the lever; and instead of the greatest effort being a cross-breaking effort, it is transmitted through the axes of the bones, in which direction, as short columns, they are capable of withstanding very great pressure. When the limbs are raised from the ground the body acts as the point of resistance, and the bones act generally as levers; but when the ground forms the point of resistance, the principle of the lever does not furnish the means of calculating the effort necessary to elevate the weight of the body. The jointed construction shown in the sketch corresponds to the device known as "lazy tongs" in mechanics, and acts in the same manner, except that muscular force is applied at each joint. When this system of jointed links is extended to nearly a straight line, a very slight muscular effort at each joint transmits a powerful force through the axis of the extended system in the direction of motion. Swimming animals usually make use of the "inclined plane," combined with the lever or the jointed links, although some animals, like the cuttle-fish, make use of an apparatus which involves the principle of the hydrostatic press; a quantity of water being drawn into the body by a large opening, and then ejected by a smaller opening with a greater velocity.



The operation of flying is nearly identical, on mechanical principles, with that of swimming, the only differences being those which arise from the lesser density of the medium in which the motion takes place. In many motions of animals the *inertia* of the body or of parts of the body acts as an instantaneous resistance by which the motion is accomplished.

The kinematics of animal movements, or the mere motions of the bodies and extremities of animals, have been made the subject of extended experiments, and have been quite fully treated by various authors. The dynamics of animal movements, or the laws of the forces exerted, have received less attention. The latter study is perhaps the more important, as the structure of nearly all animals is based, to some extent, on their mode of progression, and the conditions under which they are obliged to move from place to place, or the mode in which they procure food, defend themselves, or escape from enemies.

The general law that in animal locomotion the same elementary machines are employed, and the same mechanical principles applied, as in artificial constructions made by man, furnishes the basis of the study of animal movements. W. P. TROWBRIDGE.

Mechanicsburg, O. See APPENDIX.

Mechanicsburg, on R. R., Cumberland co., Pa. (see map of Pennsylvania, ref. 6-F, for location of county), 8 miles W. of Harrisburg. It was incorporated in 1826, and, besides being supplied with water and gas, contains Irving Female College, the Cumberland Valley Institute, graded schools, a library, foundry, door and sash factories, spoke and bending works. Pop. in 1870, 2569; in 1880, 3018.

Mechanic's Falls, Me. See MECHANIC FALLS.

Mechanicstown, on R. R., Frederick co., Md. (see map of Maryland, ref. 2-D, for location of county), 45 miles N. W. of Baltimore, has a planing- and saw-mill, a fulling-mill, and the Catoctin furnace, 3 miles outside the town, with a capacity of turning out 300 tons of pig-iron per week. Pop. of v. in 1870, 583; in 1880, 730.

Mechanicsville, N. Y. See APPENDIX.

Mechanicsville, a village of Va., about 7 miles N. E. of Richmond, which gives its name to a battle fought near by between the Confederate and Federal forces June 26, 1862. On the authority of Gen. Longstreet, Swinton places the loss of the Confederates between 3000 and 4000. The Federal loss was less than 400.

Me'chi (JOHN JOSEPH), b. in London, England, May 22, 1802, was the son of an Italian in the household of George III.; became in youth a clerk in a mercantile house, and afterward set up a cutler's shop; amassed a large fortune by the sale of razor-strops; in 1840 purchased 170 acres of poor land at Tiptree Heath, Essex, where by deep drainage, steam-ploughing, and use of liquid manures he carried on farming at a handsome profit; became in 1856 sheriff of London; alderman 1857-65; author of *Experiments in Drainage* and *How to Farm Profitably*. D. Dec. 26, 1880.

Mechitar. See MEKHITAR.

Mech'lin [Ger. *Mecheln;* Fr. *Malines*], city of Belgium, in the province of Antwerp, on the Dyle. It is the see of the archbishop-primate of Belgium, and has an ecclesiastical seminary and several other educational institutions. Its cathedral is a magnificent edifice erected in the twelfth century, and adorned by paintings of Rubens and Van Dyke. In the fourteenth century Mechlin was one of the manufacturing centres of Europe; its lace manufactures are now the only ones of any importance. Pop. 42,381.

Mecklenburg Declaration of Independence, History of. The text of this document, as well as that of the principal "Resolutions" of May 31, 1775, having been printed under the appropriate heading (see DECLARATION OF INDEPENDENCE, THE MECKLENBURG), it remains to give a historical sketch of the circumstances under which both instruments originated, and to notice the arguments brought against the authenticity of the former.

On Feb. 9, 1775, both houses of the Parliament of Great Britain presented a joint address to the king declaring that a rebellion existed in Massachusetts, and pledging their lives and property to its suppression. The American colonies took Parliament at its word, and proceeded to organize local governments in all quarters. Owing to the infrequency of communications, which were at that time by way of Charleston, S. C., the news did not reach Mecklenburg county until some time in April, when it gave rise to frequent consultations between the leaders of public opinion at Charlotte and vicinity. Among these were Col. Thomas Polk, commander of the county militia; Dr. Ephraim Brevard, a forcible and energetic writer, a graduate of Princeton; and several members of the Alexander family, so numerous in the county. As the result of these conferences a series of twenty resolutions was drawn up, which, starting from the premises of the parliamentary address, inferring therefrom the annulment of all laws and commissions in the province derived from the authority of king and Parliament, proceeded to provide the forms of local self-government by means of a committee of public safety and to determine the rules by which that body should act, subject to the future pleasure of the provincial Congress. They were from the pen of Dr. Brevard, and in the words of Bancroft "were framed with superior skill, precision of language, and calm comprehensiveness." The project being ripe for execution some time in May, Col. Polk called upon the nine companies of militiamen to elect each two delegates, with powers to act according to the urgency of the times; and they accordingly met in the little court-house at Charlotte May $\frac{19}{30}$, 1775.* An eager multitude of spectators from all parts of the county testified to the popular interest, and facilitated a knowledge of popular sentiment. Among those spectators several survived to take a leading part in the semi-centennial celebration of the event in 1825, and to give their testimony to the facts of the case.† Abraham Alexander was chosen chairman, Dr. Brevard and John McKnitt Alexander secretaries or clerks. Col. Polk, Dr. Brevard, Rev. Hezekiah J. Balch, and William Kennon, Esq., addressed the assembly, and the three latter were appointed a committee to report resolutions. The project previously prepared, based upon the "joint address" of Parliament, was discussed and accepted as a practical measure, probably without change. But on the same day news had come up from Charleston of the battle of Lexington; it created intense excitement, and prompted the determination to go beyond the original intention of the movers. After a discussion prolonged far into the night, the meeting adjourned until noon of the following day, instructing the committee to report at that time a formal declaration of independence, which should be transmitted by express to the Continental Congress at Philadelphia. At the appointed time on the following day, May $\frac{20}{31}$, the assembly was reconvened, and the Mecklenburg Declaration of Independence, consisting of six resolutions in the form published in Martin's *History of North Carolina*, was received with enthusiasm, adopted, signed by all the delegates, and read to the expectant multitude from the court-house steps by Col. Polk, along with the previously adopted series of twenty resolutions forming the code for their practical observance. Both documents were despatched to Philadelphia by a special messenger, Capt. James Jack, and by him delivered to Richard Caswell and William Hooper, delegates from North Carolina. The state of affairs at Philadelphia was such that the delegates judged it premature to present so daring a document to a body which still professed its loyalty to the Crown. They therefore wrote a joint letter to the Mecklenburg committee approving their sentiments and explaining the reason of their reluctance to precipitate a crisis. The Declaration was undoubtedly shown to other members, and probably to Richard Henry Lee of Virginia, one of the leaders of Congress, who a year later consciously or unconsciously employed several of its phrases in his celebrated "resolutions of independence," whence they passed into the national Declaration of July 4.

The Mecklenburg Declaration of Independence was not designed for publicity other than such as might be obtained by its presentation to Congress. In form it was expressly passed for the purpose of communication to Congress as the sentiment of Western Carolina on the burning question of independence. Its authors well knew that the Mecklenburg convention was technically incompetent to take a step which could only proceed from an entire State. It is not therefore surprising that while copies of the longer series of resolutions were speedily published in the papers of Charleston and Wilmington, as well as in the Massachusetts *Spy*, the "Declaration" was apparently not circulated. It was known to all the people of Mecklenburg, and its further publicity was referred to Congress; why should its authors gratuitously invoke the rage of the Tories of Central North Carolina and Upper South Carolina? For practical purposes the so-called "by-laws and regulations" were sufficient, yet the imagination was so deeply impressed by the bolder manifesto that in a few years more it was alone remembered. When, therefore, towards the close of the century, Dr. Hugh Williamson, a historian of the State, was collecting documents for his work, he found it necessary to apply to J. McK. Alexander, the surviving secretary. Dr. Brevard, after service in the army and imprisonment at Charleston, had died in 1780 at Charlotte, in the house of his fellow-secretary, to whom he presumably left his official manuscripts. Alexander had furnished at least one other copy from the original record, when it was destroyed by the burning of his house in Apr., 1800. In the same year, being requested to furnish a copy to ex-Gov. W. R. Davies, he attempted to reproduce the document from memory, in which he succeeded to a very considerable degree, though somewhat at the expense of elegance and logical connection. At the same time he appended a certificate of substantial but not verbal accuracy, referring for the exact text to the copy in the hands of Dr. Williamson. J. McK. Alexander died in 1817, without having seen the promised history from the pen of Williamson, which was never extended beyond the year 1771. Nearly fifty years had therefore elapsed, and innumerable histories of the American Revolution had appeared, none of which contained the slightest reference to the Mecklenburg Declaration. Dr. Joseph McKnitt Alexander, son of the secretary, very properly judged the action of the Mecklenburg patriots too important to be condemned to further oblivion, and on Apr. 30, 1819, he published his father's memorandum in the Raleigh *Register*, adding the reference to a more perfect copy in the hands of Dr. Williamson, then still living in New York. Republished throughout the country, this document was the first intimation to that generation of American citizens of an interesting fact of Revolutionary history. It became the subject of correspondence between ex-Presidents Adams and Jefferson, the former accepting, the latter questioning, its authenticity. There was no lack of skepticism; but, fortunately, there still remained a score or more of witnesses of the highest character, who if they could not speak to the exact date and language of the document, gave full confirmation to the accounts of the Mecklenburg convention and its results. Their evidence was obtained and published in due form, and the people and government of North Carolina placed the 20th of May on an equality with the 4th of July in their estimation. A more perfect text had appeared in 1829 in Martin's *History of North Carolina*, derived from a copy made previous to 1800, and its variations from the so-called "Alexander" and "Davies" copies were precisely such as to corroborate the claim of substantial but not verbal accuracy made for the latter. After the year 1830, when the legislature had given the stamp of its authority to the received version of the Mecklenburg Declaration, the question seemed to be for ever settled. It was not until 1837 that an entirely unexpected discovery put a new face upon the subject. The witnesses in their certificates had spoken of only one meeting at the court-house, and remembered as its result only the "Declaration of Independence." It is true that one or two of them had spoken of some "bye-laws and regulations," but they attached no importance to them, while they were very clear and decided in their recollection of the main event. In 1837 a printed copy of the "bye-laws and regulations," dated May 31, 1775, was discovered by the antiquary Peter Force, and other copies were soon found in the State Paper Office in London. This settled the doubt as to the fact of a Mecklenburg convention, and that it had passed a series of audacious resolutions, but they were not a "declaration of independence," and the date of May 31 was thought to disagree with that assigned to the convention. It was therefore argued by several learned as well as undoubtedly patriotic citizens of North Carolina that the document bearing date May 20 is a myth, or, to speak more accurately, an exaggerated travesty of the resolutions of May 31. This argument has been most elaborately presented in the *North American Review* of Apr., 1874, and in a series of articles in the New York daily press April and May, 1875, on the occasion of the approaching Centennial celebration, which took place with suitable ceremony May 20. It is believed, however, that every important argument has been incidentally answered in the above narrative, and that the only real ground of controversy was the supposed discrepancy of dates. It is singular that so protracted a controversy should have been waged without the discovery of the simple solution first propounded during the present year. Yet there can be no doubt that if this mode of reconciliation had been put forward at the outset all controversy would have been spared. The two essential facts of the equivalence of May 20 O. S. with May 31 N. S., and that the correction of the calendar was many years in becoming generalized in the remoter regions of America, are undeniable; and it is only necessary to suppose that the two secretaries followed different reckonings, and the extant copies having all come ultimately from the pen of J. McK. Alexander, the origin of the mistake is obvious. But we have positive testimony of the highest character on this head, which is all the better for being completely unconscious. It has never before been pointed out. Rev. Humphrey Hunter, in some respects the most circumstantial of the witnesses whose testimony remains, said in a memoir written shortly before his death in 1828 that the convention took place on May 20, 1775, and that "on that memorable day I (he) was 20 years and 14 days of age." Elsewhere in the same memoir he stated that he was born May 14, 1755. Correcting the obvious misprint of a 4 instead of a 7 in the latter case, and adding the two dates (17+14) gives as the date of the Declaration May 31. This is a striking confirmation of the theory above advanced, and shows that the writer had made the correction of the calendar in the instance of his own birthday, and had also borne it in mind when he made the calculation of his age "on that memorable day," but had subsequently overlooked the application of the same rule in reducing to N. S. the date of the "Declaration of Independence." It would seem that this unwitting evidence, which in no possible way can be made to agree with any other date, may be accepted as decisive.

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* May 19, Old Style = May 30, New Style. The reformed calendar adopted in England in 1752 was still in a transition state in Western Carolina.

† Rev. Humphrey Hunter, Gen. George Graham, and Isaac Alexander.

(The above was carefully prepared from materials furnished to the editor-in-chief of this work by the late ex-Gov. William A. Graham of North Carolina, and was intended to bear his name after revision, which it was prevented from receiving by his death, which occurred at Saratoga, N. Y., Aug. 11, 1875.) PORTER C. BLISS.

Meck'lenburg-Schwerin', grand duchy of Northern Germany, bounded N. by the Baltic, and E., S., and W. by Prussia. Area, 4834 square miles. Pop. 577,055, chiefly of Slavonian origin, of which they still retain marks in their features. The ground is low and level, dotted with small lakes, and covered with forests. Along the shore of the Baltic the soil is sandy or marshy, but farther inland it is fertile and well suited to agriculture and pasturage. Rye, wheat, flax, and tobacco are raised; cattle and horses are reared, and, especially the latter, are much valued. Cap. Schwerin.

Meck'lenburg-Strel'itz, grand duchy of Northern Germany, consisting of two separate parts—Stargard, between Mecklenburg-Schwerin and Pomerania, and Ratzeburg, between Mecklenburg-Schwerin and Lauenburg. The total area is 1130 square miles. Pop. 100,286. Cap. Neu-Strelitz.

Mecon'ic Acid [Gr. μήκων, the "poppy"], an acid which occurs combined with morphine in opium. (See OPIUM.)

Med'als, large coins not intended for circulation as money, but struck or cast on extraordinary occasions in commemoration of victories, treaties, coronations, or other conspicuous events, or in honor of remarkable persons. The Greeks struck no medals, and the Roman brass *medallions* differ considerably from modern medals, as they represent only political or religious ideas in an allegorical manner, not busts of historical persons. The first medals of modern times were designed by painters and sculptors, made of lead and bronze, and cast in moulds of clay or fine sand taken from models of wax. Subsequently, the art was adopted by the goldsmiths, and medals were made in *repoussé* work or in chasing in the precious metals (Cellini). In the beginning of the sixteenth century medals were made in Germany in boxwood or soapstone, from which moulds were made (Albert Dürer). At the beginning of the seventeenth century Camelio began to cut steel dies; a master-mould or model of raised steel was made, and soft iron dies stamped from it. The oldest medal known is that of David II., king of Scotland, of gold, and made between 1330 and 1370. From the fifteenth century there is a succession of medals down to our time in most European countries. In England it begins in 1480, in Denmark in 1474, in Germany in 1453, in Rome in 1464, in Spain in 1503, etc. The most beautiful series of medals are the papal and those belonging to the reigns of Louis XIV. and Napoleon I.

Med'ary (SAMUEL), b. in Montgomery co., Pa., Feb. 25, 1801; became a printer and Democratic politician; was for many years editor of the *Ohio Statesman*, and afterwards of the Columbus (O.) *Crisis*; was appointed minister to Chili 1855, but did not accept; governor of Minnesota Territory 1857–58, of Kansas 1859–60. D. at Columbus, O., Nov. 7, 1864.

Me'de, town of Italy, in the province of Pavia, situated in a plain abounding in fruit and game. Its silk industry is considerable. Pop. 6209.

Mede (JOSEPH), b. at Berden, England in Oct., 1586; graduated at Cambridge 1610; became a fellow of Christ College; took orders in the Church of England, and spent his life in teaching Greek. D. at Cambridge Oct., 1638. He was well versed in Oriental learning, and wrote several esteemed theological works, of which the best known is the *Clavis Apocalyptica*, published in Latin in 1627, and in English in 1643. It was the earliest English work of any value upon the interpretation of the Apocalypse.

Mede'a [Μήδεια], in Greek mythology, the daughter of Æëtes, king of Colchis. She assisted Jason in getting the Golden Fleece, and became his wife. With him she went to Greece, where she became renowned for her sorceries and her many tragic adventures. Repudiated by her husband, she destroys Glauce, her rival, and slays her own children by Jason. She rejected the love of Zeus, healed Heracles of a mortal illness, and at last became immortal and espoused Achilles in Elysium. Her story is variously told, and has furnished much material for the artist and the tragedian.

Medellin', town in the state of Antioquia, republic of Colombia, South America, in a fertile and beautiful valley at an elevation of 5030 feet above the level of the sea, is well built and carries on a considerable trade. Pop. 13,700.

Medeola, or **Indian Cucumber** [from the sorceress *Medea*], a genus of the natural order Liliaceæ and tribe Trillideæ, consisting of a single species, the *M. Virginica*, called *Gyromia* by Nuttall, a perennial herb with a simple slender stem, clothed with flocculent and deciduous wool, rising from a horizontal and tuberous white root, which has the taste of cucumber, whence the popular name. The scientific name was given from the erroneous notion that this root possesses great medicinal virtues. The stem bears near the middle a whorl of 5–9 obovate-lanceolate and pointed, sessile, lightly parallel-ribbed, thin leaves with netted veins; also another of three much smaller ovate leaves at the top, subtending a sessile umbel of small recurved flowers, which bloom in June. The plant grows chiefly in the rich damp woods of the Central Atlantic States.

Medford, on R. R., Middlesex co., Mass. (see map of Massachusetts, ref. 2–H, for location of county), 5 miles from Boston, contains a public library, and is the seat of Tufts College. Medford rum and crackers are largely manufactured here. Pop. of tp. in 1880, 7573; in 1885, 9041.

Medford, on R. R., cap. of Taylor co., Wis. (see map of Wisconsin, ref. 4–C, for location of county). Pop. in 1880, 504.

Med′hurst (Walter Henry), b. in London, England, in 1796; went to the East in 1816 as a missionary; travelled through India several years; resided at Batavia (Java) eight years (1822–30), laboring also in Borneo; settled at Canton, China, about 1830, and at Shanghai in 1843; spent six years in the interior of China, and d. at London Jan. 24, 1857. He acquired a remarkable knowledge of the Chinese, Japanese, and Javanese languages, translated the Bible into Chinese, edited the *Chinese Repository* (20 vols., Canton, 1838–51), published a *Chinese and English Dictionary* (2 vols., Batavia, 1842–43), and many other linguistic works; wrote an *Account of the Malayan Archipelago*, a valuable work on *China, its State and Prospects, with especial reference to the Diffusion of the Gospel* (1838), followed by *A Glance at the Interior of China* (1850), and translated the Chinese classic called *Shu-King* (1848), besides numerous minor works from the Chinese and other Oriental languages.

Me′dia, a territory of Asia, bordering N. on the Caspian Sea, and bounded on the other sides by Parthia, Assyria, and Persia, corresponded nearly to the present Persian provinces Irak-Ajemee, Azerbaijan, Ghilan, and Mazandaran. The Medes (the *Madai* of Gen. x. 2) were closely allied to the Persians in language and religion, and they distinguished themselves by their horsemanship and their skill with the bow. They came first into notice when attacked by the Assyrians about 830 B. C. The great monarchy established by them dates from 650 B. C., with Ecbatana for its capital. In 625 B. C. their king, Cyaxares, in league with Nabopolassar of Babylon, took Nineveh and overthrew the Assyrian empire. The revolt of the Persians under Cyrus brought the Median kingdom to an end, 558 B. C. The Medes, who originally were a warlike race, are later spoken of as a very effeminate people.

Media, on R. R., cap. of Delaware co., Pa. (see map of Pennsylvania, ref. 6–J, for location of county), 13 miles W. of Philadelphia, is supplied with gas and water and has the Delaware County Institute of Science and good public and private schools. The Pennsylvania Training School for Feeble-minded Children is located about half a mile beyond the borough limits. Pop. in 1870, 1045; in 1880, 1919.

Me′diant [Lat. *medius*, "middle"], in music, the designation of the third above the tonic or keynote. It may be major or minor, and is named from its position as midway between the tonic and the dominant.

Med′ical Electric′ity. Until late years electricity has not been used to any extent as a therapeutic means in the treatment of disease. In the year 1804 and farther back the static form obtained from the large glass friction apparatus was used somewhat empirically, the spark being thrown from the brass balls of the machine. Recent investigations have shown what real value this powerful agent has in many forms of nervous disease, notably in paralysis and neuralgia. Duchesne of Boulogne was among the first to treat patients with the localized induced current, and Remak in Germany employed the galvanic current with equally successful results. Three forms of electricity are employed—viz. the induced current, the galvanic current, and the static current. The two first are examples of dynamical electricity, and the other of frictional electricity. Galvanic electricity, or galvanism, and induced electricity, or Faradism, as it has been called out of compliment to its discoverer, Faraday, are the two modes generally made use of, while frictional electricity is but rarely resorted to. Golding Bird advocated its use while he lived, and Arthius has written a great deal about its merits, particularly in chorea, rheumatism, and the diseases of women. Electro-magnetism, a species of induced current produced by the rotary apparatus, has been the favorite form of treatment among quacks and empirics. Faradism is furnished by an instrument containing a coil of wire surrounded by another, the inner one containing in its centre a bundle of wires or a rod of soft iron. Through these several coils a galvanic current is passed. At the end of the wires in every instrument is a small hammer of soft iron fastened to a spring, and a pole containing a platinum-pointed screw is placed at a short distance from it, opposite the end of the bundle of wires. This hammer breaks the current induced in the coil of wire, and rapidly vibrates, producing shocks. If the wire about the inner coil receives the current, it is *secondary*, but if it passes through *one coil only*, the current is *primary*. The advantages of a perfect instrument are the following: It should be made to furnish slow or rapid shocks; the wire of the coils should be fine enough to offer such resistance to the current as to give a "*fine*," *strong* induced current. The galvanic current is obtained from a series of cells sufficient in number to give a current of *tension*. Tension is the resistance offered to the passage of a current. One cell supplies a current, the poles of other cells being alternately joined, and there are finally but two terminal poles. We find that as the current from the original cell passes through the cells which follow, its *tension* or power is increased, and the effect is appreciable to a greater or less degree in proportion to the number of cells included in the circuit. *Quantity* is another variety of the galvanic current. A current of *quantity* is furnished by a large surface of metal in the battery-cell, while *tension* is the product of a number of small metal plates. One large cell may give the quantity which twenty smaller cells would not furnish. The *tension* or *intensity* current is that which serves us the best for medical purposes, while the *quantity* current, which furnishes heat, is adapted to the purposes of electro-surgery, which will be presently described.

The best galvanic cell for medical purposes is the Bunsen, which has been adopted by Stöhrer of Dresden, and the Grenêt, a modification of the latter, is that most commonly used. The Siemens and Halske cell is now employed to a great extent. It consists of an outer cell of glass with elements of zinc and copper, a diaphragm of porous earthenware and a diaphragm of papier maché between the solutions. The static current may be furnished by the Holtz electric machine, which is undoubtedly the best. The Ruhmkorff coil has recently been used, one wire only being brought in contact with the patient, the air forming the other conductor. A spark having all the peculiarities of the ordinary friction spark will be produced.

For the application of electricity to the body we make use of various appliances called *electrodes*. These are either sponge-covered or present a polished metallic surface to the skin. Some have sponges of different sizes for the face or smaller parts of the body, and large ones for the trunk and limbs. For active effect the metallic electrodes are the best. Neuralgias are best treated by these, either bare or covered by a piece of buckskin. The points of Duchesne consist of two cones of metal attached to handles. The sensation upon the skin is like that associated with the entrance of many small needles. The electric brush is often used to restore diminished cutaneous sensibility. It consists of a number of fine wires bound together in a handle. This electrode, as well as the other metallic ones, are used upon the dry skin. Various double electrodes and electrodes for special parts, such as the eye, uterus, and bladder, are employed in different cases. The galvanic battery should include appliances for breaking the current, reversing it, and increasing or diminishing its intensity. New and improved apparatus contains adjustments for the production of shocks and varying intermittent discharges. A galvanometer is very useful to the electro-therapeutist.

Rational electro-therapeutics should be based upon electro-physiology, and the German and French observers have experimented the most, consequently their results are most perfect and reliable. Remak, Dubois-Reymond, Zeimssen, Onimus, and Le Gros, Brenner, Benedikt, and Erb stand in the front rank as authorities. In this country and England electro-*therapeutists* predominate, and, sad to say, electro-physiology has not received the attention it has demanded. Morgan, whose untimely death has robbed us of one of the most promising scientists of this day, gave to the world a work of very great value which remains as a monument to his greatness.

Certain facts have been evolved from the labors of the workers in this field, and I will briefly allude to them. We have been taught that a motor nerve, when stimulated by an electric current, is followed by a contraction of the muscles it supplies. Strong currents, uninterrupted, produce an activity in motor nerves, but if these currents be rapidly interrupted or broken, the contractions of the muscles will be stronger, and the force of the excitation in proportion to the rapidity of the alterations in the motor stimulation. The theory of *electrotonus* is based upon the following facts: If a portion of a motor nerve is included between the poles of a galvanic battery, it is said to be *polarized*, and in a state of "electrotonus." At the positive pole the irritability of the nerve is diminished, while at the negative it is excited and more susceptible to stimulation. The condition at the positive pole is called *anelectrotonus*, and that at the negative, *catelectrotonus*. The positive pole is known as the *anode*, the negative the *cathode*, and these give the names to the states described. A nerve is said to be *tetanized* when the muscle supplied is thrown into a state of permanent tetanic contraction by a rapidly intermitting current. The passage of a number of these shocks for some time will diminish the irritability of the nerve to such an extent that finally there will be no further response. This is a valuable fact to consider in connection with electro-therapeutics. An ascending current causes a greater irritability in a nerve than a descending one; a descending one depresses excitability. The stimulus is felt at the negative pole when the current commences, and when it is broken it is felt at the positive pole. Greater sensation is felt at the negative pole. Pfluger has shown that a shock is felt at the *opening* of the weak currents; with moderately strong ones, it is felt both at the opening and the closure. With very strong currents it is impossible to tell the points of sensation, as the power of the nerve is impaired.

Brenner's theories, upon which he has based his treatment of deafness, are dependent upon the fact that "when one pole is placed near a nerve and the other at a distance, the nerve obeys the nearer pole"—that the auditory nerve will obey the pole placed upon the mastoid process or in the meatus. No effect is produced by the other pole held in the patient's hand. If the negative pole is placed against the ear, the current is "ascending"—if the positive, "descending." The action upon voluntary muscles themselves is very much the same so long as the integrity of their immediate nerve-supply is concerned. Involuntary muscles respond less quickly. There are various degenerations and atrophies of muscles which interfere to a great extent with their susceptibility to electric currents. It is, then, well in disease to endeavor to pass the current through the nerve-trunk which supplies them.

The action of the faradic current upon the surface of the body is but local. It does not affect the deeper muscles nor nerves. Its action upon the skin is its characteristic property. When an electrode is applied to the moistened skin it is followed by prickling sensations, attended by redness and tingling. The faculty of perceiving sensation by the cutaneous nerves and muscles has been called the *electro-muscular sensibility*. The sensation produced by the galvanic current is one of warmth, like that which always follows the application of local stimulants, such as liniments or a mustard plaster. When the faradic current is applied to the skin previously dried, or when the electrodes are lightly brought in contact with it, there is appreciable pain produced. Cutaneous sensibility is more exaggerated by rapidly succeeding shocks from a faradic instrument than by slow ones. The galvanic current produces deeper impressions than the faradic. It likewise produces electrolytic changes which do not follow the use of the faradic. Another feature of the galvanic current is its property of producing absorption and changing the structure of different tissues of the body. The effects of the galvanic current upon various parts of the body may be briefly enumerated as follows: The application of the electrodes of a battery of moderate strength to any part of the head or face will be attended by the occurrence of flashes of light appreciated by the individual, a metallic taste, giddiness, dizziness, and a peculiar sensation at the root of the nose. The passage of a galvanic current through the bones of the cranium has been doubted by Cyon and other writers, though numerous other physiologists, Zeimssen and Erb among them, agree as to its feasibility.

The passage of such a galvanic current, according to neuro-therapeutists in general, is followed by beneficial results in many diseases of the brain. When we apply the galvanic current to the great sympathetic nerve, placing one pole upon the upper part of the sternum and the other behind the angle of the lower jaw, we bring this nerve under the galvanic influence. The first evidences of "galvanization of the sympathetic" are dilatation and subsequent contraction of the pupil. The pulse diminishes in frequency, and the tension of the carotid arteries is lowered. Electricity is used for the purpose of diagnosis. By it we may detect local tenderness, exalted sensibility, or their opposite conditions, anæsthesia and paralysis. We may ascertain whether there is disease of the nerve-centres, the brain, or spinal cord—whether a paralysis is of recent date or long standing. We may settle the question of doubtful death; we may also detect malingering. There are several important physiological facts to be taken into consideration—the function of muscles or nerves, their loss of contraction and sensation, or the reverse; and as various nervous diseases are associated with these conditions, we are enabled by electricity to determine the extent of such changes. A reference to a few morbid conditions will make these facts more clear. The existence of some recent disease of the brain will be characterized by increased muscular contractility oftentimes when there is paralysis of the muscles. Certain local paralyses, or central diseases attended with atrophy of the muscles or disease of some part of the nerve, destroying its conductivity, are associated with loss of reaction. In the application of the electric currents it is very necessary to bear in mind the anatomy of the parts affected; thus, for neuralgia of the fifth nerve we must apply one pole as near as possible to the emergence of the nerve from the cranium, and the other pole to the remote parts of distribution. In sciatica it is of importance to place one electrode over the sacro-sciatic notch, where the great sciatic nerve leaves the pelvis. Groups of muscles may be acted upon through special nerves supplying them. Many of the internal organs may be influenced through the sympathetic nerve.

We use galvanism and Faradism for the relief of pain and spasm, for the improvement of the nutritive processes, to restore lost muscular power, for stimulation of sensation in peripheral or deep nerves, for stimulation of secretion, to affect the organs of special sense, to influence circulation by means of the vaso-motor system, to produce absorption of fluids, morbid tissues, and deposits, to procure sleep, and in the form of the galvano-cautery for surgery. We employ both forms of current in the treatment of paralysis, the galvanic perhaps being the most important for paralysis from central diseases. The galvanic current is used at the nerve-centres, and the faradic upon the peripheral muscles. There are many cases of paralysis in which faradic currents will produce no muscular contraction, while the galvanic current will be followed by vigorous contractions of the muscles. In cases of this kind (lead paralysis is an example) we begin treatment with the galvanic, and afterward use the faradic. Local paralyses are best treated by the faradic current. Those conditions that are called *atrophic*—*i. e.* wasting—common forms of which are infantile paralysis, progressive muscular atrophy, and adult spinal paralysis, are cases for the galvanic treatment. Vaso-motor ataxia and other forms of sclerosis of nerve-tissue are treated by galvanism, and for cerebral hæmorrhage, commonly called apoplexy, we use both forms. The use of electricity in the beginning is injudicious, as there is considerable irritability of the brain and rigidity of the muscles. After two or three weeks, galvanization of the brain is to be commenced, and faradization of muscles. A general rule may be laid down in all paralyses. This is: Use the faradic current at first, and if no contractions are produced in the muscles use the galvanic. It will be found in most instances that after a few weeks' use of the galvanic, the faradic will begin to produce contractions. The application should be made three times a week, each *séance* lasting fifteen minutes at least. The forms of paralysis from all causes, whether they be from pressure, from injury, or from rheumatism, may be treated successfully. Paralyses of special parts are treated by differently shaped instruments. There are electrodes for applying it to the vocal cords, to the muscles of the orbit, to the ear, and Reliquet has devised an apparatus for applying it to the bladder. A very important class of cases calling for treatment is that which includes neuralgia and other nervous diseases symptomatized by pain. We may either apply it to a nerve-trunk or directly to the skin.

The galvanic current is the most appropriate for the *mediate*, and faradic for the *immediate* application. The faradic current is of great use for many of the headaches, particularly those of a rheumatic character. Galvanism asserts itself most favorably in neuralgia of all kinds. It is indicated particularly in sciatica, tic douloureux, spinal irritation, and a number of other conditions attended by pain. Forms of hysteria are particularly under the control of galvanism. Writers' cramp and chorea are benefited to some degree by both currents. Obstinate constipation and many diseases of women are improved by electrical treatment. "Galvanism of the cervical sympathetic," as it has been somewhat improperly called, effects many beneficial changes from diseased states resulting from disturbance of the nutritive processes, particularly in some forms of dyspepsia, or hyperæmia of different parts of the body. Little can be said of its value in the treatment of skin diseases. Electricity has produced very few authenticated cures, and those reported are undoubtedly due for the most part to other remedies (or galvanism only so far as it proved of use as a general tonic) and disappearance of the causes. Electricity has been used by Simpson, Thomas, Dubois, Murray, and Allen in obstetrics for the production of uterine contractions. A most important use of electricity is its application for the production of absorption of morbid products in different parts of the body.

When the two poles of a galvanic battery are connected with needles, and these needles thrust into the tissues of the body, a process goes on which has been called *electrolysis.* At the *negative* pole bubbles of hydrogen gas are disengaged, which separate mechanically the surrounding tissues and break them down, so that the disintegrated particles may be taken up in the circulation. At the *positive,* oxygen is disengaged, which forms an acid with certain elements of the tissue, and the albumen is coagulated, forming a clot if this happens in a cavity filled with blood. With this mode of treatment the physician is enabled to disperse a great many forms of tumors, among them aneurism, and even goître.

A platinum wire placed between the poles of a powerful battery possessing the requirement of sufficient *quantity* will become in a very few minutes white hot. Such wires properly adjusted in handles may be used in place of the knife or écraseur in many surgical operations. It is particularly of service in deep cavity operations, where the use of the knife is impossible. The galvanic cautery is unattended by pain or hæmorrhage. Its cuts are covered by perfect cicatrices, and it is very valuable in certain uterine operations. Care must be exercised by all persons who use electricity and are not experienced, to avoid applying strong currents to the head. It is unadvisable to use it for over ten or fifteen minutes at a time, and then very carefully.

ALLAN MCLANE HAMILTON.

Medical Jurisprudence. See JURISPRUDENCE, MEDICAL, by PROF. JOHN ORDRONAUX, M. D., LL.D.

Me'dici, a famous Florentine family, who early became prominent in public affairs, figuring largely in the fourteenth century. They were merchants. COSIMO DE' MEDICI, the Great, b. 1389, was the son of Giovanni, gonfaloniere of Florence, and by his liberality, urbanity, and prudence won great influence with the people, but avoided the appearance of power, being content with the substance. He adorned Florence with splendid public buildings, patronized art, and d. Aug. 1, 1464, and after death was honored as *pater patriæ.*—His grandson, LORENZO THE MAGNIFICENT, b. Jan. 1, 1448, was the splendid patron of Greek learning and of all the liberal arts, being himself no mean poet. He brought Florence to a great pitch of opulence and power, and, notwithstanding the hostility of Pope Sixtus IV., exercised a great influence throughout Italy. D. Apr. 8, 1492.—His son, Pope LEO X., did much to advance the fortunes of his family. (See LEO X.)—COSIMO, b. June 11, 1519, the first grand duke of Florence, was a successor of Alessandro (1510–37), the subverter of Florentine liberty, who was himself an illegitimate son by an African slave. Cosimo was declared grand duke by Pius V. 1569, and d. Apr. 21, 1574. The grand ducal line of the Medici family ended in 1743 with Jean Gaston de Medici (1671–1737), but the princely line of Ottajano, the ducal house of Sarto, etc. have perpetuated the name till our times. The popes Leo X. and XI. and Clement VII., Queens Catharine and Marie de Médicis of France, some eminent cardinals and dukes of Urbino, were also of this family. (See CATHARINE DE' MEDICI and MARIE DE MÉDICIS.)

Medici'na, town of Italy, in the province of Bologna, about 28 miles from Imola. It is substantially built, with an artesian well in one of its squares, and was once surrounded by walls, now destroyed. Antique objects of interest are often found in its vicinity. Pop. 11,355.

Med'icine [Lat. *medicina,* from *mederi,* to "heal"], the art and science of curing disease. Its origin is obscure, but dates back to the early existence of the human race, coincident with the liability to injuries, sickness, and processes of decay. Medicine in its primitive state comprised a recognition of the relative virtues of different articles of food, an empirical use of medicinal herbs and roots, and superstitious rites. For ages it was merely traditional usage in families or communities. Hence it was practised, as it is to-day in barbarous tribes, by the local chiefs. Superstition ascribed disease to evil spirits or to the displeasure of divinities, and reverenced the gifted physicians as superhuman. Temples were erected to their worship, whose priests were guided in their treatment by invocation of the oracle. The profession thus became a sacerdotal order, within which acquired knowledge of medicine was preserved and secretly transmitted. The Chinese have practised and written of medicine in the remotest ages, but without intelligence or method, being possessed only of a vast collection of extravagant empiric formulæ. The Hindoo practice has always been simple, restricted to a knowledge of dietetics, hygiene, and mild antiphlogistic measures. The methodical study of medicine began in the fabulous age of Egypt. Isis or Orus, the Hermes of the Greeks, was the god of medicine. At first, the method pursued was to expose the sick by the wayside, that passers-by who had suffered from similar maladies might recognize them and declare the means of cure. Herodotus tells us that the Babylonians, Chaldæans, and other nations had no physicians, but followed this same custom. But later, in Egypt, the sick were required, upon recovery, to go to the temple and record on tablets their symptoms and remedies. The temples of Canopus and Vulcan were the repositories, and a skilled priesthood arose which framed a code controlling public hygiene, individual regimen, and the treatment of disease. Thus, far back in a period of mythology Egypt possessed a store of medical knowledge, had able surgeons, many devoted to the study and pursuit of a single specialty, as lithotomy, and remedies bearing the name of Isis and Osiris down through subsequent Grecian, Roman, and early Christian centuries. The early medicine of Greece is legendary. Æsculapius, instructed in the healing art by Chiron the Centaur, became so skilled that he incurred the displeasure of Pluto, and was stricken by a thunderbolt from Jove. He became the god of medicine, temples were erected bearing his name, and the officiating priesthood were designated the Asclepiadæ. The sons of Æsculapius, Machaon and Podalirius, accompanied the Greeks in the Trojan war, and their skill has been immortalized in the songs of Homer. Hygieia, the goddess of health, and Hercules, reputed to cure epilepsy — the "sacred disease" or "disease of Hercules"—were also worshipped. The practice of the Asclepiadæ was simple. The temples were located in salubrious places, their interior purified by burning fragrant incense and secret remedies. Thither the sick were brought for treatment. Recourse was had to baths, gymnastics, mineral and thermal springs, and the use of unctions. Remedies were prescribed by the oracle and skill of the priesthood. Votive tablets inscribed with records of the disease and cure were deposited within or placed upon the columns and gates. Pythagoras and the sect which took his name supplanted the Asclepiadæ. They promulgated the knowledge, before a secret, sought the philosophy of disease, but confined their treatment to dietetics and hygiene. The Pythagoreans declined about 500 B. C. Hippocrates was b. in the year 460 B. C., and d. in 357 B. C. He is known as the "father of physic." He was descended remotely from the Asclepiadæ through a long line of physicians. He developed a system of theories on disease and medicine which has given to his school and period of practice the title "dogmatic." He acquired anatomy by dissection of animals, and was skilled in surgery. His study of symptoms and diseases was careful and accurate; he recognized stages and crises in disease; he relied upon the power of Nature, which he termed "first of physicians;" stimulated when Nature failed, moderating when her forces were excited. His remedies were mainly vegetable and dietetic. His works were numerous, chief of which are *The Prognostics, Aphorisms, On Epidemics, Regimen in Acute Disease.* Hippocrates made great and permanent contributions to medicine by his descriptions of disease. With the founding of the Alexandrian Library (320 B. C.) the Alexandrian school began. Most celebrated were Erasistratus and Herophilus. The latter was an anatomist, studied the nerves, the brain, and to this day his name is retained connected with its circulation, the confluence of venous sinuses being termed the "torcular Herophili." Two Alexandrian schools of medicine flourished successively — the "Empirical" of Philenus and Serapion, who renounced "dogmatism" and relied only on experience, and the "Methodists," whose influence extended over Greece, thence to Rome, and lasted for at least two Christian centuries. Methodism asserted that the body was permeated in health by atoms which entered from without and moved freely in every part and direction of the organism. Disturbances of this perfect relation by constriction or relaxation were states of disease, and all medication was therefore by astringents or relaxants.

Medicine was introduced into Rome from Greece 200 B. C. Asclepiades, who practised at Rome 100 B. C., was a Methodist. Chief among Roman physicians was Celsus, "the Cicero of medicine," great as a surgeon and scholar, whose work, *De Medicina,* in 8 books, is a record of medical knowledge down to his time. Claudius Galen, known as Galen, by his teachings and writings so influenced medicine that he was esteemed infallible authority for fully twelve centuries. He was b. at Pergamos A. D. 130, but lived and practised at Rome. He is reputed to have written 200 distinct treatises, upon every subject then known in medicine. He was educated at Alexandria, and his knowledge of anatomy was matured by dissection of animals. He was a "Humoralist," regarding disease as due to putridity of the "four humors"—blood, phlegm, bile, and black bile. The Methodists, on the other hand, found disease only in the tissues, and were known as "Solidists." So long as medicine was swayed by theories, the conflict of "Humoralism" and "Solidism" was constantly revived. Chief among Galen's works are treatises *On the Use of the Different Parts of the Body, On Temperaments, On the Seat of Disease, Methods of Cure.* During the Dark Ages medicine declined in Europe, but was preserved and advanced by the Arabian school, which dominated from the ninth to the end of the fourteenth century. Symptoms were studied, new diseases described, Galen's works were translated and commentated, rendering famous the names of Rhazes, Avicenna, Albucasis, Avenzoar, Averrhoes, etc., and drawing the students of the whole continent to the renowned Spanish schools of Cordova, Seville, Toledo, and Saragossa. Renourd in his *History of Medicine* styles the subsequent period, from the close of the fourteenth century to the present, the "age of renovation." Medicine, thus far an art based upon experience and biassed by erroneous theories, now began to advance by successive discoveries in anatomy, physiology, and pathology to the standard of a science. Printing ensured the dissemination of each progressive step. The Italian schools succeeded the Arabian. Mondini of Bologna dissected before the class in 1315, and wrote imperfectly on anatomy. To Andreas Vesalius, professor at Padua, who published his great work in 1543, anatomy owes its origin and permanent impetus. Vesalius was followed by Eustachius, Fallopius, Sylvius, Pacchioni, and others whose names now exist in anatomical nomenclature. In A. D. 1622, Aselli of Milan described the lacteals; in 1628, Harvey announced the circulation of the blood; in 1661, Malpighi of Bologna detected the movements of the red blood-globules; in 1690, Leeuwenhoek of Delft demonstrated the capillaries. The researches of Vieussens, Haller, Meckel, and Scarpa, the separation of the cerebro-spinal and ganglionic nervous systems by Bichat, the treatise of Sénac (in 1749) on the action and diseases of the heart, of Avenbrugger (in 1761) on percussion of the chest, the first work on pathology by Morgnani in 1762, the recognition of nerve origins, of the ganglia, and different faculties in the brain by Willis and others, the writings of Sydenham and Huxham, the discovery of vaccination by Jenner in 1796, are a few of the very many scientific truths which warrant us in speaking of medicine as a science. The status of medicine was again elevated. The barber-surgeons of Paris were abolished by law in 1743, at London in 1745. Clinical teaching was inaugurated at Padua in 1758. Schools of medicine were established in England, France, and Germany. During the nineteenth century this devotion to the development of technical and scientific investigation, rather than to speculation, as the true basis of the treatment of disease, has steadily increased, and warrants the belief that we are erecting a system of scientific medicine. It has also been designated an age of "rational empiricism" in medicine, since skill in treatment is largely cumulative from past experience, yet rendered intelligible and certain by a clear discernment of the laws of life, of the functional activities which constitute health, and of their perversion in disease. Histology, physiology, microscopy, micro-chemistry, pathology, physiological medicine, pharmacy, and therapeutics are fields of incessant work and progress. The physical exploration of the chest, the study of Bright's disease, the cellular pathology, the elaboration of the specialties, are some of the many results. Correct and intelligent diagnosis is sought as the only substantial basis for the treatment of disease. E. DARWIN HUDSON, JR.

Medicine Lodge, city, cap. of Barbour co., Kan. (see map of Kansas, ref. 8–E, for location of county). Pop. in 1880, 373.

Med'ick [Gr. Μηδική, so called because they were believed to be natives of Media], a name for several leguminous herbs of the genus *Medicago*, resembling clover, and often cultivated, especially in Europe, as forage-plants. Several species are naturalized in the U. S. from Europe; others are cultivated as ornamental plants. (See LUCERN.)

Medill' (JOSEPH), b. in New Brunswick, near Maine, Apr. 6, 1823; removed in childhood to Massillon, O.; studied law; founded in 1849 a "Free-Soil" paper at Coshocton; established at Cleveland in 1852 a Whig paper, the *Forest City*, which in the following year was merged in the *Leader;* was in 1854 one of the organizers of the Republican party in Ohio; went to Chicago soon after, and with two partners bought in May, 1855, the *Tribune*, a paper with which he has since been identified. He was in 1870 a member of the Illinois constitutional convention, and was the author of the minority representation clause; was appointed in 1871 a member of the U. S. civil service commission, and elected mayor of Chicago. He spent a year in Europe (1873–74), and on his return purchased a controlling interest in the *Tribune*, of which he became editor-in-chief.

Medill (WILLIAM), b. in 1805 in New Castle co., Del.; studied law; was admitted to the bar of Ohio in 1832; was often in the State legislature, and twice chosen Speaker; was in Congress from Ohio 1839–43; first assistant postmaster-general 1845–49; then commissioner of Indian affairs; chairman of the State constitutional convention of 1850; lieutenant-governor of Ohio 1851–53; governor of Ohio 1853–56; and was first comptroller of the treasury under Pres. Buchanan. D. at Lancaster, O., Sept. 2, 1865.

Medi'na, city of Arabia, in the province of Hedjaz, 250 miles N. of Mecca and 132 miles N. E. of Jemb, or Yambu, its port on the Red Sea. It is situated in a fertile and well-watered valley on the eastern slope of a lofty mountain-range, and is surrounded with high stone walls flanked with towers and defended by a strong castle. It is a handsome and well-built town, consisting of two-story houses, generally built of brick, surrounded with gardens and provided with wells. Its importance is derived from its mosque, which contains the tomb and mausoleum of Mohammed, and is annually visited by more than 50,000 pilgrims. The mosque is a large but irregular building, like that of Mecca, but the mausoleum itself, about which so many fables have been told and exploded, has never been seen by any European. Mohammed fled to Medina in 622, and d. there in 632 A. D. Accordingly, it is regarded by Mohammedans generally as quite equal if not superior in sanctity to Mecca. The inhabitants are not unlike those of Mecca, though of a more sedate character. The city has no manufactures and only an unimportant trade. Pop. 18,000.
R. D. HITCHCOCK.

Medina, Orleans co., N. Y. (see map of New York, ref. 4–D, for location of county), on the N. Y. Central and Hudson River R. R. and the Erie Canal, has 2 academies, flouring-mills, pump- and agricultural tool-factory, and carriage-factories. Pop. in 1870, 2821; in 1880, 3632.

Medina, on R. R., cap. of Medina co., O. (see map of Ohio, ref. 2–G, for location of county), has a normal school, a union school, several flour-, saw-, and planing-mills, an iron-foundry, and other manufactories. Pop. in 1870, 1159; in 1880, 1484.

Medi'na-Sido'nia, town of Spain, province of Cadiz. It was built by the Moors, is situated on a steep eminence surrounded by walls, contains a fine Gothic cathedral and a magnificent castle, and has a grand and imposing appearance; it is, however, a gloomy and comparatively an insignificant town. Pop. 12,397.

Mediterra'nean Sea, The, is the large sea bounded by the continents of Europe, Asia, and Africa, 2200 miles long, 1200 miles broad between Tunis and the Bay of Sidra, and covering an area of 977,000 square miles. It has a very irregular shape, forming many gulfs, as those of Lyons, Genoa, Taranto, Lepanto, Koron, Kolokythia, and Salonica on the shores of Europe; on the shores of Asia, Adramyti, Smyrna, Adalia, and Iskanderun; on the shores of Africa, Sidra and Cabes; and bearing different names in the different localities—as, for instance, the Tuscan, Ionian, Adriatic, and Ægean seas. Its depth in the Strait of Gibraltar is 5500 feet, but on the line between Sicily and Cape Bon in Africa only 200 feet, in some places even not more than 40 feet. It communicates E. with the Black Sea through the Strait of Constantinople, and W. with the Atlantic through the Strait of Gibraltar, through both of which the water steadily pours into it in rapid currents. It also receives the waters of several large rivers, the Ebro, Rhone, Po, and Nile. But a much greater evaporation takes place in the Mediterranean than in the Atlantic or in the Black Sea, owing to the hot winds which blow over it from Northern Africa, while the Pyrenees and the Alps prevent the cold winds from Northern Europe from reaching it. The temperature of the Mediterranean is about 3° 05′ F. higher than that of the Atlantic, and on account of this more rapid evaporation its water contains about one-sixth of 1 per cent. more salt than the water of the Atlantic. There is very little tide, owing to the narrowness of the strait which connects it with the ocean. The prevailing winds are in spring S. E. and S. W., and during the rest of the year N. E. and N. W.; they often rise suddenly and blow with great violence. (See *The Mediterranean* (1854), by Rear-Admiral William Henry Smyth.)

Med'lar [Ang.-Sax. *mäd*], the fruit of *Mespilus Germanica*, the medlar tree of Asia and Europe, belonging to the order Rosaceæ. This is a small, sometimes thorny shrub, which is often cultivated. There are many varieties. The fruit is not eaten until over-ripe. The Japan medlar is usually known by the Chinese name of LOQUAT (which see).

Med'ley (JOHN), D. D., b. in England in 1804; graduated at Wadham College, Oxford, in 1826 with honors; was several years vicar of St. Thomas's, Exeter, prebendary of the cathedral, and in 1845 was consecrated first Anglican bishop of the see of Fredericton, comprehending the province of New Brunswick.

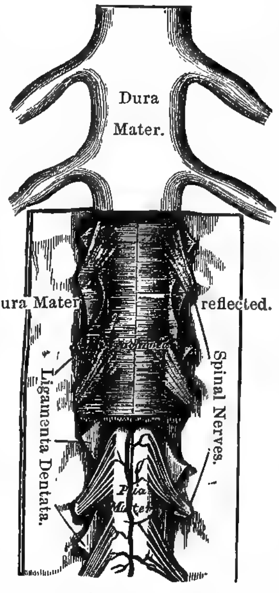
Medoc is the name of a district of France stretching along the Gironde, from Ambés to Lesparre, about 40 miles long and from 5 to 12 miles broad. It is wholly occupied with vineyards, which produce the most famous kinds of Bordeaux wine.

Med'ows (Sir WILLIAM), K. B., b. in England Dec. 31, 1738; entered the army in 1756; served with distinction in Germany 1760; came to America in Sept., 1775, with the 55th regiment; afterwards commanded the 1st brigade of grenadiers, distinguishing himself on several occasions; was wounded at Brandywine and at the capture of St. Lucie 1780; was made colonel of the 89th regiment, and sent as major-general to India 1781; was governor of Madras 1790–92; led the right wing of Cornwallis's army at the siege of Seringapatam 1792, where he displayed great courage and ability; became lieutenant-general Oct., 1793; was governor of the Isle of Wight for some years, and commander-in-chief in Ireland 1801–03. D. at Bath Nov. 14, 1813.

Medulla Oblongata. See BRAIN, by PROF. HENRY HARTSHORNE, M. D.

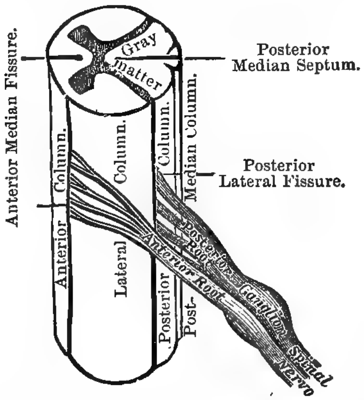
Medul'la Spinal'is [Lat.]. *Anatomy.*—The medulla spinalis, or spinal cord, is that part of the central nervous system which is enclosed in the spinal canal, extending from just below the foramen magnum, at the base of the skull, to a point between the first and second lumbar vertebræ. It is a rounded, cordlike mass of nervous matter, continuous at its upper end with the medulla oblongata, and terminating below in a conical extremity. In this long (16–17 inches) course it gives off thirty-one pairs of spinal nerves, by means of which it is placed in communication with the whole of the body below the head. It is enclosed by three membranes, which lie within the bony canal of the spine—the dura mater, arachnoid, and pia mater. The structure and general arrangement of these membranes do not essentially differ from those of the same envelopes around the brain. One or two peculiarities are worth noting. The dura mater has a firm attachment to bone at its upper end, at the edge of the foramen magnum of the skull. From the sides of the spinal cord, or from the pia mater covering it, there spring very numerous little processes of strong membrane having the shape of teeth of a saw, whose sharp points are attached to the inner surface of the dura mater, thus holding up the spinal cord within the sheath of the dura; this is the ligamentum dentatum. (See Fig. 1.) Between the dura and arachnoid there is only present a little lubricating fluid, while under the arachnoid, in the meshes of the pia mater, as in the brain, lies the cerebrospinal fluid, in considerable though changing quantity.

FIG. 1.



The spinal cord itself, like the other nervous centres, consists of the following elementary parts: a basis-substance (neuroglia) of fibro-connective tissue, bloodvessels, ganglion-cells, nerve-fibres with myeline, and others without. The special grouping of these elements gives form and character to different parts of the spinal cord. In general terms, it may be said that the spinal cord is made up in its central parts of gray matter—*i. e.* ganglion-cells of different sizes peculiarly grouped, with nerve-fibres, bloodvessels, and delicate basis-substance; and in its outer peripheral parts of white matter—*i. e.* more or less coarse basis-substance, supporting nerve-fibres with myeline, and containing bloodvessels. If we look at a spinal cord whose membranes have been stripped off, we observe the following appearances on its external surface: The cylindrical shape of the organ is made irregular by two swellings, uniform and gradually formed, in that part of the cord lying in the middle cervical and in the lowest dorsal vertebræ—the so-called cervical and lumbar enlargements. On the whole of the front surface of the cord there runs a line or deep mark, which after the removal of the pia mater is seen to be a real fissure or crack, penetrating quite deeply, separating the organ into two equal halves. This, the anterior median fissure, is in life filled by the pia mater and the anterior spinal artery and branches. On either side of the anterior median fissure very numerous delicate bundles of nerves arise from the spinal cord; these are the anterior roots of the spinal nerves, whose deep connections we shall presently learn. Turning the spinal cord over, we notice that the median line is not by any means as distinct behind as in front, and it is impossible to demonstrate a fissure without lacerating the tissue; the separation between the halves of the spinal cord posteriorly is a permanent incorporated extension of the pia mater, and is called the posterior median septum. On either side of this are arranged the posterior rootlets of the spinal nerves, in the same manner as the anterior. These two kinds of roots (which are physiologically distinct) pierce the dura mater, conjoin and mingle, escaping from side openings between the vertebræ, and receive the name of spinal nerves. Just before joining the anterior root the posterior exhibits a swelling—the ganglion of the posterior root. At the upper part of the spinal canal the spinal nerves issue from the spine at a point not much lower than their origin in the cord, but in the lower regions the nerves make a very acute angle in their course downward to their canals of exit. The structure of the central gray matter can best be studied in transverse sections of the organ. (See Fig. 2.) Such a section shows the white substance covering in the gray matter everywhere, except at a very narrow point behind where the gray matter reaches the pia mater. This piercing of the white substance by the gray enables us to divide the white substance into two unequal masses on each side—the smaller behind, between the point of gray matter and the posterior median septum, being called the posterior column (as it extends the whole length of the organ); the larger part, filling up the space in front of the point of gray matter, and extending to the bottom of the anterior fissure, is the antero-lateral column. The gray matter is irregularly developed in the cord, forming a figure not unlike a rough letter H, whose forward arms are club-shaped. The lateral pieces of the H constitute the horns of the gray matter; the connecting bridge is known technically as the gray commissure. The anterior horns are larger, more rounded than the posterior, and are differently constituted. In them (much more largely developed in the cervical and lumbar enlargements of the cord) are the largest ganglion-cells known, which present a multitude of delicate branching processes, and one short round nonbranching process. The former ramify in the gray matter; the latter is continuous with a nerve-fibre which, traversing the anterior white column, issues externally as an anterior rootlet. Thus, it is likely, are all anterior nerves connected in the anterior horns. In the cervical and lumbar parts of the cord these ganglion-cells are very numer-

FIG. 2.



ous, and fill up the anterior horns. In the cervical and upper dorsal region we meet, besides, with an accumulation of smaller ganglion-cells in the middle of the side of the gray matter, nearly on a level with the commissure. In the posterior horns very few ganglion-cells are seen, and those which exist are oval, with few processes. The posterior nerve-roots do not, as far as we know, communicate with these ganglion-cells; the rootlets enter the white matter a little to the inner side of the point of the posterior horn, and send fibres in several directions—into the posterior horn, upward and downward in the posterior column. The central parts of the spinal cord consist of an anterior commissure, lying at the bottom of the fissure, and composed of nerve-fibres with myeline. Just back of it is a quantity of basis-substance in which there is a round or oval hole lined by columnar epithelial cells, or filled up by their *débris*—the central canal of the spinal cord. This canal extends from the lowest end of the cord to the fourth ventricle in the medulla oblongata, and is visible only to the microscope. Behind this is the transverse connecting band of gray matter, the posterior commissure. This summary description applies to the higher Vertebrata as well as to man.

Physiology.—During the first twenty-five years of this century the spinal cord was looked upon as a bundle of nerves extending from the brain to the external parts—the spinal nerves gathered up into a sheaf, as it were. The brain sent nervous force through the passive cord to the muscles. Researches made previous to this time (Prochaska, Legallois, and others) had already shown that the spinal cord possessed energy of its own. In the last forty years this organ has been clothed with all the attributes of a high nervous centre, and some have even gone so far as to admit that it possesses volition and consciousness. These two attributes are not by any means proved to be truly spinal. Leaving out these, we must study the cord as a conducting organ for sensory impressions and motor excitations, as a source of force, as a co-ordinating organ, and perhaps as the seat of an obscure sensibility. Sensory impressions received from the periphery of the body reach the cord by the posterior roots (which are purely sensitive), immediately cross over to the other side of the organ, and are then conducted directly upward to the perceptive organ in the brain. If we imagine the path as one continuous nerve-fibre, we should say that it extends from the right fore-finger to the right posterior column of the cord, then crosses the median line in the gray matter to the left half of the spinal cord, and ascends on that side to the parts of the left brain which perceive and appreciate sensations. This crossing over of sensory paths takes place throughout the length of the spinal cord. The gray matter is the chief pathway for these fibres, the posterior columns not containing any, or containing them for a very short part of their courses. Motor excitations or impulses pursue quite a different course, in an inverse direction. A motor impulse destined to move the right fore-finger starts from the left side of the brain, descends through the left half of the basal parts of the encephalon, until it reaches the lower edge of the medulla oblongata (at its junction with the spinal cord), where it suddenly passes across the median line into the right half of the spinal cord, descends in the right half of that organ, issues out of the right anterior horn, which gives origin to the nerves of the arm, and follows this nerve to cause contraction of the muscles which move the right fore finger. In general terms, the motor paths (or nerves) all decussate at a small part of the spinal cord, the so-called decussation of the pyramids of the medulla oblongata. To sum up, motor paths decussate in a small spot, while sensory paths decussate along the whole length of the cord; or, in other words, the course of motor paths in the cord proper is direct (not crossed) in its whole extent. The motion referred to in the above illustration is a voluntary motion—one starting from the supreme cerebral ganglia—but the spinal cord furnishes involuntary movements of great variety and force originating within itself: it is consequently a source of power, a centre for reflex motions. Simple and convincing proof of this assertion is had by watching the movements of a frog whose head has been cut off. The legs of the animal separately move when the creature is touched, and complex movements of jumping, removing irritations by means of two legs, are done just as well as when the animal was perfect. These movements all occur after some irritation of a sensory nerve, never spontaneously; they are consequently called reflex movements. A reflex movement may be defined as the result of a direct transformation (by ganglion-cells) of a sensory impression into motor impulse; and in this sense reflex actions occur in every nervous centre, great or small. In the living, healthy man reflex spinal actions are (in part) breathing, movements produced by tickling, etc. In diseased states some convulsions are reflex spinal movements, and in some cases of palsy of the legs from disease cutting the cord across in its upper part, most extensive and violent movements are commonly observed in the palsied limbs. The spinal cord may also rightly be spoken of as a co-ordinating centre for certain coarse movements. By co-ordinating centre is meant a mass of gray matter whose ganglion-cells act in such a way, harmoniously and simultaneously, as to produce an exact movement. This performance of an exact movement (walking) must be learned by repeated trials, but when the ganglion-cells have acquired the habit of acting together (education), they so act without the watchful and directing influence of volition; *e. g.* we start walking by a volitional impulse, but continue walking by spinal action, quite inattentive to what our legs are doing. Thus it is with very many complex movements of daily life. The kind of sensibility which the spinal cord possesses is one of which we are quite unconscious; it is rather a capacity to receive and retain impressions which reach it by sensory nerves. This property of the ganglion-cells of the spinal cord (and of all ganglion-cells) I have ventured to call retentivity; or it may be spoken of (as by a few authors) as the memory of the spinal cord. In proof of this may be adduced the performance of various acts without volitional interference and outside of consciousness—the execution of complicated movements by decapitated cold-blooded animals, and the possibility (known to all) of educating the spinal cord. Impressions are stored up and kept ready for use in the gray matter of the spinal cord as well as in that of the brain.

In conclusion, one word may be added about centres for certain actions in the spinal cord. Some ganglion-cells are grouped, and exert an influence over certain nerves destined to special organs; thus nerve-fibres supplying the blood-vessels of the face and eyeball pass into the upper cervical region of the spinal cord. Movements of the parts within the pelvis (bladder, uterus, etc.) are under the control of a part of the lumbar spinal cord and parts just above it; these are the cilio-spinal and the genito-urinary centres. The spinal cord furthermore exerts an influence upon the organs contained in the chest and abdomen, and also, probably, upon the nutrition of tissues in general, and therefore upon calorification. E. C. Seguin.

Medusa. See Gorgon.

Medu'sa [so called from its tentacles, often poisonous to the touch, and likened to Medusa's snaky locks], properly the name of a genus of Discophoræ, an order of radiates of the class Acalĕphæ (jelly-fishes). The term is, however, extended to the whole order (called true Medusæ) and to the order Ctenophoræ (Beroid Medusæ). The genus belongs to the family Cyaneidæ. *Medusa aurita* is a common European species.

Med'win (Thomas), b. in England in 1789; became captain of the 24th light dragoons; was a cousin and intimate friend of the poet Shelley, with whom he travelled in Italy. He published, besides several novels and works of travel, a volume of *Conversations with Lord Byron* (1824) and a *Life of Shelley* (1833), prefixed to the Shelley papers. D. at Horsham, England, Aug. 2, 1869.

Meek (Alexander Beaufort), b. at Columbia, S. C., July 17, 1814; removed with his father in 1819 to Tuscaloosa; graduated in 1833 at the University of Alabama; was admitted in 1835 to the bar, and became editor of a Democratic newspaper; served three months in 1836 in the Seminole war; and on his return became attorney-general of Alabama; edited the *Southron* 1839; was 1842–44 judge of the court of Tuscaloosa county; law-clerk to the solicitor of the U. S. treasury 1845; U. S. district attorney for Southern Alabama 1846–50; a journalist of Mobile 1848–53; went in 1853 to the legislature, where he originated the free-school system of Alabama; became in 1854 judge of the city court of Mobile; Speaker of the house of Alabama 1859; was a fine chess-player, and author of a legal digest (1 vol., 1842), *The Red Eagle* (1855), *Songs and Poems* (1857), *Passages in South-western History* (1857), and an unpublished *History of Alabama.* D. at Columbus, Miss., Nov. 30, 1865.

Meek (Fielding Bradford). See Appendix.

Mee'rane, town of Saxony, with very flourishing and rapidly growing manufactures of cottons, cloths, and all kinds of woollens; also a number of important dye-works, and smaller industries. Pop. 22,293.

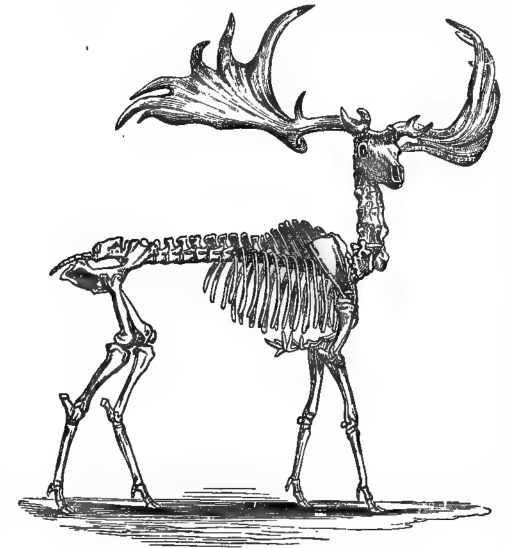
Meer'man (Gerard), Baron, b. at Leyden, Holland, in 1722; became distinguished as a jurist; was counsellor-pensionary of Rotterdam 1748–67, and was sent as envoy to England in 1757. He edited the vast collection of Latin jurisprudence known as the *Novus Thesaurus Juris Civilis et Canonici* (the Hague, 7 vols., 1751–53), but is best known by his sumptuous work, *Origines Typographicæ* (the Hague, 2 vols. 4to, 1765), devoted chiefly to maintaining the invention of movable wooden types by Laurent Coster of Haarlem. Meerman formed a magnificent library, and purchased all the manuscripts belonging to the Jesuits at Paris, but some of them were recovered by Louis XV. He was made a baron of the German empire by Joseph II., emperor of Austria. D. at Aix-la-Chapelle Dec. 15, 1771. —His son, JAN MEERMAN, b. at the Hague Nov. 1, 1753, became minister of fine arts under Louis Bonaparte, king of Holland, and count of the empire and senator under Napoleon 1811; was author of a *Supplementum* to his father's *Thesaurus* (1780), and of valuable works on Dutch history. D. Aug. 19, 1815.

Meer'schaum [Ger., "froth of the sea," so named from its lightness and white color], a compact mineral with a smooth feel, soft when first dug out of the earth, but hardening to 2.0 and 2.5. In composition it approaches silica, 60.9 per cent.; magnesia, 26.1 per cent.; water, 12 per cent. It is obtained from localities in Turkey, Asia Minor, Morocco, etc., where it is used as a substitute for fuller's earth; its principal use, however, is as a material for the bowls of tobacco-pipes. EDWARD C. H. DAY.

Mee'rut, city of British India, cap. of a district of the same name in the presidency of Agra, on a tributary of the Ganges. It has a healthful situation, and contains one of the largest English churches in India. It has also a Roman Catholic church, mission-chapel, an asylum for Europeans and Christians, etc. It is a very old town, but had partially fallen into decay when, in 1806, the British government selected it as the site of a military station. Since that time the city has rapidly developed. At this place the Sepoy mutiny began May 10, 1857, by the revolt of the garrison and the massacre of the European residents. Pop. 81,386.

Megac'erops [Gr. μέγας, "great," κέρας, "horn," and ὄψ, "face"], an extinct genus of mammals from the Miocene of Colorado, allied to the rhinoceroses, but bearing a large pair of horns upon the nose. (See TITANOTHERIDÆ.)

Megac'eros Hiber'nicus [Gr. μέγας, "great," and κέρας, "horn"], the Irish elk, an extinct species of stag or deer of large size, remains of which are found in the Quaternary deposits of marl below the peat-swamps in England, and especially Ireland. Fragments have also been found in bone-caverns. This animal was much larger than any existing species of the group, the largest individuals measuring eleven feet in height to the top of the antlers, which were sometimes twelve feet across from tip to tip. The horns were proportionally larger than in the living species, and the cervical vertebræ of the males were correspondingly developed to support the heavy armature of the head. The females had no antlers. The bones of the extremities were stronger in proportion to their length than in living species. The small spurious hoofs, or dew-claws, were present, but in the fore feet at least their metacarpals were ossified only at their extremities. The dentition was of the ordinary ruminant type, and the upper canines were wanting. The Irish elk became extinct before the beginning of the historic period, although perhaps contemporaneous with man in the British Islands. Goldfuss has conjectured that it is mentioned in the *Nibelungen Lied* of the thirteenth century under the name "*schelch.*" O. C. MARSH.



Irish Elk.

Megadac'tylus [Gr. μέγας, "great," and δάκτυλος, "claw"], a genus of extinct bird-like reptiles whose remains are found in the Triassic sandstone of the Connecticut Valley. Its tracks were formerly regarded as those of birds.

Megaderm'idæ [from *Megaderma*, the typical genus], a family of insectivorous bats or Cheiroptera, with "nose leaf" or nasal appendages variable in extent of development; the ears large, and provided each with a well-developed tragus; the intermaxillaries well developed; the molars ($\frac{4}{4} - \frac{5}{5}$) with distinct W-shaped ridges; the incisors small or wanting in the upper jaw ($0 - 3 \times 2$), constantly developed ($2 - 3 \times 2$) in the lower; and the middle finger of the wings with one or two phalanges; the stomach is sacciform, and the cardiac and pyloric portions approximated. The food is insects. The family, according to Dr. Wilhelm Peters, has five genera—viz. *Megaderma, Rhinopoma,* and *Nycteris* of Africa, as well as *Nyctophilus* of Australia and *Antrozous* of the South-western U. S. The relations of the latter are, however, not perfectly established, and the family itself needs confirmation. THEO. GILL.

Megalich'thys [Gr. μέγας, "great," and ἰχθύς, a "fish"], a genus of extinct rhomboganoid fishes whose bones are found in European Carboniferous strata. They were covered with huge bony plates, and their powerful jaws were armed with immense teeth. These fishes seem to have possessed a crocodilian character, and are now represented by the much smaller gar-fishes of the U. S.

Megalon'yx [Gr. μέγας, "great," and ὄνυξ, a "claw"], a genus of extinct Quaternary mammals from North and South America, allied to the sloths. The type, *Megalonyx*, was first discovered in the caves of Virginia, and named by Pres. Jefferson in allusion to its large claws, the length of the terminal phalanx or bony support of the median claw being seven inches, or more than one-third the length of the humerus of the same animal. Its remains have also been found at Bigbone Lick in Kentucky, and other localities. The typical species has received the name *Megalonyx Jeffersoni.* Many other species of the genus occur in South America, principally in the southern part. (See MEGATHERIIDÆ.)

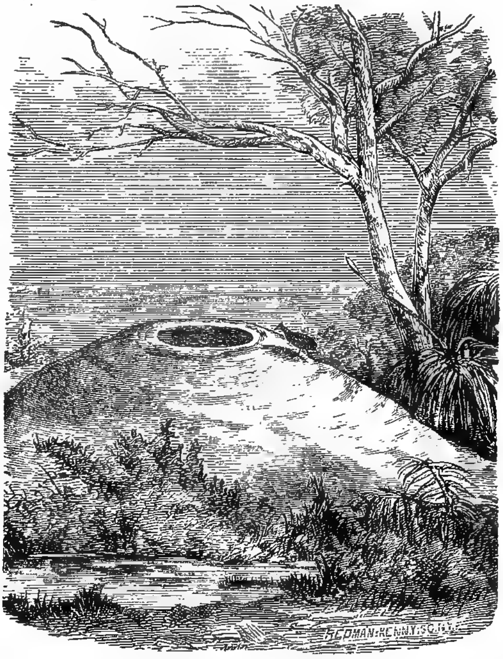
Megalop'olis ["the great city"], city of Greece, situated on both sides of the river Helisson, an affluent of the Alpheius, was founded in 371 B. C., immediately after the battle of Leuctra, for the purpose of gathering the Arcadian communities, hitherto independent of each other, into a compact state, thereby forming a bulwark against Sparta. The city was laid out in grand style, but never acquired any considerable importance. It contained the greatest theatre in Greece, of which remains are extant.

Megalosauridæ. See APPENDIX.

Megalosau'rus [Gr. μέγας, "large," and σαῦρος, "lizard"], a large carnivorous reptile from the Oolite and Wealden of England, belonging to the order Dinosauria, and exemplifying the carnivorous type of that order, as *Iguanodon* does the herbivorous. *Megalosaurus Bucklandi*, the best-known species, was perhaps thirty feet in length, and attained a weight of two or three tons. The head is supposed by Prof. Phillips to have resembled that of the monitor lizard. The teeth are large, curved, pointed, and compressed; the crown is covered with smooth enamel, which rises along the margin of the tooth into a trenchant serrated edge. They are directed backward and set in sockets. The cervical vertebræ are little known, but appear to indicate an upward curve in the neck, as in some mammals and birds. The dorsal vertebræ have the anterior face somewhat convex, the posterior concave. The bodies of the vertebræ are smooth and hour-glass-shaped, and the neural spines elongated. Both faces of the lumbar vertebræ are concave. The sacrals are five in number, and the caudals estimated at between thirty and forty. The structure of the shoulder-girdle recalls that of the wingless bird *Apteryx* of Australia. The humerus is hollow internally, but beyond that bone the structure of the fore limbs is unknown. They were, however, small in comparison with the hind limbs. In the pelvis the ilium was a broad, strong, arched plate, narrowed in front, and ending with a double truncated keel. The lower margin projects in thick strong processes, which receive the pubic and ischial bones. These appear to have been joined in the lower part of the acetabular socket, which probably was perforated at the side. This arrangement resembled that of a bird or monitor, and not that of a crocodile. The ischium and pubis were slender and directed backward. The femur is of the crocodilian type, and more curved than in *Iguanodon.* It appears to be hollow like that of a bird. There were three well-developed toes on the hind foot, and the claws were strong and compressed. These animals lived upon the land, and probably moved mainly by means of their hind limbs. Remains of *Megalosaurus* have been found in the strata of the Mesozoic or Reptilian age in England, from the Lias to the Wealden; also in the Kimmeridge clay at Honfleur in Normandy, and in Oolite at Besançon, France.

O. C. MARSH.

Megapod′idæ [from the generic name *Megapodius,* μέγας, "big," and πούς, "foot"], a family of gallinaceous birds whose representatives are chiefly Australian, and there are popularly known as brush turkeys and mound-birds; they are nearly related to the curassows (Cracidæ) of South America, and the two form the group Peristeropodes of Huxley. The different types of the group vary much in external appearance, some (*Megapodius*) reminding one somewhat of a rail or a hen that has lost her tail, while others (*Tallegallus,* etc.) rather resemble a turkey; the head and neck are sometimes (in Megapodinæ) thickly feathered, and sometimes (in Tallegallinæ) sparsely feathered or almost naked; the bill is more or less like that of the common cock; the gape not deep; the nostrils are subcentral or somewhat anterior; the tarsi unarmed; the hind toe on a level with the fore ones; the tail is very variable in its development. The sternum is broad, and the middle and lateral portions ("lophosteon" and "pterostea") are united for the greater part of their length, the lateral or "xiphioid" processes arising from or near the sides of the posterior half, thus agreeing with that of the curassows, and markedly differing from that of the turkeys. G. R. Gray admits in the family two sub-families and four genera—viz. Tallegallinæ, with the genera *Tallegallus* (New Guinea and Australia) and *Megacephalon* (Celebes), and Megapodinæ, with *Megapodius* (East Indian Islands and Australia) and *Leipoa* (Southern Australia). The different forms differ considerably in habits, but are all terrestrial birds; the Tallegallinæ live in small flocks; the Megapodinæ generally in pairs. The Megapodinæ are unique among birds in their nesting arrangements; they do not sit upon their eggs, but deposit them in mounds formed by themselves, and composed of sand, leaves, etc.; and in these a sufficient degree of heat is generated to hatch the eggs. (See also BRUSH TURKEY.) THEO. GILL.


REDMAN-KENNY.SC.N.Y.

Nest of Megapodius.

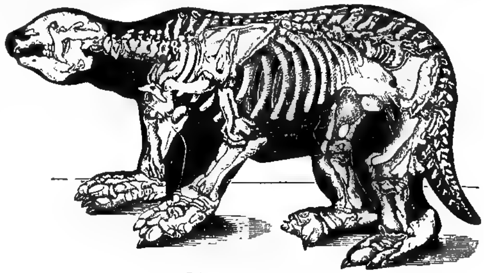
Meg′ara, a celebrated city of ancient Greece and the capital of Megaris, a territory bounded by Attica, Bœotia, Corinthia, the Saronic and the Corinthian Gulfs. As early as the seventh and eighth century B. C. it was a prosperous and even wealthy city. It formed many colonies, of which Chalcedon and Byzantium were the most remarkable. It even entered into rivalship with Athens, but had to yield in the contest, and became subject to that city. By its attempts to free itself from the Athenian supremacy it became one of the causes of the Peloponnesian war, during which it suffered severely, and sustained losses from which it never recovered. Euclid the philosopher was a citizen of Megara.

Megas′thena [μέγας, "great," and σθένος, "force"], a name given by Prof. Dana to the group of generally large mammals constituting the orders Primates (exclusive of man), Feræ, Ungulata, Cetacea, etc. The term in question alludes to the supposed superior life-force and specialization (so far as ways and means, mental as well as physical, are concerned) exhibited by them. The group is exactly equivalent as to its contents with the "sub-class Gyrencephala" of Owen, and, with the addition of man, to the "super-order Educabilia." THEO. GILL.

Megas′thenes, a Greek statesman and author in the service of Seleucus Nicator, one of the generals of Alexander the Great, who became monarch of Syria, Persia, and Bactria. He was sent as ambassador about B. C. 302 to the court of Sandracottos (Chandra-gupta), king of the Prasii, at Palibothra (Pataliputra) on the Ganges, supposed to be the modern Patna. He resided at this great capital many years, and wrote a work upon the history and geography of India, which was the foundation of nearly all that subsequent writers have communicated upon ancient India. The work of Megasthenes is lost, but copious extracts, given by Strabo and other geographers, show him to have been an acute observer. These fragments were edited by E. A. Schwanbeck (Bonn, 1846).

Megatheri′idæ [from *Megatherium*], an extinct family of monodelph mammals of the order Bruta or Edentata, and sub-order Tardigrada, related to the Bradypodidæ or sloths, but distinguished by their comparatively gigantic size, heavy bodies, short robust legs, and long stout tail. The skull was oblong; the intermaxillary bones developed simply as the front of the floor of the olfactory chamber; the supramaxillary retracted but moderately under the orbits, and with a considerably anterior extension, and converging backward; malar bone moderately or largely developed, articulating with or shortly disconnected from the zygomatic process, with a posterior ascending "supratemporal" process behind the postorbital, and a descending "masseteric" process in front; the zygomatic process of the squamosal enlarged backward, and trigonal from its base; "the mastoid bone with a wide digastric fossa, and a strong, thick styloid process, terminating in a circular concavity for the reception of the stylo-hyal bone;" the lower jaw with a wide gutter-like extension forward; molar teeth $\frac{5}{4} \times 2$; the members are stout; the anterior moderately so, with the humerus comparatively slender, but the radius and ulna very stout; pelvis massive, the iliac and ischiac bones being much expanded; posterior limbs much stouter and shorter than the anterior; femur very robust; tibia and fibula co-ossified; toes in moderate number, 4–5 in front, 3–4 behind. The remains of these animals (if we except some very doubtful ones from Australia) have only been found in America. They lived during the Later Tertiary, perhaps even till the advent of man on this continent, under a number of forms. Gervais has recently (1874) claimed nine genera for the family—viz. (1) *Megatherium,* (2) *Cœlodon,* (3) *Lestodon,* (4) *Megalonyx,* (5) *Mylodon,* (6) *Scelidotherium* or *Platyonyx,* (7) *Spherodon,* and (8–9) two unnamed genera, all having been represented in South America, and the first, fourth, and fifth in North America as well. They are generally supposed to have been terrestrial, feeding upon the leaves of trees, which they partly obtained by pulling downward wholly or in part. Gervais supposes them to have fed upon ants, etc. (See MEGALONYX, MEGATHERIUM.) THEO. GILL.

Megathe′rium [Gr. μέγας, "great," and θηρίον, a "wild beast"], an extinct genus of Quaternary mammals. This genus may be considered as typical of the extinct family of Edentates, Megatheriidæ. Their remains are more abundant in South than in North America, and indicate a former much greater development of the order of Edentates than now prevails. The tibia and fibula are co-ossified. The vertebræ of the tail are very large and



Megatherium.

powerful, and that organ, with the hind legs, seems to have formed a support for the heavy body, while the huge fore legs were employed in breaking the branches from trees or tearing them down for food. There are four toes in front, two behind. The teeth, five above and four below on each side, resemble those of the sloths. They grew from persistent pulps, and are deeply implanted in the jaw; they have a grinding surface of triangular ridges, and were fitted for masticating coarse vegetable food. The lower jaw is prolonged, and grooved in the symphysial region, and probably supported a powerful muscular tongue. *Megatherium Cuvieri*, from South America, exceeded the rhinoceros in size, its skeleton measuring eighteen feet in length. The femur is three times as thick as that of the elephant. The former is very large. *M. mirabile* is a North American species, and its remains occur in Georgia and South Carolina. O. C. Marsh.

Megerle (Ulrich). See Abraham-a-Sancta-Clara.

Mehadia, a small town of Hungary, on the Bereka, is celebrated for its hot springs, which annually attract more than a thousand visitors. The waters are strongly impregnated with sulphur, iodine, and bromine. Their temperature varies between 75° and 145°. They are used both for bathing and for drinking.

Me'hemet A'li, b. in 1769 (the same year with Napoleon and Wellington), at Kavala, a small town of Macedonia; gave very early proofs of the energy and enterprise of his character, of his audacity and shrewdness. An intimate friendship with a French merchant from Marseilles, M. Lion, developed that enthusiasm for France, those ideas of reform, that feeling of tolerance, and passion for speculation, which characterized him throughout life. In 1800 he came to Egypt at the head of the contingent which his native township sent to the Turkish army operating here against the French. He was soon at the head of the whole Albanian corps, and with great cunning utilized the confusion which reigned in the country after the departure of the French. In 1806 he was appointed viceroy of Egypt by the Porte, in which position he developed an astonishing activity. His aims were generally good—even those dictated by his personal ambition command respect—but the means he employed were rather Asiatic. The Mamelukes were the plague of the country. In 1811 he invited the greater number of their chiefs to a great festival at Cairo, and after the banquet he shot them down in the corridors of the palace. About 1000 were massacred on the spot; the rest were pursued into Upper Egypt, and from Egypt into Nubia, where the last were slain in 1820. He cleared the country of robbers; introduced the cultivation of cotton, indigo, and sugar; organized an army on a European plan; created a fleet; established schools; built roads, etc.; but among his means of procuring money for the execution of his plans were arbitrary confiscations of private property and the exportation of the inhabitants of Kordofan, which country he conquered, to the slave-markets. The prosperity of Egypt soon excited the jealousy of the Porte, and the ambition of Mehemet Ali at last brought about an open conflict. Twice, after the battle of Konieh (Dec. 20, 1832) and of Nizeeb (June 24, 1839), it was in his power to crush the Ottoman empire (see Ibrahim Pasha), but both times it was saved by the intervention of the great European powers—that is, Russia, Austria, and England. France never participated in these infamous transactions. It serves the speculations of the exchange of London, the ambitious desires of the court of St. Petersburg, and the fears of the house of Hapsburg to have Turkey always tottering. Mehemet Ali's only ally was France during the short ministry of Thiers, and in spite of the brilliant victories of his son and the sympathy of the whole civilized world, he was restricted to the viceroyship of Egypt, which was made hereditary in his family. But Syria, which he had conquered in 1833, which was formally ceded to him at that time by the Porte, and which prospered under his government, he was compelled to give back to Turkey in 1839. In the last years of his life he fell into dotage, and d. Aug. 2, 1849, at Cairo. (See M. P. Mouriez, *Histoire de Méhémet-Ali* (1858); Ed. Gouin, *L'Égypte au XIX*^{e}. *Siècle* (1849); and Hamont, *L'Égypte sous Méhémet-Ali* (1843).)

Méhul' (Étienne Henri), b. June 24, 1763, at Givet, in the department of the Ardennes, France, in humble circumstances; went in 1779 to Paris with an introduction to Gluck, whose favor he gained, and under whom he studied; made a successful début as a composer in 1791 by his opera *Euphrosine and Conradin*; achieved a most brilliant success by his composition of Chenier's song, *Chant du Départ*; became professor at the Conservatory; wrote 42 operas. D. at Paris Oct. 18, 1817. His most remarkable composition, besides the above-mentioned song, is his opera of *Joseph*. The overture to the opera *La Chasse du Jeune Henri*, also characteristic, is often performed.

Meiggs (Henry), b. at Catskill, N. Y., in 1811; was engaged in business as a contractor in Boston, and in the lumber-trade in New York made a considerable fortune, which he lost in the panic of 1837; resumed business, and in 1848 sailed for San Francisco with a cargo of lumber, for which he obtained such enormous profits as to enable him to establish lumber-yards on a vast scale. In 1854 he again became bankrupt, and embarked for South America with his family. He engaged in railway construction in Chili, and in 1858 for the government laid the road from Santiago to Valparaiso in two years, with great profit to himself. In 1867 he undertook for the Peruvian government the construction of a railway from Mollendo to Arequipa, which was finished Jan. 1, 1871; and in 1870 contracted to build six other railroads in Peru; besides which he executed many other large public works. D. in Peru Sept. 29, 1877.

Meignau (Guillaume René), b. at Denayé, in the department of Mayenne, France, Apr. 11, 1817, was educated for the Church, was ordained a priest in 1840, held various minor charges, and was in 1862 appointed professor of biblical theology at the Sorbonne, in 1863 vicar-general of the diocese of Paris, and in 1864 bishop of Chalons. He published *Prophècies messianiques* (1858; 2d ed. 1878), *M. Rénan réfuté par les Rationalistes Allemands* (1863), *Les Évangiles et la critique au XIX. siècle* (1864; 2d ed. 1871), *La crise Protestante en Angleterre et en France* (1864), *Le monde et l'homme primitif selon la Bible* (1869), *Instructions et conseils addressées aux familles chrétiennes* (1875), besides a great number of minor essays in periodicals and newspaper articles.

Meigs (Charles Delucena), M. D., b. at St. George's, Bermuda, Feb. 17, 1792; received medical degrees from the University of Pennsylvania 1814, and at Princeton 1818; settled in Philadelphia in 1820; made specialties of obstetrical practice and the diseases of women and children, in which he acquired a high reputation; was a professor in Jefferson Medical College 1840–62. He wrote several professional works, among which are *Midwifery* (1838), *Lectures on the Female* (1847), *Obstetrics*, a standard work (1849), *Childbed Fevers* (1854); he made several valuable translations from French medical literature. He was also the author of a *Memoir of Samuel George Morton, M. D.* (1854). D. in Delaware co., Pa., June 25, 1869.

Meigs (James Aitken), M. D., b. in Philadelphia July 31, 1829; graduated at Jefferson Medical College 1851; became in 1856 librarian of the Philadelphia Academy of Natural Sciences; professor of the institutes of medicine in Pennsylvania College in 1859; prof. of the institutes of medicine in Jefferson Medical Coll. 1868. Author of works chiefly on craniology and ethnology. D. Nov. 9, 1879.

Meigs (John Forsyth), M. D., son of Prof. C. D. Meigs, b. in Philadelphia Oct., 1818, and wrote an excellent *Practical Treatise on the Diseases of Children* (1857), which has passed through many editions.

Meigs (Montgomery Cunningham), b. at Augusta, Richmond co., Ga., May 3, 1816; educated at the University of Pennsylvania and U. S. Military Academy; graduated from the latter July 1, 1836, and appointed second lieutenant of artillery; which commission he relinquished in 1837 for the purpose of being transferred to the corps of engineers as brevet second lieutenant from date of graduation; became first lieutenant of engineers 1838, captain 1853. From 1836 to 1841 he was mainly engaged in the construction of Fort Delaware, of the Delaware Breakwater, and in the improvement of the Delaware Bay and River; in charge of the construction of Fort Wayne, Mich., and Forts Porter and Niagara, N. Y., 1841–49; of Fort Montgomery, N. Y., 1850–52. From Nov., 1852, to 1860 was engaged upon his great work of supplying the national capital with water from the Potomac River; the Washington aqueduct, by which the cities of Washington and Georgetown are now supplied, was designed and constructed under his personal direction, during which time he conducted the construction of the Capitol extension and its iron dome, as well as of the post-office extension. In Nov., 1860, he was sent to Florida to put Forts Jefferson and Taylor in a condition to resist attack; returning to Washington, he was by request relieved from other duties, Apr., 1861, and appointed chief engineer of the expedition for the relief of Fort Pickens; appointed colonel 11th Infantry May 14, 1861, and the next day quartermaster-general U. S. army, with the rank of brigadier-general, and as such directed the equipment and supply of our vast armies during the civil war, making frequent inspections of the operations of the quartermaster's department in the various armies in the field, being at Chattanooga throughout its investment, and engaged in the battle of Nov. 23–25, 1863; during Gen. Grant's operations in the Wilderness, May, 1864, was in charge of the base of supplies at Fredericksburg and Belle Plain; and during the appearance of the Confederate forces under Breckenridge and Early in front of Washington commanded a division composed of employés of the war department. Brevetted major-general July 5, 1864. In Jan., 1865, he directed, at Savannah, Ga., the supply and refit of Gen. Sherman's army, just arrived from Atlanta, and in March, at Goldsboro', N. C., directed the opening of communications for the supply of that army on its arrival there and at Raleigh. Visited Europe 1867–68, since which he has inspected the operations of his department in Texas, California, Dakota, Wyoming, and Arizona; also the North Pacific R. R. route to Red River of the North. In 1875 he was sent to Europe on important special services, particularly to inspect the organization of the staff departments (especially the quartermaster's) of European armies. Retired Feb. 6, 1882.

G. C. Simmons.

Meigs (Col. Return Jonathan), b. at Middletown, Conn., Dec. 17, 1740; served as major in the expedition against Quebec, where he was taken prisoner; raised a regiment 1777, becoming its colonel, and performed several brilliant exploits; removed in 1788 to Marietta, O., as one of the first settlers in Ohio; was commissary of clothing under Wayne 1795; became in 1801 an agent to the Indians; and d. Jan. 28, 1823, at the Cherokee agency. His *Journal of the Expedition to Quebec* was printed in Almon's *Remembrancer* (1776), and reprinted with an introduction and notes by C. J. Bushnell (New York, 1864).

Meigs (Col. Return Jonathan, Jr.), son of Col. R. J. Meigs, b. at Middletown, Conn., Nov., 1765; graduated at Yale in 1785; went to Marietta, O., with his father 1788; became a lawyer there, and was much engaged in border warfare; chief-justice of the Ohio supreme court 1803–04; brevet colonel U. S. army, serving in Louisiana, 1804–06; a judge in Louisiana 1805–06; U. S. district judge in Michigan 1807–08; U. S. Senator from Ohio 1808–10; governor of Ohio 1810–14; U. S. postmaster-general 1814–23. His governorship was remarkable for the active support which he and his State afforded the U. S. government during the war of 1812–15. D. at Marietta, O., Mar. 29, 1824.—His nephew, bearing the same name, became a distinguished lawyer of Tennessee, and published a volume of *Law Reports* (1839).

Mei'ningen, town of Germany, capital of the duchy of Saxe-Meiningen, on the Werra, has a large palace, the ducal residence, and several good educational institutions. Pop. 11,227.

Meis'sen, town of Saxony, on the Elbe, has a beautiful Gothic cathedral and celebrated manufactures of porcelain, in which the so-called "Dresden china" is made. Pop. 14,166.

Meissonier' (Jean Louis Ernest), b. in Lyons, France, in 1813 (some say 1815); went to Paris as a youth, and entered the studio of Leon Cogniet; produced several works, among others *Le Petit Hallebardier*, which since his great fame have been valued. His special domain in art was disclosed in 1836 in a picture, *Le Petit Messager*, which attracted attention by the extreme delicacy of its execution and the compression of thought within the smallest compass. Thenceforth the painter devoted himself to microscopic art, and soon rose to a rank with Terburg and Metzer, the famous Dutch painters of genre. But Meissonier is peculiar in his power to give character to single figures and to groups of figures either in violent action or in repose. His work is intellectual. He paints slowly, producing comparatively few pieces, but each is a masterpiece of its kind. Among his best-known pieces are *The Chess-Players, The English Doctor, The Reader, The Painter in his Studio, The Guardhouse, The Bravos, A Man in Armor, Napoleon III. at Solferino, Napoleon in Russia, Charity.* He has also executed a few portraits, illustrative vignettes, and lithographs. His pictures bring great prices. Meissonier was elected member of the Academy of Fine Arts in 1861; obtained a third-class medal in 1840, a second-class medal in 1841, two first-class medals in 1843 and 1848; in 1846 was created a knight of the Legion of Honor, and in 1856 an officer; in 1867 he was made commander. At the Paris Exposition in 1855 one of the grand medals of honor was bestowed on him. Fine examples of his art may be seen at several private galleries in New York.—His son, Jean Charles, is an artist, also a pupil of his father, who has many imitators.

O. B. Frothingham.

Meji'a (Gen. Ignacio), b. at Zimatlan, Oaxaca, Mexico, Aug. 14, 1814; was educated in the Institute of Arts and Sciences at Oaxaca; took up arms as a volunteer at the time of the Spanish invasion of Barradas in 1829; became captain of grenadiers in 1833 in the campaign against the revolution headed by Gens. Arista and Duran; became colonel in 1846; was chosen to both houses of the state legislature; became military commander of Tehuantepec 1852, in which year he was for a short time provisional governor of the state; took an active part in behalf of the liberal cause during the "war of reform," with the rank of brigadier-general, having presented himself to Juarez at Vera Cruz in May, 1858, at the head of his brigade; was defeated in an important battle at Teotitlan del Camino (1860), but acquitted of all blame by a court-martial convened at his own request; took part in the bloody battle of Pachuca (Oct. 20, 1861) against Marquez and Tomas Mejia; was quartermaster of the "army of the east" organized to repel the French in Dec., 1861, and participated in the glorious repulse of Lorencez from Puebla, May 5, 1862; but was taken prisoner on the capitulation of that city in May of the following year, and sent to France, where he remained until released in June, 1864, when he immediately traversed the U. S., and presented himself to Pres. Juarez at Chihuahua. In 1865 he was made general of division and minister of war, and retained that post, displaying remarkable skill in organization, until the fall of Pres. Lerdo, in 1876, when he was exiled, but returned to Mexico in 1878.

Mejia (Gen. Tomas), b. in the state of Guanajuato, Mexico, about 1812, was of pure Indian blood, and having become a soldier acquired such influence among his countrymen of the Sierra Gorda as to be called the "king of the mountains." He was a consistent member of the conservative or "Church" party, and took part in many revolutions in its favor; fought with credit against the American invasion of 1847–48: headed a rebellion against Pres. Comonfort in 1856, which was at first quelled rather by policy than by arms, but soon afterwards took up arms again, captured Querétaro, and operated in force in San Luis Potosi, but was ultimately defeated and forced to capitulate. On the outbreak of the "war of reform" in 1858 he was a formidable antagonist of Pres. Juarez, whom he drove successively from Querétaro and Guanajuato; received high honors from the conservative presidents Zuloaga and Miramon, and continued to wage a guerilla warfare against Juarez after his restoration to power in 1861. He naturally became a prominent supporter of the archduke Maximilian, to whom he was much attached, and with whom he was captured May 15, 1867, and after trial executed at Querétaro, June 19, 1867. He was uneducated, but a brave and skilful soldier, loyal, honorable, and humane in his conduct.

Mek'hitar, or **Mechitar,** the founder of a congregation of Armenian monks, called after him Mekhitarists, was b. Feb. 7, 1676, at Sebaste in Lesser Armenia. His true name was Manuk, but on entering a monastery in the vicinity of his native city in 1690 he received the name of Mekhitar, "comforter." He distinguished himself both for religious zeal and talent for learning, and in 1701 founded in Constantinople a congregation with the purpose of uniting the Armenian and Roman Catholic churches. Compelled to leave Constantinople on account of the persecutions of the Armenian patriarch, he moved in 1703 to Modon in the Morea, where, under the authority of the Venetians, who at that time held the country, he founded a monastery. Expelled from this place too by the war between Turkey and Venice, he repaired with his followers to the latter city, and having received the island of San Lazzaro as a possession for all future times, he built a new monastery here (1717), and d. Apr. 29, 1749. In their original aim of uniting the Armenian and Roman Catholic churches the Mekhitarists have not been very successful. They have branches in Italy, Germany, and Turkey, but United Armenians are hardly found in Armenia proper. (See article on the Armenian Church.) But as a link of intercommunication between their native country and European civilization they have developed a great and beneficial activity. Through them, Armenia, its language, literature, and history have become known to Europe, and many of the best products of European learning and genius have become accessible to Armenian readers through their translations.

Mekhitarists. See Mekhitar.

Meklong', town of Siam, Farther India, on the Meklong, near its junction with the Menam, is a well-built and thriving place, surrounded with very fertile and densely-peopled districts. Pop. 8000.

Mekong (or **Mèikhong**) **River.** See Indo-China.

Mel [anc. *Castrum Zumellarum*], town of Northern Italy, in the province of Belluno, situated in a hilly region overlooking the Piave, about 8 miles from Belluno. There is an old castle near it, said to have been built by the Goths as early as 553. Some curious Roman sepulchral stones are preserved here. Pop. 7839.

Me'la (Pomponius), b. at Tingentera in Spain, in the beginning of the first century of our era, was the first Roman who composed a formal treatise on geography. His work, *De Situ Orbis Libri III.*, is still extant, though the text has suffered much. The first edition was published at Milan (1471); the best are those by Tzschucke (Leipsic, 1807) and by Parthey (Berlin, 1867). There is an English translation by Arthur Golding (London, 1585).

Melam, and **Melamine** (the latter also called **Cyanuramide**), two substances as yet obscurely known. Liebig discovered melam as a residue from the destructive distillation of sulphocyanide of ammonium, CN_2H_4S. Melam being amorphous, its true composition has been a matter of uncertainty, but an analysis of Völckel makes it $C_3N_6H_6$, and a metamere of cyanuramide, $(CN)_3H_6N_3$. These substances have as yet no interest except for the advanced chemical student. HENRY WURTZ.

Melan Asphalt, or **Albertite,** a variety of asphaltum found filling an irregular fissure in rocks of the sub-Carboniferous age (or Lower Carboniferous) in Nova Scotia. It is jet black, and has a brilliant pitch-like lustre. It is very brittle, has a gravity of 1.097, softens a little in boiling water, undergoes a very imperfect fusion when heated, dissolves partially in oil of turpentine (30 per cent.), in ether (4 per cent.), and in alcohol (a trace). It contains carbon, 86.04; hydrogen, 8.96; oxygen, 1.97; nitrogen, 2.93; sulphur, a trace; ash, 0.10 = 100. (*Wetherill.*) It is thought to be the product of inspissated and oxygenated petroleum. Before the introduction of petroleum it was employed for the production of burning and lubricating oils and paraffine. (See OIL FROM COAL, and PETROLEUM.) It has since been used as an enricher in the manufacture of coal-gas. (See GAS-LIGHTING.) (For further information consult *Trans. Am. Phil. Soc.*, 1852, 353, and *Am. J. Sci.* [2], xxxix. 267.) C. F. CHANDLER.

Melancholia. See INSANITY, by WILLIAM A. HAMMOND, M. D.

Melanch'thon (PHILIPP), b. at Bretten in the Rhenish Palatinate Feb. 16, 1497; was educated at the Latin school of Pforzheim, and studied at the universities of Heidelberg and Tübingen. His grandmother was a sister of the celebrated scholar Reuchlin, and his German name, SCHWARZERD, "black earth," was by Reuchlin made into a Greek form from μέλας and χθών, after the custom of the day among learned men. In his seventeenth year he began to lecture at Tübingen, and published a Greek grammar and an edition of Terence which won the admiration even of Erasmus. On the recommendation of Reuchlin he was appointed professor of Greek at the University of Wittenberg in 1518, and held this position till his death. He lectured first on rhetoric, philosophy, and classical literature, and soon became one of the most celebrated teachers of Germany. His immense learning and the wonderful clearness of his presentation of his subjects attracted crowds of students from all parts of Europe, and his handbooks, *De Dialectica*, *De Anima*, *Epitome philosophiæ moralis*, etc., were widely used. But his highest fame he gained by his participation in the great work of the Reformation, in which his superior knowledge, his systematic power, and his dialectic skill formed a necessary supplement to the labors of Luther. As early as 1519, at the Leipsic Disputation, he took up openly the defence of Luther's ideas, and two years afterwards (in 1521) he published his *Loci Communes Rerum Theologicarum*, which was republished over fifty times during his own lifetime, revised and enlarged, and may be considered as the first attempt at a systematic representation of Protestant dogmatics. In 1529, at the Diet of Spires, he drew up the Protest of the evangelical minority, whence arose the name of Protestants; and in 1530, at the Diet of Augsburg, he wrote his most important work, the *Augsburg Confession*, which was signed by all the Lutheran princes. This work and the *Apology for the Confession*, form the two principal symbolical books of the Lutheran Church. In the course of time a difference of views became apparent between him and Luther, though perhaps not greater than might be charged to a difference of character; their intimate friendship was never broken off. But after the death of Luther, when Melanchthon stood as the acknowledged leader of the Lutheran Church, this difference grew into one of party, the strict Lutherans and the Philippists. It is alleged that Melanchthon inclined more and more to the doctrines of Calvin concerning the Lord's Supper, and that in the later editions of the *Augsburg Confession* he altered the tenth article in conformity with Calvin's views. On the other hand, his standpoint in the controversy of the Adiaphorists (1549), and still more his theory of synergism (1557), were considered as a leaning towards Roman Catholicism. He was violently attacked by the strict Lutherans, and he felt the attacks so much the more keenly as he was by nature a tender, conciliatory, peace-loving man. Up to the very last, even after the convention of Worms in 1557, he hoped for a reconciliation of the various branches of the Christian Church, and on his deathbed (Apr. 19, 1560) he gave as one of the reasons why he wished to die that thus he might escape from the fury of the theologians. He was buried in the castle church of Wittenberg, beside Luther. His wife, whom he married in 1520, d. in 1557; of his three children, only the son survived him. His collected works were published at Bâle 1541 and Wittenberg 1562–64, but both these editions are incomplete; the only complete one is that by Bretschneider and Bindseil in *Corpus Reformatorum* (1834–60).

Melaniidæ. See APPENDIX.

Melastoma'ceæ [from *Melastoma*, one of the genera, whose name, "black mouth," is given because its fruit blackens the mouth of the eater], a natural order of some 1200 species of trees, shrubs, and herbs, mostly tropical, represented in the U. S. by the deer-grasses (*Rhexia*). None are poisonous. Useful fruits, dyestuffs, and medicines of value are among the products of the order.

Mel'bourne, city of Australia, the capital of the colony of Victoria, on the Yarra-Yarra River, 9 miles above its mouth in the basin of Port Philip, in lat. 47° 48′ S. and lon. 144° 57′ E. It was founded in 1837. In 1847 it had 10,955 inhabitants, and became the seat of a bishop. In 1851 it had 20,400 inhabitants, and became the capital of the newly-formed colony of Victoria. In 1874 it was the largest commercial port in the southern hemisphere, and an elegant city with 210,000 inhabitants. It has now 282,907 inhabitants. This marvellous growth is mostly due to the discovery in 1851 of the gold-fields at Mount Alexander and Ballarat, from 60 to 70 miles distant from Melbourne. In the single year 1852 the shipping increased to 1657 vessels of 408,000 tons burden. In the same year the value of imports rose from £1,056,000 to £4,044,000, and in 1853 to £14,000,000. In 1880, 1500 vessels of 960,000 tons burden entered and cleared the harbor. In the same year the total value of imports amounted to £14,557,000, and that of exports to £15,954,000. The situation of Melbourne is very fine. Although the Yarra-Yarra does not admit large sea-going vessels, on account of the bar at its mouth, railways have been constructed between Melbourne and Port Philip, which is a beautiful inlet of the Indian Ocean, safe and deep. The streets are all paved and provided with gas and water, and many elegant buildings have been erected, among which is a well-endowed university.

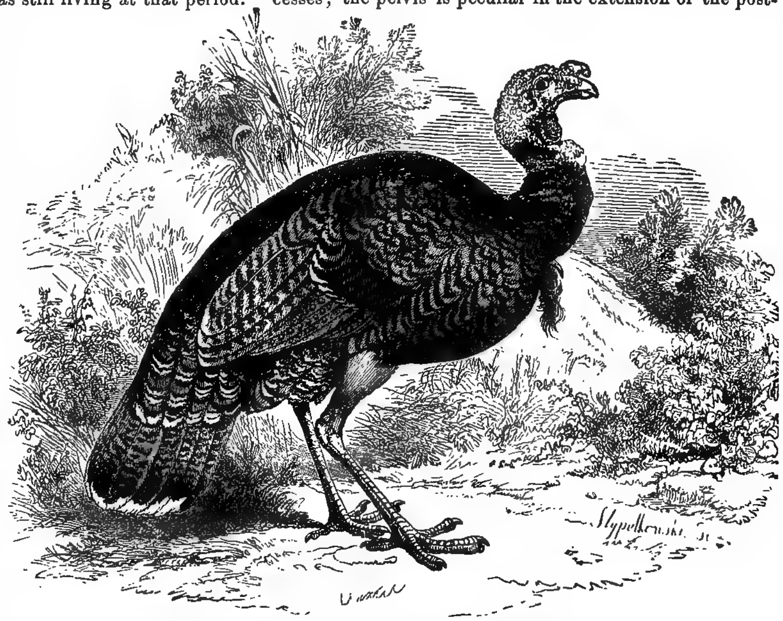
Melbourne, cap. of Izard co., Ark. (see map of Arkansas, ref. 1–D, for location of county). Pop. in 1880, 149.

Melbourne (WILLIAM **Lamb**), VISCOUNT, b. at Melbourne House, Derbyshire, England, Mar. 15, 1779, was educated at Eton and Cambridge; studied politics and jurisprudence at Glasgow; was called to the bar at Lincoln's Inn Nov. 23, 1804; entered Parliament for Leominster and married Lady Caroline Ponsonby 1805; was elected member for Lander 1806, for Portarlington 1807, for Westminster 1812, for Peterborough 1816, and for the county of Hertford 1819. He attached himself to the Whig party, and continued a moderate opposition to the administrations of Perceval and Lord Liverpool; became chief secretary for Ireland on the accession of the Canning ministry Apr., 1827; succeeded to the title on the death of his father, July, 1828; was a distinguished advocate of Catholic emancipation and of parliamentary reform; became secretary of state for the home department in Earl Gray's cabinet Nov., 1830, and on the retirement of the latter, July 9, 1834, succeeded him as first lord of the treasury and premier; was dismissed in November of that year, but recovered his place in Apr., 1835, through the support of the House of Commons, and retained his position until Aug. 30, 1841. He was therefore the responsible head of the British government at the accession of Queen Victoria and during the first four years of her reign, and contributed much to the education of his young sovereign in the performance of her royal duties. D. at Brocket Hall, Hertfordshire, Nov. 24, 1848.—His wife, CAROLINE PONSONBY, known in literature as LADY CAROLINE LAMB (she died before he succeeded to the title), a daughter of the earl of Bessborough, b. Nov. 13, 1785, acquired great celebrity through her romantic attachment to Lord Byron, and her subsequent bitter quarrel with him. She wrote three novels, *Glenarvon* (1816), *Graham Hamilton* (1820), and *Ada Reis* (1823). D. in London Nov. 26, 1828.

Mel'chites [Syr. *melek*, = "king," because they belonged to the royal instead of the clerical and popular party], (1) a sect of Greek Christians in Egypt, descendants of those who in the fifth century conformed to the orthodox Greek faith, in opposition to the Coptic priests, who by way of reproach gave them this name. They are few in numbers, and are greatly detested by the Copts of the national (monophysitic) Church. (See COPTS.) (2) One of the branches of the Roman Catholic Church in the East. They are strictly a branch of the United Greeks, but are under a patriarch of their own, who resides at Damascus, but with five other prelates bears the title of patriarch of Antioch. They are of the Eastern rite, use a Greek liturgy, take the Eucharist in both kinds, and their priests and deacons may be married, but only once, and that before ordination. They are not numerous. (See EASTERN RITE.)

Melchiz′edek, or **Melchisedec** [Heb. *Malki-zedek,* "righteous king"], a mysterious personage who appears but once in a historical light in the Bible (Gen. xiv. 18–20), but who was regarded by the writers of Psalm cx. and of the Epistle to the Hebrews (vi. 20; vii. 1–21) as a type of an order of priesthood superior to the Levitical, of which the Messiah was interpreted to be the fulfilment. Melchizedek in Genesis was "king of Salem" and "priest of the most high God;" he met Abraham on his return from the rescue of Lot and slaughter of Chedorlaomer, brought forth bread and wine, and offered a banquet to Abraham and the king of Sodom in the valley of Shaveh, called "the king's dale," after which he blessed Abraham, and received from him tithes of the spoil. The real character of this incident, as well as the localities, have furnished Jewish and Christian commentators abundant scope for conjecture, and many extravagant interpretations have been ventured. Jewish traditions, recorded in the Targums as well as in many cabbalistic and rabbinical writings, identified Melchizedek with the patriarch Shem, who, according to the current biblical chronology, was still living at that period. This was the prevalent Jewish opinion in the time of Jerome, was adopted by Luther and Melanchthon, and by Selden, Lightfoot, and Jackson among English writers. A sect of Christian heretics, called Melchizedekians, regarded him as an incarnation of the "great power of God," superior even to Christ. Others regarded him as an angel, as the Holy Ghost, or as the son of God, with which conception harmonized a Jewish belief that he was the Messiah. This latter opinion has been held by many modern writers, but at present the current view seems to have returned to the simplicity of the original narrative, regarding Melchizedek as a Canaanite monarch of Hamitic descent, and chief priest by virtue of his kingly office in a form of worship identical with or closely similar to that of the earliest Phœnicians. The locality of Salem and Shaveh has been much questioned. By Jewish tradition. hitherto generally accepted, the former has been identified with Jerusalem, but the "Shalem, a city of Shechem," of Gen. xxxiii. 18, where Jacob bought a field and erected an altar, seems to be preferable on both historical and geographical grounds. It still exists under the name of Salim, as a village 3 miles E. of Nablus, the ancient Shechem. Shaveh would then be the well-known valley in the immediate vicinity. Dean Stanley maintains (*Sinai and Palestine,* pp. 237, 238) that Mount Gerizim, subsequently the holy place of the Samaritans, was the spot where Melchizedek ministered to the most high God.

PORTER C. BLISS.



The Turkey.

Mel′dola, town of Italy, in the province of Forli, on the left bank of the Reno. It is a place of considerable trade, almost all the unmanufactured silk of the province being collected here for market. During the Middle Ages Meldola was one of the strongest fortresses of the Romagna. Pop. 5969.

Melea′ger, in Greek mythology, a hero-hunter who killed the boar which Artemis sent to ravage the fields of Calydon, Ætolia, because Œneus, the king of the place, had neglected to offer up to her a sacrifice. This Calydonian hunt was a favorite subject with the ancient poets and artists. Among the other heroes who took part in the Calydonian hunt were Theseus, Jason, and Nestor.

Meleager, a Greek epigrammatist and cynic philosopher, the son of Eucrates, b. at Gadara in Palestine, and lived in the middle of the first century before Christ. The Greek Anthology contains 131 epigrams by him, which have been separately published by Gräfe (Leipsic, 1811). A collection of epigrams, of all kinds, he made from more than forty different poets, of all ages of Greek poetry, and known in ancient times under the title Στέφανος Ἐπιγραμμάτων, has been lost. The work was arranged in alphabetical order, according to the initial letters of the first line of each poem.

Meleagrid′idæ [from *Meleagris,* the name of the common turkey], a family of gallinaceous birds, forming one of the sections of the group of Alecteropodes of Huxley; the guinea-fowls (Numididæ), common fowls, and pheasants (Phasianidæ), and grouse and partridges (Tetraonidæ), forming the others. The turkeys have a characteristic form in the large upraised body, long neck, and small head; the head and neck are destitute of feathers, but have scattered "hairs," and are more or less caruneulated; an extensible fleshy process is also developed from the forehead; the bill is moderate; the nasal fossæ are bare; the tarsi armed with spurs in the male; the hind toe elevated; the tail (about as long as the wing) is truncate, and has more than twelve feathers. The breast-bone, as will be readily recalled, has a long, narrow keel (the "lophosteon") extending far backward, while from near the front on each side, and separated by a very deep notch from the sides of the anterior portion, a wing-like process (the "metosteon") both diverges and extends far backward, but is split into two parts, the external and internal xiphioid processes; the pelvis is peculiar in the extension of the post-acetabular area (or that behind the insertion of the legs), which is greater than the anterior; the second metacarpal bone has a backward directed process, in this respect, as well as several others, differing from the guinea-fowls, to which they are most nearly related. The family is at present limited to two species—viz. (1) the common turkey, *Meleagris gallipavo,* with two varieties, the typical *gallipavo* of the South-western U. S. and Mexico, and the *sylvestris* of the more Northern U. S.; and (2) the rare and beautiful turkey, *Meleagris ocellata,* of Honduras. Our common domesticated bird is a descendant of the Mexican form, and not of the common wild one of the U. S., which has generally been considered a distinct species. In former geological epochs other species existed within the limits of the present U. S., the remains of two species (*Meleagris altus,* or *superbus,* and *M. celer*) having been found in the Post-pliocene of New Jersey, and of another (*M. antiquus*) in the Miocene beds of Colorado. THEO. GILL.

Melegna′no, town of Northern Italy, in the province of Milan, on the railway between Milan and Piacenza. This little town is well built, having quite the aspect of a small city, and its trade in all the produce of the neighborhood is very active. Its mediæval history is interesting, and in modern times it has been the theatre of two important battles—one in which Francis I. defeated the Swiss mercenaries of the duke of Milan in 1515; the other the victory of the French and Italian allies over the Austrians on June 8, 1859. Pop. 5124.

Melen′dez Val′dez (JUAN ANTONIO), b. Mar. 11, 1754, at Ribera de Fresno, near Badajoz; studied law at Salamanca, and held various judicial positions at Saragossa, Valladolid, and Madrid during the government of Jovellanos; but was banished from Spain at his fall in 1798, and not allowed to return until 1802. Won by Murat and Napoleon, he was employed in various important civil-service offices during the French government, but the indignation of the national party was so strong that once he came near being shot in Oviedo by the populace, and after the departure of the French he was compelled to flee to France, where he d. at Montpellier May 24, 1817. In 1780 his eclogue *Batilo* was crowned by the Academy of Madrid, and his lyrical poems and pastoral dramas, in which he broke with the French classicism and returned to the old national Spanish models, made so deep an impression that he was called a "restaurador del Parnaso." Collected editions Madrid (1820), Paris (1832), Barcelona (1838).

Mel′fi, town of Southern Italy, in the province of Potenza, lying in a most fertile region, about 28 miles from the town of Potenza. The commerce and industry of this place are noteworthy. The cathedral and episcopal palace are fine structures. Six out of its eight monasteries have recently been suppressed. Melfi was a large town in 304 A. D., and its mediæval story is one of the most stormy of those stormy times. In 1528 the French general Lautrec de Foix took Melfi after an obstinate resistance, and put 18,000 of its inhabitants to the sword. It suffered from earthquakes in 1456, 1694, and 1851. Pop. 12,657.

Melgare′jo (Gen. MARIANO), b. in Bolivia about 1810; became a famous partisan leader in the civil wars of his country; had been concerned, with varied success, in revolutions against every president of Bolivia for more than twenty years, when in Dec., 1864, he overthrew the government of his brother-in-law, Pres. Acha, and made himself dictator. He maintained himself in power against a constant series of revolutions for five years; joined in 1865 the quadruple alliance of Ecuador, Peru, Bolivia, and Chili against Spain; was made general-in-chief of the combined armies, but had no occasion to take the field; was overthrown by Morales in Jan., 1870; escaped to Peru, and was killed at Lima by his son-in-law, Gen. Sanchez, in an altercation, Nov. 23, 1870.

Melikoff (LORIS), COUNT, b. at Lori, a town of Transcaucasia, Jan. 1, 1826, of Armenian descent, entered the army as colonel, commanded a regiment of light cavalry in the Crimean war, and was adjutant-general to the grand duke Michael, who commanded the army of Caucasus, in 1877. Ardaban was taken in May and Kars in November, and after the war Loris Melikoff was made a count. He still more distinguished himself as governor of Astrakhan by his measures against the plague, and as governor of Kharkov by his measures against the Nihilists. After the crisis of Feb. 17, 1880 (the blowing-up of the dining-room in the imperial palace of St. Petersburg), he was made the chief of an extraordinary commission, with almost unlimited power, and afterward minister of the interior.

Mel′ilot [Lat. *melilotus*, "honey lotus," from its sweet smell], a name applied to various leguminous herbs of the genus *Melilotus*. *M. officinalis* (common melilot), *M. alba* (sweet clover), *M. cœrulea, arborea, Messanensis*, and others are cultivated in Europe, but not much in the U. S., as forage-plants. The fibre of some species is useful. These plants possess the rich odor so familiar in "sweet clover." The forage is eagerly eaten by cattle, and is of excellent quality, but is not very abundant.

Meline′ (Col. JAMES F.), b. in 1811 at Sackett's Harbor, N. Y., was the son of a French officer of the U. S. army, of remote Swedish descent; was educated at Emmittsburg, Md.; taught for a time in the Athenæum, Cincinnati; was admitted to the bar; studied three years in Europe, and afterwards held several U. S. consulships there; became a banker; served during the civil war, chiefly on the staff of Gen. Pope, and was soon promoted to the grade of colonel: served after the war as chief of bureau of civil affairs third military district; was a brilliant lecturer and writer; author of *Two Thousand Miles on Horseback, Mary Queen of Scots and her Latest English Historian, Life of Sixtus V.*, etc. D. at Brooklyn, N. Y., Aug. 14, 1873.

Meliphag′idæ [from *Meliphaga*—*μέλι*, "honey," and *φαγεῖν*, to "eat"—the name of one of the genera], a family of passerine birds, the "honey-suckers," distinguished by G. R. Gray in the following combination of characters: The form is thrush-like; the head well-shaped: the bill more or less long, curved, and usually acute at the tip, which is slightly emarginated; the nostrils placed in a large groove, and generally covered by a membranous scale; the tongue is extensile, and furnished at the tip with a pencil of short fibres; the tarsi rather short and strong; the toes more or less long, the outer always united at its base; the tail long and broad. The species are quite numerous, and almost entirely confined to Australia and New Zealand, with the outlying islands: and of the ornis of the former country especially they form a characteristic feature. They vary in size from a large thrush to a small warbler. By Gray the family is divided into three sub-families—viz. Meliphaginæ, with seven genera; Melithreptinæ, with two genera; and Myzomelinæ, with 4 genera. THEO. GILL.

Melito, bishop of Sardis, flourished in the second century, and wrote, besides many other works, an apology for Christianity, of which some fragments are found in Routh, *Reliquiæ Sacræ*. The *Apologia Melitonis*, of which a Syrian translation was discovered by Tattam, is generally ascribed to Mileto of Sardis, but on doubtful grounds.

Mell (PATRICK H.), D. D., LL.D., b. in Walthourville, Liberty co., Ga., July 19, 1814. His parents both died when he was fourteen years of age, leaving him a penniless orphan. Having a good elementary education for one of his age, he earned means sufficient to support him two years at Amherst College, Mass., and then became a Baptist minister. By constant study he rose to distinction, and soon after the organization of Mercer University by the Baptist convention of Georgia he became professor of ancient languages. In 1857 he was called to the same chair in the State University, and subsequently became vice-chancellor, which he resigned in 1872, but retained a professorship. For fifteen years he was president of the Georgia Baptist convention, and for nine years president of the Southern Baptist convention. Dr. Mell has published several works which have been highly valued and extensively circulated—one on *Baptism*, one on *Corrective Church Discipline*, one on *Predestination*, an *Essay on Calvinism*, an *Argument on the Subject of Slavery*, a sermon on *God's Providential Government*, a treatise on *Parliamentary Practice*, and *Prayer as Related to Providence*. A. H. STEPHENS.

Mel′len (GRENVILLE), son of Judge Prentiss, b. at Biddeford, Me., June 19, 1799; graduated at Harvard in 1818; became a lawyer and *littérateur*, residing successively at Portland and North Yarmouth, Me., in Boston, and in New York, where he d. Sept. 5, 1841. He was the author of several volumes of prose and verse, the latter very popular in his lifetime.

Mellen (PRENTISS), LL.D., b. at Sterling, Mass., Oct. 11, 1764; graduated at Harvard in 1784; practised law at Bridgewater, Mass.; removed in 1792 to Biddeford, Mass. (now in Maine), and in 1806 to Portland; was U. S. Senator from Massachusetts 1817–20; chief-justice of the supreme court of Maine 1820–34, and held other important public positions. D. at Portland, Me., Dec. 31, 1840.

Mellon, or **Mellone,** supposed to be $C_6N_9H_3$ by Gerhardt, who also considered the H_3 to be basylic, and susceptible of replacement by metals; thus making the substance a hydracid, which he called hydromellonic acid. It is obtained by a number of methods, from different sources, and is certainly a well-defined compound, though its composition, nature, and relations are still subjects of discussion. The easiest mode of preparation, one of the methods of Liebig, its discoverer, is to heat together sulphocyanide of potassium and chloride of sodium in a current of chlorine gas, and wash the product with water, in which it is insoluble. (For further information the textbooks on chemistry must be referred to.) HENRY WURTZ.

Mellon (HARRIET). See ST. ALBANS, DUCHESS OF.

Mel′moth (WILLIAM), b. in London, England, in 1666; was called to the bar 1693; became a bencher of Lincoln's Inn; was treasurer of that corporation 1730; was appointed by the court of chancery, in conjunction with William Peere Williams, to edit the celebrated *Reports of Cases in Chancery* (1726–28) of Thomas Vernon, but is best known as the author of *The Great Importance of a Religious Life* (new ed. 1849), of which more than 100,000 copies were sold. D. at London Apr. 6, 1743.

Melmoth (WILLIAM), son of the above, b. in London in 1710; was bred to the law, and in 1756 became a commissioner of bankrupts. He resided many years at Shrewsbury, and afterwards at Bath, where he d. Mar. 15, 1799. He was an elegant writer, and his *Translation of the Letters of Pliny* (1746) is claimed on good authority to be "better than the original." He also translated Cicero's *Letters* (1753), the *De Senectute* and *De Amicitia* (1773–77), and wrote *Letters on Several Subjects* (1742) under the pseudonym of "Sir Thomas Fitzosborne," which were much admired, and were reprinted at Boston in 1805.

Me′lo (or **Mello**) **de** (FRANCISCO MANOEL), b. at Lisbon, Portugal, Nov. 23, 1611; was educated by the Jesuits; rose to the rank of colonel in the Spanish army (Portugal being then subject to Spain), serving in the Netherlands and in Catalonia against the rebels who attempted to establish a separate kingdom. Of this movement he wrote (in Spanish) a history which has taken rank as a classic, *Historia de los movimientos, separacion y guerra de Cataluña* (Lisbon, 1645). He entered the service of Portugal when it declared its independence; was imprisoned nine years through the enmity of a powerful nobleman, and spent many years in exile in Brazil. D. at Lisbon Oct. 13, 1665. He wrote a multitude of works, chiefly in Portuguese, embracing essays, satires, poems, tragedies, and farces, few of which have been published, as well as historical works relating to Portugal and Brazil.

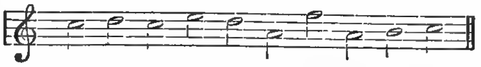
Melodeon. See REED INSTRUMENTS.

Melodra'ma [Gr. μέλος, "song," and δρᾶμα, "drama"], a name first bestowed upon the opera by Rinuccini, but now more frequently given to a non-operatic play of a semi-tragic or serious character, and marked by sensational, effective, or startling situations, and by exaggerated sentiment.

Mel'ody [Lat. *melodia*], in music, a connected series of single sounds, so arranged and linked together as to become capable of expressing some sentiment, and stirring up pleasurable, religious, patriotic, warlike, tragic, or other emotions. It is not *every* succession of sounds that can properly be called a "melody," for sounds in any number may be produced by voice or instrument which are unrelated, devoid of form, rhythm, accent, and symmetrical arrangement, and are therefore unmeaning, and incapable of awakening any feeling other than that of weariness. The music of the ancient Greeks appears to have been of a type not unlike this, however admired and extolled in its own day, when true melody was unborn, and music and noise were nearly akin. To *our* perceptions the music of the ancients seems to have consisted of a mere succession of intervals, selected without taste and refinement, and laid together without skill, design, or any trace of elegance and inspiration. The fragments that remain to us of such music, while valuable as curiosities and historical relics, are yet so sterile as to yield no indications of that connection of thought and richness in ideas which we look for now in what bears the name of "melody." The same may be affirmed, to a considerable extent, of the early music of the Church, which, though much improved by the labors of St. Ambrose, and afterwards by the learning and patience of Pope Gregory I., was, in modern judgment, bald, dry, and dreary; and whatever power it possessed of exciting emotion appears to have been due to external associations, the surroundings of liturgical grandeur, its alliance with sacred ideas and poetical imagery, rather than to its own intrinsic merit. Even as late as the fourteenth and fifteenth centuries, or the period when the early masters of harmony were working out their elaborate fugues and canons, the distinctive beauties of melody were scarcely known. Hence the dryness and the hard mechanical stiffness of much of the music of their age—music which, in spite of its ponderous harmony, lacks altogether the spirit, life, and warmth which would have been imparted to it by an infusion of glowing melody. Musical thought, however rich in harmonious combinations, is not perfect without a certain leading theme or train of ideas to which all other things bear relation, and which is itself the golden thread around which all the harmonies seem to cluster. In modern schools of music the cultivation of melody has risen to an importance which proves the value assigned it by the severest masters and professors of counterpoint. And this importance springs not only from the large space occupied by melody in its scientific relations, but also from the facility with which it is recognized and appreciated by the ordinary ear, and its power also in gradually leading the mind to a just conception of the harmonies dependent upon it. Without melody much of the gorgeous harmony now heard would be unintelligible to nine-tenths of those who hear it; and to a popular audience the richest symphonies of a Beethoven or Mendelssohn would be a bewilderment were it not for those clear, captivating, and ever-present lines of melody which enchain attention and take hold on the memory.

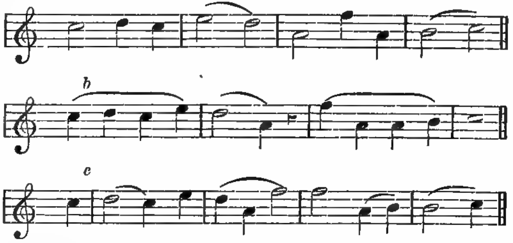
In the conception or formation of melody much more is implied (as we have already said) than the mere arranging of several sounds or notes in any haphazard order of succession. Considerations of key and scale, mode, rhythm, time, accent, cadence, and rules affecting the progressions of certain intervals, are all to be taken into account if from any series of notes we would form a melodious strain, having in itself evidence of meaning and design. To illustrate this, we give in Ex. 1 a short train of notes, which, taken just as they stand, express little or nothing:

Ex. 1.



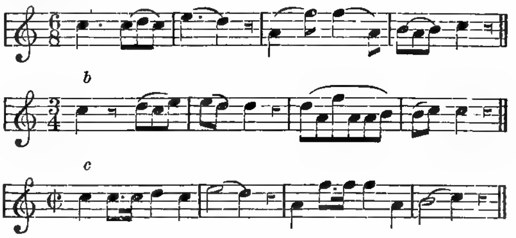
But these same unmeaning notes, when moulded into form and regularity by the application of rhythm, and by various changes of their time-values, as at *a*, *b*, and *c* in Ex. 2, are found to assume more or less of a melodious character:

Ex. 2.—*a*



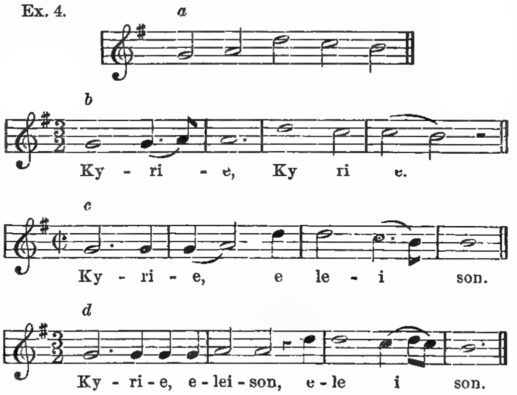
Under still freer treatment, as at *a*, *b*, and *c* in Ex. 3, the dryness of the original notes entirely disappears, and the qualities of a simple but true melody are distinctly apparent:

Ex. 3.—*a*



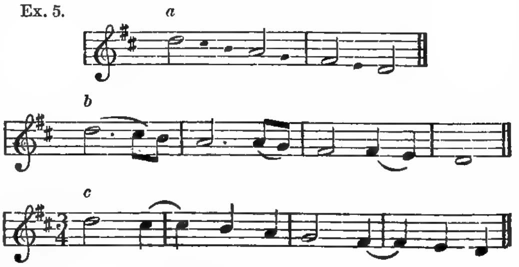
By dint of art and contrivance the most meagre and limited series of notes may thus become the origin and source of many melodious ideas and progressions, often interesting and attractive, and suggestive also of still other ideas by the simple laws of association. In Ex. 4, at *a*, see a formula of only five notes, from which the melodies at *b*, *c*, and *d* are derived, and into which they may again be readily reduced:

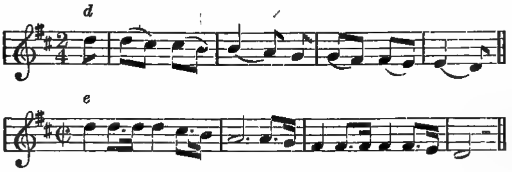
Ex. 4.


a
b
Ky - ri - e, Ky ri e.
c
Ky - ri - e, e le - i son.
d
Ky - ri - e, e - lei - son, e - le i son.

In the derived melodies given in the above examples no other notes have been used than those found in the rough formulas from which they spring. It will be observed, also, that those melodies have been produced chiefly by the addition of *rhythm* and of variations of the *times* of the original notes. But the field of invention is much enlarged, and the process of creating new melodies greatly facilitated, first, by filling up with notes the intervals made by skips in the original sketch, and using such notes as occasion serves. See Ex. 5, where at *a* the notes thus gained are marked by black dots, and several of the melodious forms obtained are shown at *b*, *c*, *d*, and *e*:

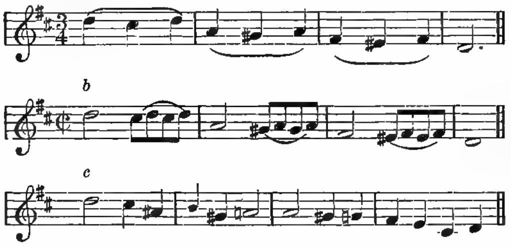
Ex. 5.





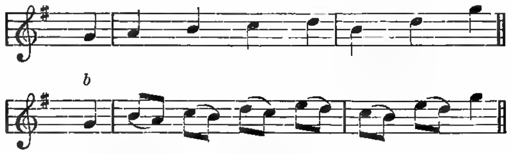
Secondly, by a judicious use of the semitone *below* any prominent note of the model, in the manner of an accidental leading-note, as in Ex. 6, at *a*, *b*, and *c*:

Ex. 6.—*a*



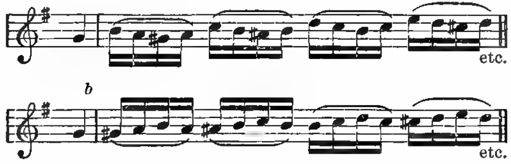
Thirdly, by a similar use of the note *above*, as in Ex. 7, at *b*, where the progression may be compared with the plain notes at *a*:

Ex. 7.—*a*



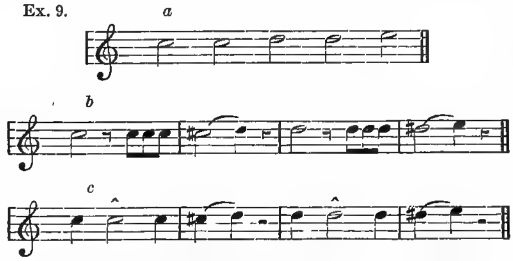
Fourthly, by the use of both the note above and the semitone below, by which means the plain notes at *a* in the last example may take such forms as appear at *a* and *b* in Ex. 8:

Ex. 8.—*a*



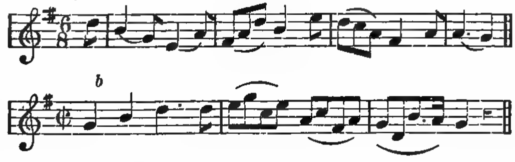
Fifthly, by a discriminating use of a lengthened semitonic appoggiatura where the current of the melody naturally suggests it. See Ex. 9, where the plain notes at *a* are cast into form at *b*, and enforced by appoggiaturas. At *c*, the appoggiaturas are accompanied by suspensions and marks of emphasis:

Ex. 9.



Sixthly, by the use of harmonic intervals in arpeggio form, either as the prevailing character of the melody, or as a passing relief to the ordinary motion when it consists of direct and contiguous intervals. It is to be carefully observed, however, that as melodies of this kind consist chiefly of broken *chords*, their progressions must be such as are proper to those chords and in conformity with the rules of musical harmony. Instances of such melodies are given in Ex. 10, at *a* and *b*:

Ex. 10.—*a*



The observations thus made on the development of melody are to be taken, of course, rather as hints than rules. Melody is so dependent on the power of imagination and the existence of a creative talent as to render it far less amenable to laws and restrictions than the harmony by which it is accompanied. In its higher departments it requires gifts of nature and powers of invention so peculiarly its own that many of the most accomplished harmonists have signally failed in the production of original melody; while, on the other hand, minds quite unskilled and unscientific have conceived and written such glowing strains as take strange hold on human feeling and linger for years in the memory. WILLIAM STAUNTON.

Mel'on [Lat. *melo*], the large edible fruit of several species of annual running and climbing plants of the order Cucurbitaceæ, natives of Africa and Asia. In the desert of South Africa wild melons, both edible and poisonous, abound, and are greedily eaten by men and beasts, the poisonous ones being easily distinguished by the bitter taste. In like manner the common watermelon when planted near the colocynth (which is a true melon) becomes hybridized and acquires poisonous properties. The melons of cultivation are extensively raised in the U. S. They are of two or more species and of many well-marked varieties. The *Citrullus vulgaris*, or watermelon, is prized for the coolness and sweetness of its abundant watery juice. It does best on sandy soils, and has been proposed as a source of sugar for general commerce. The amount of sugar present varies according to the soil, treatment, and variety. The muskmelon (*Cucumis melo*) is of Asiatic origin. Its numerous varieties are highly esteemed for their delicate flavors. Tropical Asia and Africa have several other cultivated species which deserve acclimatization in the U. S.

Melpom'ene [Gr., the "singer"], one of the nine Muses, the Muse of Tragedy. As represented by Greek art, she bears a mask, Heracles' club, or a sword, is shod with buskins, and wears on her brows a garland of vine-leaves.

Mel'rose, a v. of Roxburghshire, Scotland, 31 miles S. E. of Edinburgh, contains the ruins of the celebrated Melrose Abbey. There was a Columbite monastery of Melrose, which stood at the place now known as Old Melrose, about a mile and a half to the E. of the village. But that building, which was not distinguished by any architectural magnificence, was destroyed in the ninth century. The present abbey was founded in 1136 by David I., but destroyed in 1322 by the English under Edward II. It was rebuilt in 1326 by Robert Bruce and David II., but suffered severely in 1385 and 1545 by the English, and still more during the Reformation. While standing in its original splendor it was the finest structure in Scotland and a remarkable specimen of Gothic architecture; but now it is only a ruin, though the church has been tolerably well preserved.

Melrose, Middlesex co., Mass. (see map of Massachusetts, ref. 2–H, for location of county), 8 miles north of Boston, on the Boston and Maine R. R., is supplied with water from Spot Pond (in Stoneham) and gas, has a park, a public library, manufactories of furniture, boots and shoes, sewing-machine needles, silver polish, etc. Pop. of township in 1870, 3414; in 1880, 4560; in 1885, 6101.

Melton Mowbray, a market-town of England, in the county of Leicester, at the confluence of the Wreake and the Eye, has large breweries and tanneries, an important cattle market, and a considerable trade in Stilton cheese. It is the centre of a large and celebrated hunting-district, and contains all accommodations for the hunters. Pop. in 1881, 5766.

Melun', town of France, in the department of Seine-et-Marne, on the Seine. It manufactures great quantities of cement, bricks, and tiles, and has some trade in timber and flour. Pop. in 1881, 12,145.

Mel'vil (Sir JAMES) OF HALLHILL, b. at Raith, Fifeshire, Scotland, about 1535; went to France in early youth as page to Mary Stuart, who was betrothed to the dauphin; was for nine years a gentleman of the household to the Constable Montgomery, and employed three years at the court of the elector palatine; travelled in Italy; returned to Scotland when his former mistress had become queen of Scots, and was appointed by her privy councillor and member of the royal household. He was closely connected with political affairs for several years, but having opposed the queen's inclination in favor of Bothwell after the murder of Darnley, he was obliged to consult his own safety by withdrawal from court. After the overthrow of the queen's party Melvil returned to court, enjoyed the confidence of the four successive regents who governed the country during the minority of the heir, and when King James assumed the direction of affairs was appointed a privy councillor. When James succeeded to the throne of England, Melvil retired to his estate at Hallhill, where he d. Nov. 1, 1607. His name had been nearly forgotten when in 1660 a collection of MSS. left by him was accidentally discovered in Edinburgh Castle, and found to contain very important data concerning the reigns of Mary and James. They were published in 1683 by George Scott, under the title *The Memoirs of Sir James Melvil of Hallhill, containing an Impartial Account of the most Remarkable Affairs of State during the Last Age, not mentioned by Other Historians*, etc. This edition was incomplete; the first perfect edition was that published in 1827–33 by the Bannatyne Club, which has also printed Melvil's *Diary* (1829).

Melvill (HENRY), D. D., b. at Pendennis Castle, England, Sept. 14, 1798; graduated with high honors at Cambridge 1821; became a fellow and tutor there; took orders in the Church of England; was minister of Camden chapel, Camberwell, London, 1829–43, where he acquired wide celebrity as an eloquent preacher; was appointed by the duke of Wellington chaplain to the Tower of London 1840; was principal of the East India College at Haileybury from 1843 to its dissolution in 1859; was long chaplain to the queen, canon of St. Paul's, rector of Barnes, rural dean, and "Golden lecturer" at St. Margaret's, Lothbury. He published many volumes of sermons, all of them remarkable for rhetorical power and a glowing imagination. Some of them were republished in the U. S. by the late Bishop McIlvaine (1847–48). D. in London Feb. 9, 1871.

Mel'ville, an island of British North America, situated in the Arctic Ocean between lat. 74° and 77° N., and between lon. 105° and 117° W., and bounded W. by Fitzwilliam and Kellet Straits, and S. and E. by Melville Sound. It was discovered in 1819 by Capt. Parry, who wintered here with his crew, and further explored in 1851 by Lieut. McClintock.

Melville (ANDREW), b. at Baldovy, near Montrose, Scotland, Aug. 1, 1545; was educated at the University of St. Andrew's, which he left in 1564 with the reputation of being "the best philosopher, poet, and Grecian of any young master in the land;" studied law and theology at Paris and elsewhere on the Continent; became a teacher at Poitiers (1566), and soon afterwards (1569–74) professor at Geneva, through the influence of Beza. Returning to Scotland, in 1574 he was appointed principal of the University of Glasgow. In 1580 he was made principal of St. Mary's College, St. Andrew's. In 1582 he preached the opening sermon before the Presbyterian General Assembly, boldly attacking the interference of the court with religious liberty, and headed a deputation which presented a remonstrance to King James at Perth. He was moderator of the General Assembly in 1587, 1589, and 1594, was made rector of the university in 1590, and was recognized as the most prominent member of the Scottish National Church. In May, 1606, James then king of England, Melville was summoned to London with other Presbyterian divines to confer upon Scottish ecclesiastical matters, and, having denounced the archbishop of Canterbury for encouraging popery, was committed to the Tower 1607, where he remained four years. In 1611 he was released at the request of the duke of Bouillon, who appointed him professor of theology at Sedan, where he d. in 1622. He published a number of Latin poetical paraphrases of portions of the Bible, the best of which, the *Song of Moses*, is accounted an elegant production. His epigrams were very neat, and sometimes brought him into trouble, especially one written in ridicule of the chapel-services at King James's English court. (See his *Life*, by Dr. Thomas McCrie.)

Melville (GEORGE JOHN WHYTE), b. near St. Andrew's, Scotland, in 1821; entered the army in 1839; became captain in the Coldstream Guards 1846, and retired in 1849, but served again in the Turkish cavalry during the Crimean war. He wrote several novels, which became popular in both Great Britain and the U. S. The best known are *Captain Digby Grand* (1853), *Kate Coventry* (1856), *Holmby House* (1860), *Good for Nothing* (1860), *The Gladiators* (1863), *Cerise* (1865), *Sarchedon* (1871), *Satanella* (1872), and *Katerfelto* (1875). He also published a translation of the *Odes* of Horace and a volume of *Songs and Verses*. D. Dec. 5, 1878.

Melville (HERMAN), b. in New York Aug. 1, 1819; shipped as a common sailor when eighteen years old: deserted in 1842 from a whaling ship at the Marquesas Islands, remaining four months a prisoner in Typee (Taipi) Valley, Nukaheva; escaped, and returned in 1844 to the U. S. He published *Typee* (1846), *Omoo* (1847), *Mardi* (1849), *Redburn* (1849), *White Jacket* (1850), *Moby Dick* (1851), *Pierre* (1852), *The Piazza Tales* (1856), *The Confidence Man* (1857), *Battle-Pieces* (1866), and other works. He married a daughter of Chief-Justice Shaw of Massachusetts in 1847, and in 1860 he went upon another whaling voyage. In 1850 he removed from New York to Pittsfield, Mass. Most of his works are fictions of much power, of which the best are his sea-tales.

Melville (Gen. ROBERT), LL.D., b. at Monimail, Scotland, Oct. 12, 1723; served in the West Indies in the Seven Years' war; participated in the capture of Guadalupe, Dominique, Martinique, and other French islands, upon which he was made brigadier-general and governor of all the captured possessions. In his later years he was a sagacious inquirer into Roman military antiquities, traced the sites of many Roman camps in England; solved the question of the arrangement of oars and rowers in Roman galleys, and made minute examinations of the Alps to determine the route of Hannibal in the invasion of Italy. He became a full general in 1798, and d. Aug. 29, 1809.

Melville (VISCOUNT). See DUNDAS (HENRY).

Membré (ZENOBIUS), b. at Bapaume, France, in 1645; entered the Franciscan order; went as a missionary to Canada in 1675; accompanied La Salle upon his expedition to the Western rivers 1679; remained at Fort Crèvecœur, on Lake Peoria, with Tonty, whom he aided in effecting a peace between the Iroquois and Illinois; descended the Mississippi with La Salle 1682; returned to France the same year; wrote a narrative of the expedition, which was published by his cousin, Le Clerc, in his work, *Etablissement de la Foi dans la Nouvelle France* (1691); became warden of a convent at Bapaume; accompanied La Salle in his final expedition to Texas by sea 1684, and remained in Fort St. Louis, where, with his companions, he was massacred by the Indians in 1687. Membré's narrative was plagiarized by Hennepin (1697), and by some authorities is ascribed to La Salle himself.

Mem'el, town of Prussia, on the great fresh lagoon called the Kurisches Haff. It has a large and safe harbor, considerable shipbuilding, manufactures of ropes, sailcloth, and linens, distilleries, breweries, and iron-foundries, and a very important trade in corn, hemp, flax, timber, and amber. Pop. 19,603.

Mem'ling (HANS), a Flemish painter belonging to the school of Van Eyck; was received, after the battle of Granson in 1476, wounded and miserable, into the hospital of St. John at Bruges, where he painted an altarpiece and the reliquary of St. Ursula. Another celebrated work of his is the altarpiece in the church of Mary in Dantzic, and the striking resemblance between these pictures and certain paintings in Miraflores and Palencia in Spain, belonging to the period between 1496 and 1509, has given rise to the supposition that he went to Spain. The dates of his birth, death, and other events of his life are unknown.

Mem'mingen, town of Bavaria, on the Iller. It has manufactures of ribbons, silks, cottons, and linens, and a large trade in hops, which are produced in its vicinity. Pop. 8406.

Mem'minger (CHARLES GUSTAVUS), b. at Würtemberg, Germany, Jan. 7, 1803; came when two years old to Charleston, S. C., with his mother. Left an orphan, he was befriended by Gov. Thomas Bennett; graduated at South Carolina College in 1820; became a lawyer of Charleston in 1825; opposed nullification, and wrote the satirical *Book of Nullification* (1832–33); was for many years prominent in the financial business of the legislature, and took part in the school reform in 1854; was secretary of the treasury in the Confederate cabinet 1861–64.

Mem'non, a name of several persons, the most remarkable of whom was the son of Tithonos and Eos, who after the death of Hector brought the Æthiopians to the assistance of Priam in the war against Troy. His adventures were the subject of the poem called the *Aithiopis* by Arktinos, according to which his armor was made by Hephaistos or Vulcan. He was, although of dark color, distinguished for his beauty. He killed Antilochos, the son of Nestor, in single combat, and was himself subsequently killed by Achilles. His mother, Eos, had in vain pleaded before Zeus against Thetis for the life of Memnon, her son, and was present with the daughters of the Sun at the fight. Ajax challenged him to single combat, and Memnon being wounded, Achilles came and pierced him through the neck. The ancient works of art, however, represented a monomachia or single combat between Achilles and Memnon alone over the dead body of Antilochos. Eos carried in her arms the naked corpse of her son out of the battlefield. A flower, the *Paphlagonios*, was supposed to have sprung from the earth out of his blood. His body, according to some traditions, was burnt on a pyre in the plains of Troy, and the ashes sent to his country or his sister Hemera, or to the Æsopos, where a mound was erected for his grave, or else in the Trojan territory. His companions, the Æthiopians, or negroes, always thus represented in ancient art, were changed into birds which contended at his pyre and frequented his grave. Other and later traditions make Memnon come to Troy with 20,000 Æthiopians and Susians and 20 war-chariots, by orders of Teutamos, king of Assyria, and state that the palace or city of Susa was called Memnoneion. The name of Memnon was connected at the period of the Roman empire with that of Amenhetp or Amenophis III., of the eighteenth Egyptian dynasty, about B. C. 1400, and attached to the northernmost of the seated colossal statues still remaining on the W. bank of the Nile at Thebes, where they formed part of a dromos or row of statues leading to the pylon or gate of the Amenopheum, or palace of Amenophis, in that quarter. The two statues still remaining amidst the ruins of eighteen others, all made of a breccia sandstone, bear the name and titles of Amenophis III., and the most northern gave out sounds at sunrise when touched by the morning beams, supposed to be the salutations of Memnon to his mother, Eos or Aurora. The statue was said to have been broken in two by Cambyses (B. C. 525), and was called by the Thebans Phamenoph. The upper part appears really to have been thrown down by an earthquake B. C. 27, and continued so till A. D. 170, when it was set up and restored by brickwork, but ceased to give out sounds. In that interval seventy-two inscriptions were cut in Greek and Latin on it, recording the visits of Roman military officers, prefects, and others, some of which are dated, the earliest one mentioned being in the eleventh year of Nero (A. D. 64), and the last, A. D. 194. These record, sometimes in verses, the visit of the writer, and attest that he has heard the voice of Memnon. The most remarkable visit was that of the emperor Hadrian and his wife Sabina (A. D. 130), recorded in verses by Julia Balbilla, a poetess in their suite. There has been much speculation as to the cause of the harp-like sound or tone given forth by the statue, which was heard emanating from the pedestal by several modern travellers in 1821 and later. It has been attributed to the expansion of the stone by the warmth of the sun, a phenomenon occurring occasionally in certain mountains, or to the frauds of the priests. Certain parts of Egyptian Thebes were named Memnoneia in honor of Memnon. Some historical personages of this name are known, as a Rhodian who revolted against Artaxerxes Ochos and fled to Philip, king of Macedon, but subsequently returned to the service of Persia, where he repulsed the first attempts of the Macedonians to establish their forces in Asia Minor, and became under Darius the commander-in-chief of the forces of Darius, and fought against Alexander the Great the battle of Granicus (B. C. 334). His plans of the campaign were unfortunately not followed, and after an unsuccessful attempt to defend Ephesus and Halicarnassus, which he burned, Memnon retired to Mitylene, where he d. B. C. 333. There was also a historian of this name, who wrote the local history of Heraclea of Pontus in the commencement of the second century A. D., and an Æthiopian people between the Nile and Astapus called Memnones, probably from their supposed resemblance to the hero of the Trojan war. S. BIRCH.

Mem'oirs [Fr. *mémoires pour servir*], a class of literature very abundant in France, which may be styled the raw materials of history. If this species of literature is not always reliable in the sense of implicit trust to be reposed in all the statements made, it never fails to throw a vivid light upon the surroundings and the contemporaries of the author; and his own real character is unconsciously revealed, not by his own estimate, but by the sum-total of the unquestionable facts related. English and American literature is sadly deficient in this amusing and valuable department of literature, of which the best recent example is the *Greville Memoirs* (1874).

Mem'ory [Lat. *memoria*, from *memini*, preterite of the old form *meno;* Gr. *μέμνω, μνάω, maneo*, to "stay or remain"], the mind's faculty for connecting its past experience with its present self, or "the faculty for retaining representatives of whatever has once been in the consciousness." (*Hickok.*) When this faculty is exercised involuntarily, it is *remembrance*, and when its exercise is occasioned by some intention or purpose of the will, it is *recollection*. In Greek the former of these is *μνήμη*, and the latter *ἀνάμνησις*; in Latin, *memoria* and *recordatio*. Without this faculty our past experience would be a blank, and not only would all knowledge be limited to the field of the present moment, but all plans and calculations respecting the future would be impossible. Its value, therefore, cannot be exaggerated. Neither can its possibilities be over-estimated. It has been said that neither Pascal nor Grotius ever forgot anything he had ever read or thought. Leibnitz and Euler were as remarkable for their memory as for their other powers. Joseph Scaliger committed the whole of Homer to memory in twenty-one days, and all of the Greek poets in three months. Cyrus knew the name of every officer (according to Xenophon, and of every soldier, according to Pliny and Quintilian) who served under him. Themistocles, it is said, could call by name each one of the twenty thousand citizens of Athens. Mithridates is said to have conquered twenty-two nations, whose different languages he knew and spoke with the same ease as his own. While we justly call these instances remarkable, there are yet facts which render it probable that no mind ever actually loses anything which has once entered its consciousness. Persons resuscitated from drowning or hanging have reported a sudden revelation of all their past life flashing out with distinctness and minuteness just before their consciousness was lost. I am myself acquainted with an army officer who has had two distinct experiences of this sort—once in early life when near drowning, and once in a sudden exigency in a battle. Pointing in a similar direction are the numerous facts cited where persons in extreme sickness and under operations for injuries of the head have conversed in languages which they had known in youth, but had for many years seemed to have entirely forgotten. Persons also in the delirium of a fever have repeated with apparent accuracy discourses to which they had listened many years previously, and of which, before the fever, they had no recollection. More remarkable cases still are reported where persons in certain abnormal states have accurately repeated long passages from foreign tongues which they had casually heard recited long before, but of which they never had any understanding. Whatever may be thought about arts of remembering, there would seem to be no art of forgetting.

A memory at the same time ready and trustworthy, though often an original gift, is often also largely the result of culture. Sir Philip Warwick in his *Memoirs* says of Lord Stratford: "His memory was great, and he made it greater by confiding in it;" and it may be affirmed as a general truth that the memory grows in trustworthiness by being trusted. By trusting his memory, even though it often fails him, and by giving himself with undivided attention to what he would remember, any person may increase his powers of memory to any degree. (See MNEMONICS.) J. H. SEELYE.

Mem'phis, a celebrated city, for more than 1000 years the capital of Egypt, was in the Delta, on the western arm of the Nile, about 10 miles S. of Cairo. It was founded by Menes, the first king of the first dynasty, and was one of the most magnificent cities the world ever saw. It was 17 miles in circumference, and contained the temples of Apis, Isis, and Serapis. It is mentioned in the Old Testament under the name of Noph (Isa. xix. 13; Jer. ii. 16), or Moph (Hos. ix. 6): and, as it contained some of the most magnificent architectural monuments—not to speak of the pyramids, the great Sphinx, the numberless tombs, etc., in its immediate neighborhood—it was able to sustain its reputation even after Thebes had been made the residence of the king. But after the building of Alexandria it began to decline, and soon fell into ruin. Strabo speaks of it as the second greatest city of Egypt, but he could not help noticing that traces of actual decay began to make themselves visible; and when, after the Moslem conquest, a Mohammedan city was built on the opposite bank of the Nile, Memphis was doomed. The modern Cairo was built in part from its remains, and it disappeared so utterly that for many years even its site was disputed. The remains which during the last twenty years have been excavated are of the most stupendous description.

Memphis, on R. R., cap. of Scotland co., Mo. (see map of Missouri, ref. 1–H, for location of county), has an academy and flouring-mills. Principal occupation, farming and stock-raising. Pop. in 1870, 1007; in 1880, 1418.

Memphis, city and important R. R. and commercial centre, cap. of Shelby co., Tenn. (see map of Tennessee, ref. 7–A, for location of county), in lat. 35° 8″ N. and lon. 13° W., at head of navigation for large vessels on Mississippi River. Incorporated in 1827. The city has fine educational advantages, its public free schools numbering about 70, besides many other institutions of learning, several of them being attached to the Roman Catholic Church. It has a board of health, chamber of commerce, cotton exchange; and railroads making connections with all prominent points North, South, East, and West enable the city to carry on an immense traffic with all parts of the U. S. The Mississippi River, the inland sea of the U.S., is navigable at all seasons of the year between Memphis, New Orleans, and generally St. Louis. Cotton is the chief and absorbing article of commerce, about 500,000 bales being received annually. The tonnage of the river is represented by the arrival and departure yearly of over 2000 steamboats, averaging 2000 tons. The city possesses a fine water-front of about 2 miles, and massive stone-paved wharves facilitate the heavy shipments from the districts watered by the Mississippi, White, Arkansas, St. Francis, Hatchie, and the other rivers of which Memphis is the entrepôt. The streets of Memphis are broad and well laid out, and most of them are fitted with the Nicolson pavement.

Manufactures.—Great progress has been made in manufacturing enterprises. The census of 1880 showed 138 manufactories; capital, $2,313,975; average number of hands employed, 2268; wages paid during the year, $845,672; value of products, $4,413,422. Among the principal manufactured articles are cotton-seed oil and cake, sawed lumber, foundry and machine-shop products, carriages, and clothing. Memphis has 10 cotton-seed oil-mills; cap. $1,000,000.

Owing to three disastrous yellow-fever epidemics in 1873, 1878, and 1879, Memphis decreased in population from the first-named year. In 1880 the Waring sewerage and drainage system was completed, and population has rapidly increased. A new trunk-line R. R. was finished to the ocean in 1883, and two important R. Rs. to this point were completed in 1884, making a total of seven R. Rs. entering this city. The thorough sanitary reform already carried out and its new and enlarged transportation facilities, together with its natural advantages for building up great manufacturing industries, give sure promise of rapid growth in the near future. Pop. in 1870, 40,226; in 1880, 33,592; in 1885 about 45,000. On June 6, 1862, a short engagement took place near Memphis, in which the Confederate fleet of eight vessels, under Com. Montgomery, was defeated by the Union fleet of fourteen vessels, under Com. C. H. Davis, and the city was thenceforth occupied by Union forces; but in Aug., 1864, Gen. Forrest's cavalry entered and took several hundred prisoners.

H. M. Doak, Ed. "Memphis Avalanche."

Memphrema'gog Lake, a beautiful lake, 35 miles long and from 2 to 5 miles in breadth, lying partly in Orleans co., Vt., and partly in Canada. Its shores are marked by bold headlands, and there are numerous wooded islands. Its waters flow northward into St. Francis River. The lake is navigated by steamers and abounds in trout.

Me'na, de (Juan), b. at Cordova, Spain, about 1411; studied at Salamanca and at Rome, and became Latin secretary and historiographer to John II., king of Castile. He composed many verses in honor of his sovereign, the allegorical poems *Coplas de los Siete Pecados Mortales* and *La Coronacion*, and an imitation of the *Divina Commedia* entitled *El Laberinto*. All these productions were extremely popular, and were printed in many editions soon after the introduction of the press into Spain, but they are no longer esteemed for poetic merit. D. in 1456.

Menabre'a (Luigi Federigo), Count, b. at Chambéry Sept. 4, 1809, of a Piedmontese family; studied mathematics at Turin; entered the Sardinian corps of engineers, and was appointed professor in technical science at the military academy and at the University of Turin while yet only a lieutenant. In 1848, having attained the rank of captain, he was employed in a diplomatic mission to the Italian duchies which were afterwards annexed. He was elected a deputy, and served first in the ministry of war, then in the ministry of the interior. In the war of 1859 against Austria he was chief of the staff. After the cession of Savoy and Nice to France the French government endeavored to win him as a native of Savoy over to France, but he remained true to Italy, and Victor Emmanuel created him a senator. As chief of the engineering department he fortified Bologna, Piacenza, and Pavia; was made a lieutenant-general in 1860, and led the siege of Gaeta. In 1861 he became a member of the ministry of Ricasoli as minister of the marine, in which position he carried through several important reforms and devoted much interest to the building of the arsenal at Spezzia. In 1866 he was Italian plenipotentiary at the conclusion of peace between Austria and Prussia. In 1867, when the ministry of Rattazzi resigned, he formed a new cabinet, and took charge of the ministry of foreign affairs under difficult relations with France. In the Roman question he defended the rights of Italy against France, without suffering any breach to take place; he spoke for the annexation of Rome, but he imprisoned Garibaldi for his arbitrary intermeddling; thus he threaded his way between the hostile parties with great adroitness and without compromising the dignity of the government. Only a few months after he entered office as president of the cabinet the imprisonment of Garibaldi brought him a vote of want of confidence in the house. He gave in his resignation immediately, but was induced by the king to remain and form a new cabinet. In May, 1869, the financial difficulties made another reorganization of the ministry necessary, but even after the accession of the new ministers Menabrea did not succeed in gaining the confidence of the house. On the opening of the session (Nov. 19, 1869) the government proposed Mari for president, but Lanza was chosen. Menabrea resigned immediately, and Lanza became president of the cabinet. Menabrea is a great mathematician and physicist. Prominent among his scientific works are *Études sur la série de Lagrange*, which appeared at Turin 1844–47, and *Le génie italien dans la campagne d'Ancone et de la Basse-Italie* (Paris, 1866). His administration as president of the cabinet, although lasting only two years, brought order into the interior, and the relations of Italy to foreign countries were improved by his cautious policy.

August Niemann.

Mena'do, town of Celebes, in the East Indian Archipelago, and the capital of an important Dutch possession of the same name, comprising the whole north-eastern peninsula of that island, and containing a population of 228,051. The high, volcanic surface of the territory is eminently well adapted to coffee-culture; rice is also extensively grown. The value of the exports of the district during one year amounted to 1,250,370 gulden. The town, Menado, has about 6000 inhabitants.

Men'ai Strait, a narrow channel, 13 miles long and from 250 yards to 2 miles wide, between the island of Anglesea and Carnarvonshire, Wales, crossed by two bridges, the suspension and the Britannia bridge. At the entrance of the channel the tide sometimes rises 30 feet, and ordinarily from 10 to 12 feet. The navigation is difficult, but as it saves time, the route is often chosen by vessels under 100 tons burden.

Menan'der, a celebrated Greek dramatist, of whose works only fragments are extant, edited by Meineke in his *Fragmenta Comicorum Græcorum* (Berlin, 1841), but whose character as a dramatic poet is well known to us through the imitations of Terence. He was b. at Athens in 342 b. c.; lived in elegant circumstances; had Theophrastus for a teacher, Epicurus for a friend, Demetrius Phalereus for a patron; was invited by Ptolemy to his court at Alexandria, but declined to come; wrote about 100 comedies; and was drowned in 291 b. c., while swimming, at the Piræus. The Athenians raised to him a monument beside that of Euripides, and placed his statue in the theatre. His plays formed the transition from the old to the new comedy —that is, with him the representation of general ideas and their political relations, with its personal satire, such as we know it from Aristophanes, ceased, and the representation of individual characters and their social relation, with its psychological signification, began, such as afterwards became the principle of modern comedy.

Menant' (Joachim), b. at Cherbourg, France, in 1820; studied law; became a magistrate of the civil tribunal at Havre, and acquired considerable celebrity as one of the earliest French decipherers of the cuneiform inscriptions of Assyria. He published, among other works, *Zoroastre* (Caen, 1844), *Receuil d'Alphabets des Écritures cunéiformes* (1860), *Éléments d'Epigraphie assyrienne* (1860; 2d ed. 1864), *Inscriptions assyriennes des Briques de Babylone* (1860), *Inscriptions de Hammourabi, roi de Babylone au XVI. siècle avant notre ère* (1863), and *Exposé des Éléments de la Grammaire assyrienne* (1868). He aided Prof. Jules Oppert in translating the *Grande Inscription de Khorsabad* (1865) and *Les Fastes de Sargon* (1863), and has published several learned essays in the *Journal* of the French Oriental Society.

Menard (René), b. in Paris, France, in 1604; entered the Society of Jesus in 1624; went to Montreal 1640; labored among the Nipissings and other Algonkin tribes, subsequently among the Cayugas and Oneidas of Central New York, 1656–60; and established the mission-station of St. Thérèse among the Ottawas on Keweenaw Bay, Lake Superior. In 1661 he set out to visit the friendly Huron Indians on Black River, and perished in an unknown manner upon the journey. His name has been given to a county in Illinois.

Menard'ville, cap. of Menard co., Tex. (see map of Texas, ref. 4–F, for location of county), on the Rio San Saba, 132 miles W. N. W. of Austin. Pop. in 1880, 67.

Menash'a, city and R. R. centre, Winnebago co., Wis. (see map of Wisconsin, ref. 5–E, for location of county), 18 miles N. of Oshkosh, has several manufactories. The Chicago and North-western, the Milwaukee and Northern, and the Wisconsin Central R. Rs. pass through this city. Pop. in 1870, 2484; in 1880, 3144.

Menas'seh Ben Is'rael (properly Manasseh ben Joseph ben Israel), b. in Portugal about 1604; came very early with his family to Holland, fleeing from the Inquisition; settled in Amsterdam; was elected rabbi in his eighteenth year; engaged afterwards in business, as the property of the family was confiscated by the Inquisition, but did not abandon his studies and literary pursuits. D. at Middelburg, in Zealand, Nov. 20, 1657. He wrote several books in Portuguese, Spanish, Latin, and Hebrew, but his best-known work is the *Defence of the Jews* (London, 1656), which he wrote in order to persuade Cromwell to re-admit the Jews into England.

Men′cius, the Latinized form (first brought into use by the Jesuits) of the Chinese MENG-TSE, "the teacher Meng," next to Confucius the most celebrated philosopher of Chinese literature. He was b. about 370 B. C. in the state of Tsow, afterwards incorporated with the kingdom of Loo, and forming part of the present province of Shan-Tung. He lost his father very early, but his mother educated him so carefully and conscientiously that "the mother of Meng" became proverbial among the Chinese. When his studies were finished and his ideas ripened he travelled through all the petty kingdoms into which the Chinese empire was divided at that time, setting forth his views at the courts somewhat in the manner of Socrates. His success was small, however, and the last twenty years of his life he spent in retirement among his disciples and writing his books. D. about 288 B. C. He acknowledged himself a disciple of Confucius, and Chinese critics consider it one of his greatest merits that he revived the influence and authority of that philosopher. He considered man good by nature, and his vices and miseries produced, like the stunted and distorted growth of a tree, by evil influences. The great problem, then, was to return to the original goodness, to set one's heart right. In politics he emphasized the rights of the subjects so strongly in opposition to those of the sovereign that he declared it righteous for a people to kill their ruler when he injured their welfare. His works have been translated into Latin by P. Noel (Prague, 1711) and Stan. Julien (Paris, 1824); into French by Pauthier (Paris, 1851); and into English by Collie (Malacca, 1828).

Mendæans, a religious sect in Persia, called also **Nazareans, Sabæans,** and **Christians of St. John,** residing chiefly in the vicinity of Bassorah. When discovered by Catholic missionaries about 1650, they numbered above 20,000 families, but are said to have dwindled to 1500 souls. Their history is involved in great obscurity. According to their own statements, they took their rise from the preaching of John the Baptist on the banks of the Jordan, and were driven from Palestine by the Mohammedans, some going to Persia, others to India. To avoid persecution the Persian Mendæans connected themselves with the Nestorians, and were officially regarded as Christians, but they preserved their doctrines and rites, and separated from the Nestorians some centuries later. They assert Jesus to have been an impostor, and the Jehovah of the Old Testament a spurious divinity. Their doctrines have been largely tinged with Persian dualism, and they recognize a double Supreme Being, male and female; the religious history of the world consists of a struggle between the kingdoms of light and darkness. John the Baptist was the revealer of the kingdom of light through the ordinance of baptism, which they regard as the only means of obtaining salvation and the pardon of sins. They prohibit mourning for the dead and the practice of all sensual indulgence by their devotees, but tolerate polygamy, even among their priests. They preserve a kind of love-feast resembling the *agapæ* of the early Christians. They have five sacred books, four of them doctrinal, and the fifth astrological. As to the origin of the name, various opinions have been offered; the most probable seems to be that of Neander, who interprets it to signify "disciples," and concedes to them the correctness of their claim to be the present representatives of a sect which took its rise from John the Baptist. If this be the case, it must be admitted that their doctrines have undergone such changes that they would not be recognized by the founder whose name they invoke.

Menda′ña de Ney′ra (ALVARO), b. in Spain in 1541; had resided in Lima for some years when his uncle, Lope Garcia de Castro, viceroy of Peru, gave him the command of an expedition sent for purposes of discovery among the islands of the Pacific. He sailed from Callao Nov. 19, 1567, with two small ships and 125 men; met with many adventures; discovered a numerous group of islands to which he gave the name of "Solomon Islands," thereby indicating his belief that they were the source of the gold employed upon the temple of Jerusalem. He returned by way of Colima on the coast of Mexico, reached Lima in Mar., 1568, and circulated reports of the wealth of the Solomon Islands. The myth thus originated gradually took form, and twenty-seven years later a considerable expedition was formed for the colonization of the Solomon Islands, of which the command was given to Mendaña. He sailed from Callao Apr. 11, 1595, but, instead of reaching the Solomon Islands, discovered another group, which he named after the wife of the viceroy of Peru, the marchioness Mendoza, and which are still known as the "Marquesas," while the archipelago bears the name of Mendaña, its discoverer. Proceeding N. W., many other groups of islands were visited, but Mendaña d. Oct. 17. His widow, Doña Isabel, who was on board, took command of the expedition, and with the aid of the skilful navigator Fernandez de Queiros it was brought safely to Manila Feb. 11, 1596, where the "lady governor" was received by the authorities with great honors. After some time she embarked for Mexico, and is presumed to have died there. Mendaña's MS. narrative of his first expedition is in the Imperial Library at Paris.

Mende, town of France, capital of the department of Lozère, on the Lot. Its manufactures of serges are very celebrated and largely exported. Pop. 7202.

Men′delssohn (MOSES), b. at Dessau, in the duchy of Anhalt, Germany, Sept. 6, 1729, of Jewish parents; studied almost from infancy with the greatest energy, but under the hardest circumstances, the Bible, the Talmud, Maimonides, and afterwards also modern literature, and became in 1750 tutor in a rich Jewish family at Berlin, and in 1754 bookkeeper in the firm. An accidental acquaintance with Lessing soon grew into an intimate friendship, and Lessing is said to have taken Mendelssohn as a model for his *Nathan*. He also associated with Nicolai, Abbt, and other literary persons, and began in 1755 to write for different periodicals. In 1763 his treatise on the *Evidence of Metaphysics* received a prize from the Academy of Berlin. In 1767 he published his *Phædon*, a dialogue on the immortality of the soul, which won a European celebrity. In 1783 appeared his *Jerusalem;* in 1785 his *Morgenstunden*, which exercised a considerable influence on his coreligionists. D. at Berlin Jan. 4, 1786. A complete edition of his works was published by his grandson at Leipsic (1843–45). At one time he occupied a prominent place in German literature as a philosopher, but it was before the time of Kant. The later development of German philosophy has rendered entirely antiquated both his ideas and his method. The most interesting of his works are his controversies with Lavater, who wished to convert him to Christianity, and Jacobi, who accused Lessing of being a Spinozist.

Mendelssohn-Bartholdy (FELIX), b. at Hamburg Feb. 5, 1809. His father, a wealthy Israelite, was a man of extensive learning and refined taste, and his mother was equally cultivated, being one of the brightest women in the best society of Berlin. He very early showed great talent for music under the instruction of his mother and of Madame Bigot; became the pupil of the romantic Berger for the piano, and of the severe Zelter for harmony; at eight years of age could read any music at sight, and write correct harmony. Although he had not the time to practise a great deal, yet such were the flexibility of his hands and the quickness of his musical faculty that he played perfectly the most difficult music. For his improvement and the entertainment of their guests Mendelssohn's father hired for the boy a small orchestra, which he led with skill and great zeal at the home musical evenings. Aided by his talented sister Fanny, he often produced his own compositions before the large circle of artists and scholars frequenting his home; he thus became the musical prodigy and the bright centre of their friendly interest. Up to 1826 his compositions showed less of the spontaneousness of genius than of skill in scholastic forms, which were the natural expression of a sensitive and not very self-asserting nature while under the dominion of the scientific Zelter. But in that year, writing his *Midsummer Night's Dream*, he left the class-room, and revealed the leading quality of his originality, the graceful vivacity of his fancy. In 1829 he left Berlin to travel through Scotland, England, Germany, Italy, and France. In 1833 he was made musical director of the city of Düsseldorf. This office he kept but two years, and then moved to Leipsic, where he lived till his death, excepting during short periods of time—once to go to Berlin as director of music to the king of Prussia, and occasionally to visit England and various German cities to conduct performances of his works. By his strong personal influence, his intelligent direction of the concerts of the Gewandhaus, and the establishment of the conservatory, he made Leipsic the leading city of Germany for pure music. In recognition of his services the university conferred on him the degree of doctor of philosophy and of fine arts, and in 1836 the king of Saxony made him his honorary kapellmeister. In 1837 he married Cecile Jean Renaud of Frankfort, whose grace, intelligence, and devotion were the happiness of the remaining ten short, busy years of his life. His continuous, laborious activity so much exhausted his sensitive organization that the death of his beloved sister Fanny (in 1847) was a blow from which he could not rally. A few months afterwards he d. of apoplexy (Nov. 4, 1847).

His leading characteristic was extraordinary sensibility, but his nature united also strong affections and a keen intellect, great energy, and mirth that was even frolicsome. One of his strongest traits was his unflagging pursuit of perfection; in every detail of every work he strove to express his best thought in the best form. He was too excitable and exacting to be a perfect conductor for the somewhat dull and stubborn players given him in England and Berlin. But in Leipsic, where enthusiasm and intelligence united in the cause, his power seems to have been little short of magical in rousing his men and leading them to the heights of his conceptions. As a pianist he was one of the greatest of an age that counted such artists as Liszt, Madame Schumann, and Chopin. His execution was a rare union of fire, delicacy, and purity. Among his best-known works may be mentioned the oratorio *Elijah*, which is more popular in England than any other oratorio excepting Handel's *Messiah;* the oratorio *St. Paul*, in which are happily united the grandeur of the ancient masters and the resources of modern art; the 42d Psalm; the *Midsummer Night's Dream*, a composition of extraordinary sprightliness and grace, probably the most striking work of its kind in the world; the concerto for the violin; the first concerto for the piano; the third symphony (in A minor); and the overture *Fingal's Cave*. His chamber-music, *Songs without Words* for the piano, and his vocal quartets and songs are among the purest and most charming contributions to the art. He seems to have had no dramatic power, or else that side of his genius was undeveloped, for his efforts in opera are few, and—what is still worse—they are failures.

His works are a worthy culmination of the art and science of his predecessors. They are the latest master-works of the pure classic school, and just precede the rise of the "music of the future" under the leadership of Wagner. In them are perfectly exquisite details, harmonious proportions, perfection of finish, and the refined, elevated taste to be expected of the perfect scholar.

C. H. FARNHAM.

Men'des Le'al (JOSÉ DA SILVA), b. at Lisbon, Portugal, Oct. 22, 1820; became at an early age distinguished as a lyric and dramatic poet, and also as a liberal politician. He became in 1845 a member of the Academy, in 1850 librarian of the royal library, and on the death of Viscount Santarem was entrusted with the continuation of his great work on cosmography. His *Poems* were collected in 1858, and have enjoyed a popularity not exceeded by that of any Portuguese author of the time. He has written much on political subjects and on literary topics, and is author of several romances and historical essays.

Men'dez-Pin'to (FERNAM), b. at Montemor-o-Velho, near Coimbra, Portugal, about 1510, of poor parents; after various adventures in Europe he set out for the East Indies, and arrived in 1537 at Diu, on the W. coast of India. His adventures lasted many years, and were narrated by him in a book published after his death, in which he states that he had spent twenty-one years in the East, had been thirteen times taken prisoner by the enemy, and seventeen times sold as a slave. His captivities had carried him from Egypt, Abyssinia, and Arabia through Persia, India, Burmah, Malacca, Siam, Java, the Loo Choo Islands, Japan, China, and Tartary. Mendez-Pinto made four visits to Japan, one of which was in company with St. Francis Xavier, through whose influence he entered the order of Jesuits at Goa, devoting the large fortune he had acquired to the establishment of a seminary in Japan. Obtaining a release from his vows, he returned to Portugal in 1558 with letters of commendation from the viceroy at Goa. He resided at court several years, and d. at Almada, near Lisbon, July 8, 1583. His book, *Peregrinação de Fernam Mendez-Pinto*, was first printed in 1614, when it immediately became a favorite, and is now ranked among the Portuguese classics. It was translated into the principal languages of Europe, and was much read, as were, indeed, at that time all books treating of Eastern countries and nations.

Men'dicant Orders and **Mendicants** [Lat. *mendicare*, to "beg"], persons who beg alms. Persons of this class have existed in all times since the fabled golden age. It is remarkable how few references to mendicants occur in the Bible. Homer has left us a fine picture of the bold beggarman of classical times in Irus, who is drubbed by Ulysses when the hero comes home disguised. Irus surpassed the other beggars of Ithaca in his unbounded stomach, was ever craving for meat and drink, and seems to have been sent hither and thither on messages. Juvenal speaks of the beggars of Aricia who ran beside the chariots and blew fawning kisses as they descended the hill. There are many allusions to this place as a haunt of mendicants. Martial wishes that the slanderous poet may wander from town to town, outcast on bridge and hill, begging for the scraps of spoilt bread that had been reserved for the dogs. Apuleius has left a vivid picture of the rogueries of the begging priests of the Syrian goddess—their public flagellations and ecstasies and their private gluttony and vice. This serves to remind us of the curious fact that begging has often been considered as a religious duty. The fakirs of India can claim a very remote antiquity. In that land beggary and saintliness were almost synonymous. This facile method of gaining a living may have attracted to the profession many not remarkable for piety. At the same time, it must be remembered that if in the East mendicant saints are in very small danger of starvation, the austerities and self-tortures common amongst them are not likely to attract any but the fanatical. These celibates, devoted to religious meditation and repentance, are clothed in filth, and may not even ask for their daily bread, the only petition allowed being to carry the open box into which free-will offerings may be thrown. The monstrous cruelties they inflict upon themselves sometimes end in lunacy, even when they are not prompted by a diseased brain. They number about 3,000,000 at the present time. Some of them live for years in constrained and painful positions; others inflict wounds upon their bodies or expose themselves to the rays of the burning sun. The central idea is that of conquering human feelings, emotions, loves, and hopes, and becoming absorbed in the contemplation of spiritual truth. No doubt a fearful amount of suffering is thus caused, and a fearful amount of hypocrisy engendered. In Booddhism clerical poverty is a leading rule. Every follower of Booddha who aspires to the priesthood must imitate the founder of the religion, who clothed himself in rags, renounced riches and power and family ties, and lived upon unasked alms.

In Christendom the literal acceptation of some of the gospel precepts led to the development of the monastic spirit. Sometimes in individual seclusion, as in the case of the hermits and pillar-saints, and sometimes in organized communities of men and women, the doctrines of personal poverty and celibacy were wrought out with more or less of consistency and success. In the thirteenth century came the mendicant orders. St. Francis of Assisi, the founder of the Frati Minores, forbade the possession of property, not merely to the individual members, but to the brotherhood also as a body; in this deviating from monasticism. The progress of the Franciscans was of an astonishing character. Over 100,000 of them are said to have perished whilst attending to the sick when the "black death" was sweeping over Europe. The interpretation of the rigid vow of poverty led to disputes which occasioned some offshoots from the main body. The success of the order also led to imitation. At one time the mendicant orders were so numerous that the general Council of Lyons (in 1274) limited them to the four orders of Dominicans, Franciscans, Carmelites, and Augustinian friars. The mendicant friars had access to every class of society, and as they went from place to place preaching and instructing the people, the orders became powerful corporations, and their members sometimes exercised great influence in temporal affairs, enjoying offices not always according with the simplicity of their rule.

Begging was by no means an exclusively clerical profession in the Middle Ages. Perhaps, indeed, in some cases, the success of the mendicant orders would induce imitation by those who could not plead any religious motive, but were merely seeking an easy mode of obtaining daily food. To the suggestions of idleness would be added the charm of variety and the pleasure of seeing the world. Some curious documents have been preserved which serve to show how numerous were the branches of the begging profession in the "good old times." About 1509 was written the *Liber Vagatorum*, of which the first edition was printed at Augsburg about 1512–14. This book commended itself to Luther, who wrote a preface to the edition issued in 1528. He had himself been imposed upon by some of these tramps. Amongst those named are the honest paupers who cannot obtain work: the bread-gatherers; the liberated prisoners who carried chains, and professed to have been captives amongst the infidels; the cripples (one is mentioned who obtained the leg of a dead thief, which he put on and tied his own leg up); knaves with the falling sickness, some of whom, by means of soap, made themselves foam at the mouth; blind rogues, some of whom, with bloody cotton tied over their eyes, pretended to have had their eyesight destroyed by robbers; women who lay outside churches covered with a sheet, and asserted that they had recently been delivered and that the babe was dead, or that they had given birth to a monster (at Strasbourg one of these *dütz betterins* was found to be a man); vagrants who said they were of noble birth and had suffered by war, etc.; pretended merchants who asserted they had been robbed of their goods; women who said they were baptized Jewesses. After this classification various curious particulars are given of other varieties—treasure-seekers, travelling quack doctors, card-sharpers, tinkers, and roguish peddlers. The little book ends with a canting vocabulary. There is a vivid description of the mendicants who swarmed in England in the sixteenth century in Thomas Horman's *Caueat, or Warning for Common Cursetors,* published about 1567. This work was preceded by *The Fraternitye of Vacabondes,* written and printed by John Awdeley in 1560, and the subject being popular was succeeded by many others. (See introduction to the reprint of Awdeley and Horman in the Early English Text Society's extra series.)

There would seem to be very little essential variation in the fashion of roguery, for many of the tricks recorded of these early mendicants are still practised by the beggars of to-day. In the Roxburghe collection there is a spirited ballad which confirms the details given by Horman. The "cunning Northerne beggar" would not change his rags for rich preferments, and acts many parts, being a poor old soldier, a sailor in old canvas clothing, a one-legged cripple, a mass of festering flesh infected with the falling sickness, and a burnt-out countryman. W. E. A. AXON.

Mendic'ity [Lat. *mendicare,* "to beg"] is that condition of pauperism in which the poor make a business of begging alms and become mendicants by profession. It has become a more permanent condition in Roman Catholic than in Protestant countries, partly because the latter have more frequently a "poor law," and partly because it is held a religious duty in the former to give alms directly to the poor, while under the modern system more thought is given to removing the causes of poverty. Yet all countries have seen the evils of mendicity, and have sought to remove them by legislation. A begging population will of necessity be more or less a criminal and thievish one: it has no ties of home, and few of family; social opinion does not reach it; it seeks to live in violation of the great law that man shall earn his bread by labor. Its habit is dependence, without any of the good effects of personal relations to a superior. The mendicants under modern habits of life become the most worthless and debased of any members of "the dangerous classes." Legislation has been almost useless against this evil.

French Mendicancy.—In the history of France we find as far back as 1351 an ordinance of King John commanding all lazy persons, *truands,* and able-bodied beggars to go to some species of labor or to leave Paris in three days, under penalty of imprisonment for the first violation of the law, of pillory for the second, and of branding with red-hot iron and banishment for the third. Again, in 1413 an important act was passed requiring able-bodied beggars to be forced to labor, under strict penalties. Under Francis I. these penalties were removed, and an ordinance of 1545 compelled the authorities to employ mendicants by force on the public works of Paris. All these severe laws did not, however, check the growth of mendicity; and, gradually discovering the failure of over-strict legislation, the French authorities in the seventeenth century made trial of more humane methods of repression. In 1627 the law required beggars to be forced into the service of commercial companies or into the French naval service and to embark for the Indies. At the same time there were ordered to be founded in the different provinces "hospital workshops" or workhouses, which were the beginnings of the present French system of "dépôts of mendicity." Still, the evil steadily increased with the nation's growth. Again, in 1688, an ordinance was passed expelling every pauper and beggar from Paris, under penalty of being sent to the galleys. Nothing, however, seemed to check mendicity in France, till in 1698 it was calculated that one-tenth of the whole population of the country was reduced to beggary. In the eighteenth century, however, the great progress of manufacturing industry and of commerce reduced the evil. Still, in 1790 a decree was passed ordering the opening of workshops for able-bodied beggars. The poor who were impotent or sickly were to be sent to the hospitals, and those strangers to the kingdom were to be forwarded to the frontier. Another law organized workhouses and almshouses for ordinary beggars, while those were sentenced to transportation who persisted in begging after their punishment or who committed other offences. Under the Empire the humane principle seems to have been recognized in legislation that before punishing mendicity as an offence work must be offered as an assistance. A decree of 1808 ordered that a workhouse or "dépôt of mendicity" be established in every department. In four years 80 of these were founded. Many complaints against them, however, arose on account of their large expenditures and their industrial competition with non-pauper laborers. It had been hoped that these establishments would in process of time nearly support themselves by the labor of the inmates, but this proved illusory, and these houses gradually became refuges of incurables. Under the Restoration they were nearly all suppressed, and at the present time (1874) but few "dépôts of mendicity" remain in France. By the law of 1838 the departments were relieved from the legal obligation of repressing mendicity by special establishment. There was no legal obligation placed on the tribunals to repress mendicity by penalties. Several workshops were substituted under the Restoration for the dépôts, and some provinces founded houses of refuge for beggars, but none of these succeeded. Thus, during five centuries every species of penalty and punishment has been tried in vain in France to repress mendicity. Humane legislation has been equally a failure; and the sum of all experience in that country is that all legal means fail to reach this great evil.

English Mendicancy.—From the earliest periods begging has been held as an offence by the English laws. The laws of Henry VII. required beggars not able to work to return to the hundred where last they dwelt. The distinction, however, was very early recognized between the impotent poor and able-bodied beggars. In 1531 the law required that an able-bodied beggar must be whipped and returned to the place where he was born. This law and others similar had no effect in diminishing the evil, of the progress of which a more full account will be given under PAUPERISM. The failure of severe legislation undoubtedly led to the formation of the poor laws of England. The principle recognized in this legislation is that begging is to be repressed, and no excuse is to be taken from the beggar for this mode of life. The unfortunate poor are to be provided for, but those accepting charity are to work for it. The 27th Hen. VIII. enacts that land-officers of every parish shall receive the poor and the vagabonds who may come there, and shall support them by voluntary alms, so that none shall be compelled to beg openly; and that the parish authorities shall force "the said valiant beggars" to be kept to continual labor, so that they may earn their own living. Almsgiving on the streets or at doors is forbidden, on forfeit of ten times the amount given. A "sturdy beggar" is to be whipped for the first offence, for the second his right ear is to be cropped, and for the third he is to be sent to jail, and, if convicted, he shall suffer death as a felon. As in France, legislation grew gradually milder against the evil from the experience gained that severe penalties did not diminish it. Still, even in Elizabeth's reign an act (14th) sentenced all persons convicted of begging and defined as "sturdy beggars" for the first offence to be whipped or branded with hot iron, for the second to be deemed felons, and for the third to suffer death. Licenses, however, were now permitted for beggars on condition that they begged only in their own parish and for food alone, and in the manner directed by the church-wardens and overseers. In the time of Charles II. the more modern condition of settled pauperism had begun to take the place of mendicant vagrancy. The poor law of Elizabeth (see PAUPERISM) did succeed in largely diminishing mendicancy during 150 years, but before the great reform in 1834 it had again appeared in alarming proportions. It has again been diminished by the slow working of the new legislation and by more general causes. In fact, the conclusion of all European experience is that nothing can permanently affect the evil of mendicity but a general diffusion of prosperity, morality, and intelligence. Whatever tends to the equal distribution of wealth, to the elevation and improvement of the working-classes, to the increase of the self-respect and the comfort of the workingman—whatever cheapens food and spreads education—whatever in political privilege or religious hope adds to the dignity of the laborer—in so far diminishes the tendency to mendicity.

Mendicity in the U. S.—There is, in fact, no good ground in the U. S. for any class of persons resorting to mendicancy for a livelihood. So great is the demand for labor that even children's earnings in street-trades in the large cities amount to a considerable sum per diem. Chance-work in all towns and villages is well paid, and a small sum in the spring would put every laborer's family in the Western districts, where they would be sure of good wages and cheap land. Still, with all this, there is a certain proportion of idle and dissolute persons in every American community who prefer the vagabond and restless life of a mendicant to steady labor. These persons have frequently no settled home, but migrate to the country from the cities in the spring, living on mendicancy, thieving, and chance-work, and then drift back at the approach of winter to enjoy the city charities during that season. The great proportion of these persons are able-bodied and of foreign descent. They are, however, not found to any large extent in the Western States. Their number in the State of Massachusetts alone is estimated at 25,000 each year. By the laws of that State, if vagrants under the meaning of the act, they may be committed by magistrates to the house of correction or to a workhouse for a term not exceeding six months, and constables are authorized to arrest them without warrant, to take them before such magistrates, and then make proper complaint. There are also methods of obtaining a longer period of commitment to the State workhouse. Such, however, is the extreme humanity of the Massachusetts law that some towns send the tramps to a hotel, and pay for meals and lodging for a night! According to the New York law, a vagrant may be committed to the poorhouse, there to be kept to hard labor for any time not exceeding six months, or, if he be a hardened offender, to the common jail for a term not exceeding sixty days, there to be kept, if the justice think proper, on bread and water for a time not exceeding one-half the time of his commitment. Children found begging may be sent to the poorhouse or to some appropriate institution, there to be instructed in useful labor. All the Eastern States suffer under the evil of mendicancy or vagrancy, and have passed similar laws to reform it. What, however, is most needed in American legislation is the establishment of State workhouses, where able-bodied tramps and beggars should be sent from the country poorhouses, and compelled to work out their own support during a period of not less than six months. Shorter sentences make it impossible to establish any remunerative farm or industrial work.

What the mendicant most dreads is labor and detention. If he found that he would incur the risk of both these in our villages and towns, he would abandon begging for industrious labor. As population increases, however, there will be a necessity for a system of connection by passes or tickets for the different county poorhouses, so that a vagrant may receive the necessary alms, but be kept under supervision and forced to move to his destination. The difficult subject of "settlement" has met with different treatment in different States. In regard to the statistics of mendicancy, it should be remembered that they are everywhere exceedingly untrustworthy, as in general the same beggar or vagrant is re-counted in every almshouse or police-station which receives him, or at every fresh sentence of the magistrate who commits him. De Watteville (an excellent authority) makes the proportion of mendicants in France 1 to 104. In certain departments, as Bordeaux, Nantes, Rouen, Strasbourg, no beggars are registered; in Marseilles the proportion is 1 to 1429; in Paris, 1 to 397; in the department Du Nord, 1 to 62. According to E. Villeneuve, the proportions are as follows: 1 beggar in 117 in England; 1 in 200 in Germany; 1 in 200 in Austria; 1 in 250 in Denmark; 1 in 154 in Spain; 1 in 166 in France; 1 in 126 in Italy; 1 in 102 in the Low Countries; 1 in 121 in Portugal; 1 in 202 in Prussia; 1 in 1000 in Russia; 1 in 243 in Sweden; 1 in 150 in Switzerland; 1 in 666 in Turkey (in Europe). The tramps on a given night in England have been returned as amounting in 1867 to 33,191, which would make a proportion of about 1 in 666. CHARLES L. BRACE.

Mendizabal' (JUAN ALVAREZ Y), b. in Cadiz, Spain, 1790, son of a Jewish tradesman named Mendez; was employed in the commissariat of the French army of invasion 1808–13; was afterwards engaged in a banking-house in Madrid; took part in 1819, with Alcalá Galiano and Isturiz, in the conspiracy for the restoration of the constitution of 1812; rendered important services in procuring funds for the revolutionary army 1820; aided the constitutional minister, Canga-Arguelles, in negotiating loans. In 1823, on the re-establishment of absolute government, Mendizabal fled to England, where he was for some time imprisoned at the instance of some capitalists who had lost money by investing in Spanish securities. He afterwards established in London a successful mercantile house; negotiated a loan for Dom Pedro I., the ex-emperor of Brazil (1827), and effected other operations in favor of the Spanish government which were considered to display great financial abilities. He was in consequence appointed minister of finance in June, 1835; negotiated a fresh loan in August before setting out from London. Received with great honor in Madrid, he became president of the cabinet Sept. 14, promised to finish the Carlist insurrection in six months, and was granted all his demands by the Cortes; but being unsuccessful in realizing his expectations, he retired from his post in May, 1836. He was again in office from Sept., 1836, to Aug., 1837, was for several years deputy for Madrid in the Cortes, again became minister of finance under Espartero in 1841, was obliged to escape to Portugal on the fall of the latter in July, 1843, and afterwards lived in great splendor in London and Paris. He returned to Spain in 1848, and d. at Madrid Nov. 3, 1853. His statue has been erected in that capital.

Mendo (ANDREÆ), b. at Logrono, Spain, 1608, studied theology in the University of Salamanca, entered the order of the Jesuits, and successively filled the positions of preacher to the court, secretary to the Inquisition, director of the schools of Oviedo and Salamanca, vice-provincial of Castille, and confessor to the duke of Assuna, viceroy of Catalonia. He d. in 1685, having earned a great reputation for learning by his various writings, of which the principal are *Bullæ sacræ cruciatæ Dilucidatio* (Madrid, 1651), *De Jure academico* (Salamanca, 1655), *De Ordinibus militaribus Disquisitiones theologico-morales* (Salamanca, 1657), several collections of sermons in Latin and Spanish, and *Statera opinionum benignarum in controversiis moralibus* (Lyons, 1666).

Mendoci'no, Mendocino co., Cal. (see map of California, ref. 3–A, for location of county), 125 miles N. of San Francisco. It is a seaport-town, and has good harbor facilities and a large saw-mill. Principal business, lumbering. Pop. about 800.

Mendon, Mich. See APPENDIX.

Mendo'ta, city and R. R. junction, La Salle co., Ill. (see map of Illinois, ref. 3–E, for location of county), has a public library, an iron-foundry, an organ-manufactory, etc. Pop. in 1870, 3546; in 1880, 4142.

Mendo'za, province of the Argentine Republic, on the eastern slope of the Andes, between lat. 32° and 34° S. and lon. 67° and 70° W. Bounded W. by Chili, E. by San Luis, N. by San Juan, and S. by Buenos Ayres. Area, 54,000 square miles. Pop. 99,000, mostly mestizoes, descending from Spaniards and Indians of the Guapes tribe. The Andes, which form the boundary between Mendoza and Chili, contain Aconcagua, one of the highest peaks of the American continent, and fill most of the province with their spurs. The entire region is very volcanic. The soil is fertile, but rain is rare, and artificial irrigation is necessary. The principal rivers are the Mendoza, descending from Aconcagua, and the Tunugan, both of which form extensive lagoons. Agriculture is the main occupation. Corn, wine, and fruits are produced in great quantities and of excellent quality, but means of communication are wanting. The province was almost treeless when the Lombardy poplar was successfully introduced.

Mendoza, town of the Argentine Republic, and the capital of the province of Mendoza, is situated at an elevation of 2891 feet above the sea. It was a thriving and even prosperous town, with 15,000 inhabitants, when in 1861 it was totally destroyed by an earthquake; nine-tenths of its inhabitants perished, having congregated in the churches, which fell and took fire. The rebuilding of the town at a short distance from its old site speedily began, and already it has 6000 inhabitants.

Mendoza is the name of an illustrious Spanish family whose origin dates back to the times of Didaco Lopez, lord of Biscaya, d. toward the end of the twelfth century. The family has played a very important part in the history of both Portugal and Spain, in both of which countries it is still represented, having divided into numerous branches—the Santillanas, Modejars, Coruguas, Priegos, Mendibils, Melitos, Infantados, etc.

Mendoza (ANTONIO), b. in Spain about 1590; became secretary of state under Philip IV.; and was author of poems and dramas which were much admired in the literary circles at court. D. in 1644. His poems are mostly pieces of a fugitive character, addressed to the duke of Lerma and other great personages at the court of Madrid. More merit have his dramas, some of which occupy a place in the history of Spanish literature; as, for instance, *Much Love is a Great Merit*, *Company changes our Habits*, and more especially *Love for Love*. He also published some minor historical writings. Nearly fifty years afterward his works were edited by the archbishop of Lisbon under the title *El Fenix Castellano, D. Antonio de Mendoza renascido* (Lisbon, 1690). A second edition appeared at Madrid in 1728. (See Ticknor, *History of Spanish Literature*, vol. ii.)

Mendoza, de (ANTONIO), Conde de Tendilla, Spanish statesman and first viceroy (from 1535 to 1550) of Mexico or New Spain. Chamberlain and high in the consideration of Charles V., he was chosen to inaugurate the vice-regal system in Mexico, all the more difficult at the time from the presence there of Cortez. His administration was marked by the highest order of statecraft. Considerate for the rights and well-being of the natives, founding schools for their instruction, he brought them into remarkable assimilation with European political and religious ideas. He founded cities and public institutions, including a mint, and greatly extended Spanish settlements, promoted agriculture, introduced the printing-press as early as 1536, and developed the mineral wealth of the land. A grave, obstinate Indian revolt in Guadalajara he repressed with the aid of Indian allies, but so tempered his rigorous course with justice and moderation as in a short time to obliterate hostility and discontent. It is estimated that in 1548 as many as 800,000 of the natives perished with a mortal fever which swept over Mexico. In 1543 he despatched a party of exploration to the Pacific coast, which discovered Cape Mendocino, named in his honor, with other points in California. During his administration the exportation of silver to Spain exceeded $22,500,000, exclusive of the very considerable quantity smuggled. Affairs in Peru having fallen into disorder, Charles V. transferred Mendoza to that viceroyalty in 1550, as essential for the restoration of good government. Thomas Jordan.

Mendoza, de (Diego Hurtado), b. at Granada about 1503; studied at Salamanca, and was employed by Charles V. in many important diplomatic missions to Venice, the pope, the Council of Trent, etc., and as governor-general of Siena, but made himself hated by his haughty manners and cruel proceedings. Philip II. banished him from the court on account of a quarrel with one of his rivals, and he d. at Valladolid in 1575. Although very successful in his undertakings as a statesman, his fame rests chiefly on his literary merits. His poems (only collected edition, Madrid, 1610) did not make a lasting impression. But his comical romance, *Vida de Lazarillo de Tormes* (1554), first condemned by the Inquisition, formed a new literary species, much admired, and imitated not only in Spain, but in all Europe; and his historical work, *Guerra de Granada*, which could not be published entire until 1776, is considered a masterpiece. His library, which contained many manuscripts of great value, is now at the Escurial.

Mendoza, de (Iñigo Lopez). See Santillana, Marquis of.

Mendoza, de (Juan Gonzales), b. at Toledo, Spain, about 1540; belonged to a wealthy and distinguished family; had been for some years an officer in the army when he entered the order of St. Augustine, and was sent by Philip II. to China in 1580 to obtain information about the politics, commerce, manners, and customs of that country. Father Mendoza spent three years in China, and remained two years in Mexico on his return. He published a valuable account of his observations in China in a work entitled *Historia de las Cosas mas Notables Ritos y Costumbres del Gran Reyno de la China* (Madrid, 1586). An English translation was published in 1588, and reprinted by the Hakluyt Society (2 vols., 1853–54). Father Mendoza was successively bishop of the Lipari Islands, vicar-apostolic of Mexico (1607), bishop of Chiapas and of Popayan, New Granada, where he d. in 1617. His great work contains an important account of early missionary explorations in New Mexico.

Mendoza, de (Lorenzo Suarez), of the same family with the first and noblest of the viceroys of New Spain; was the fifth viceroy, and exercised power from Oct., 1580, to June, 1583, when he d. He established the Royal Tribunal of Commerce of Vera Cruz (1581), subsequently so important a feature in Spanish colonial administration. During his administration the coinage amounted to $9,000,000. His title was that of count de Coruña. Thomas Jordan.

Mendoza, de (Pedro), b. in Spain about 1487; filled a high office at the court of Charles V. in 1535, when he proposed to undertake the discovery, conquest, and settlement of the southern portions of South America; was appointed adelantado, alcalde mayor, and alguazil mayor of the region in question, and agreed to transport thither a large and well-equipped colony. He sailed from San Lucas de Barrameda in Apr., 1535, with twelve ships and 800 men; touched at the Bay of Rio de Janeiro, where the vice-admiral, Osorio, was murdered by his own officers; ascended the Rio de la Plata as far as the island of San Gabriel; founded the city of Buenos Ayres, but lost a great part of the colonists in a war with the Querandi Indians, who attacked and burned the settlement. Mendoza sent his brother, Gonzalo, to Paraguay, where he founded the city of Asuncion Aug. 15, 1536; and another brother, Diego, was his general in the wars with the Indians. The adelantado embarked for Europe after a long series of misfortunes, was reduced to famine on the voyage, became a lunatic, and d. at sea in 1537.

Menees (Thomas), b. in Davidson co., Tenn., June 26, 1823. He graduated in medicine in Transylvania University, Lexington, Ky., in 1846; returned to Springfield, and practised there until 1857, when he was elected to the State senate; then resumed his practice in Springfield. He was elected in 1861 to the Confederate Congress, and re-elected in 1863. In 1865 he went to Nashville. He was in 1873 elected professor of materia medica and therapeutics in the medical department of the University of Nashville; after filling that chair for one term he was transferred to the chair of obstetrics, which he long occupied. In 1874 he was elected to the chair of obstetrics in the medical department of Vanderbilt University, and dean of the faculty, and before the Tennessee State Medical Society presented an able paper on hour-glass contraction of the uterus. Paul F. Eve.

Menela'us, king of Lacedæmon, son of Atreus and brother of Agamemnon, was the husband of Helen, and became thereby one of the most conspicuous figures in the Trojan war and the verses of Homer.

Menen'dez de Aviles, b. at Aviles, Spain, in 1519, of a noble Asturian family; took service in the Spanish navy, and was for many years a daring and successful cruiser on his own account, under royal commission, against Moorish and other pirates, but more especially against the French during the long wars of Charles V. with that nation. He attained the rank of captain-general; commanded the fleet which carried Philip II. to England 1554, of that which brought to Flanders the money and reinforcements which enabled Philip to win the battle of St. Quentin (1557), and of that which brought back the king and court to Spain in 1559. He went several times to the West Indies, where he amassed great wealth, and served twice as "general" of the annual India fleet. On returning to Spain (July, 1560) he was imprisoned and fined for alleged misconduct, but his great abilities enabled him to regain the favor of the court, and in 1565 Philip made him adelantado of Florida, and entrusted him with perhaps the best-appointed fleet sent to the Indies in that century. The news of a French colony having been planted in Florida was a powerful incentive, and Menendez sailed from Cadiz June 29, 1565, with thirty-four vessels, carrying 2646 colonists, while about the same time several vessels sailed for Florida from other Spanish ports. Touching at Puerto Rico in August, Menendez proceeded to Florida; went first in quest of the French on St. John's River; announced to the commander his intention of exterminating the colony; discovered the bay and river, which he called St. Augustine, and established on its bank (Sept. 8) the town of the same name, the oldest now existing in the U. S. The French fleet, commanded by Ribault, soon appeared in the Bay of St. Augustine with the intention of attacking the Spanish settlement, but it was driven off by a storm, and Menendez profited by the circumstance to march a force overland, with which at daybreak (Sept. 21) he surprised and massacred the French garrison at Fort Caroline. Only about seventy persons were spared, but Laudonnière with a few others escaped in boats and reached the French fleet. Menendez left a garrison in the fort, changing its name to San Mateo, and returned to St. Augustine. Ribault was soon afterwards wrecked on the coast, and having surrendered to Menendez, most of the French were put to death, in violation, as is alleged, of a formal promise of mercy. The fort of Santa Lucia was built at Cape Cañaveral, that of Santa Elena in what is now Port Royal harbor, S. C., and the next year Menendez pushed his explorations northward as far as Chesapeake Bay, called by him Santa Maria, after which he returned to Spain. During his absence Dominique de Gourgues, a French adventurer, captured Fort San Mateo, and massacred its garrison. Menendez sent in 1570 a colony of Jesuits to begin a mission on the Rappahannock River, but they were soon cut off by the Indians. In 1572 he sailed up the Potomac, avenged the destruction of his colony, and proceeded to make a careful exploration of the coasts of the Chesapeake. Two years later he was summoned to Spain, and appointed to the command of a squadron to be sent against the revolted Netherlands, but before setting sail he d. at Santander Sept. 17, 1574. Porter C. Bliss.

Menes. See Egypt.

Men'fi, town of Sicily, in the province of Girgenti, about 3½ miles from the sea-shore. Pop. 9542.

Mengs (Anton Rafael), b. at Aussig, Bohemia, Mar. 12, 1728; was educated, or rather trained, to be a painter by his father; lived alternately in Dresden, where he was court-painter to Augustus III., in Rome, and at the court of Charles III. of Spain, and d. at Rome June 29, 1779. His pictures, the products of a fine taste and great care, enjoyed high reputation in their time, but his art-criticisms, written in Italian, published at Parma in 1780, and translated into most European languages, are considered more interesting. It cannot be denied, however, that his art-criticism or art-theory obtains its principal interest from the intimate connection which existed between him and Winckelmann. His best pictures (*The Triumph of Trajan*, *The Temple of Glory*, etc.) are in Madrid.

Menha'den, Moss-Bunker, or **Bony Fish,** the *Brevoortia menhaden*, a fish of the herring family, extensively caught along the Atlantic coast. It is full of small bones, and is almost uneatable in the regular way, but for some years it has been the subject of an extensive and growing industry. The fish are put up as sardines. They are decapitated, the tail cut off, and otherwise trimmed, and by being subjected to steam the bones are softened; they are then put in cotton-seed or other oil. They have been long caught for their oil, which is abundant and is used in leather-dressing, rope-making, and for adulterating higher-priced oils. The refuse, called fish-guano, is a valuable fertilizer. The business of making this oil and guano is extensively carried on along the coasts of New England, Long Island, and New Jersey.

Menhaden Fisheries. See MENHADEN.

Menin′, town of Belgium, in the province of West Flanders, on the Lys. It has some breweries and manufactures of lace and tobacco. Pop. 9752.

Menin′ges [Gr. μῆνιγξ, "membrane"], in anatomy, the three membranes enveloping the brain and spinal cord, called *dura mater*, *pia mater*, and the arachnoid membrane. Each is described under its alphabetical head.

Meningi′tis [Lat. *meninges*, "membrane," and *-itis*, an affix denoting "inflammation"], inflammation of the membranes which envelop the brain and spinal cord, termed cerebral, spinal, and cerebro-spinal meningitis according as the inflammatory process is limited to the region of the cerebrum or brain, the region of the cord, or involves the investments of both. Acute cerebral meningitis results from injuries of the head, as fractures and diseases of the cranial bones, inflammation and suppuration of the middle and internal ear, from excessive mental labor, from perverted states of the blood, as in typhus fever and acute rheumatism. Sub-acute or secondary meningitis, of less intensity, occurs in many of the febrile diseases. The tubercular meningitis of children is the result of mal-nutrition of the blood or of actual tubercle of the brain. Spinal meningitis most often follows injury or disease of the vertebræ, less frequently is excited by rheumatic, gouty, and tubercular blood states. It may occur, as among soldiers in the field, from exposure in sleeping on the ground. Cerebro-spinal meningitis is usually epidemic, and is but one manifestation of a malignant febrile disease, the cerebro-spinal or spotted fever. In cerebral meningitis there are intense headache, active delirium, contracted pupil, flushed face, a tense, bounding pulse, sometimes convulsions, coma, paralysis, and death, due to exudation of inflammatory products upon the surface or within the ventricles of the brain. Chronic meningitis may be the cause of chronic headache, of epilepsy, idiocy, and insanity. In tubercular meningitis of children delirium is absent, but the pain in the head is lancinating and intense, causing the utterance of shrill cries, constant motion of the head, sleeplessness, and peevishness. There are automatic movements of the extremities, and convulsions. General emaciation coexists, as this is a disease of delicate and bottle-fed infants or of children tainted with scrofula or tuberculosis. In spinal meningitis movement of the body develops intense pain over the length of the spine and in the extremities, and an incurvation or rigid arching of the back. Epidemic cerebro-spinal meningitis has, in addition to meningeal symptoms, febrile disturbance, great debility, and a peculiar purple eruption. Acute meningitis is treated locally by cold applications and counter-irritants, internally by remedies reducing the action of the heart. In secondary meningitis we treat the primary disease, the exciting cause. Tubercular meningitis requires improved hygiene, diet, tonics, and alteratives. Cerebro-spinal meningitis requires nourishing diet, tonics, and stimulants to resist the degenerated blood state, and opium is pre-eminent in curative effects. E. DARWIN HUDSON, JR.

Menisperma′ceæ [from *Menispermum*, "moon-seed," one of the genera], a curious natural order of climbing exogenous shrubs, mostly tropical lianas, but there are a few species found in the U. S. Colombo, cocculus Indicus, and pareira brava are its most important medicinal products. There are a number of actively poisonous species and some of doubtful character.

Menisper′mine [Gr. μήνη, the "moon," and σπέρμα, "seed"], a crystalline principle found, with PICROTOXINE (which see), in a plant known as *Anamirta cocculus*, one of the names of which, formerly used by Linnæus, is *Menispermum cocculus*. The seeds are familiarly known as COCCULUS INDICUS (which see). Menispermine, by analyses of Pelletier and Conerbe, is $C_{18}H_{12}NO_2$. Though alkaloid in its nature, it is stated to be not poisonous; while picrotoxine, which is *not* alkaloid, is very baneful. H. WURTZ.

Menno, or **Menno Simons.** See MENNONITES, BAPTISTS, and ANABAPTISTS.

Men′nonites, a body of Christians deriving their name from Menno Simons (1496–1561). After the taking of Münster, and the execution of the leaders of the ANABAPTISTS (which see), June 24, 1535, Menno Simons, who had been a Roman Catholic priest, gave himself to the winning of the remnants of the deluded people from the lawless fanaticism into which they had been led. With older and purer elements he united them in the Netherlands and in North Germany, and the adherents of his views were known henceforth as *Tauf-gesinnte* (Baptists in the general sense) or as Mennonites. While some of the earlier views of the Anabaptists were retained, their fanatical violence was completely set aside. The Mennonites were carefully organized after what was regarded as the primitive congregational model. They had ministers and deacons. Their discipline was very strict. They maintained that Christians should not bring lawsuits, demand interest, take oaths, nor serve as soldiers. They rejected infant baptism, but did not immerse. Some of them adopted feet-washing in connection with preparation for the Lord's Supper. They dropped all the views subversive of civil rule which had been held by the Anabaptists. Their ministry is unpaid, and, for the most part, not regularly educated. The Galenists, however, established a seminary for preachers in 1735, and in our own century some efforts have been made in theological education. Their simple lives, thrifty habits, and fidelity to promises made them many friends. They obtained toleration first in the Netherlands, and then in England and in Germany. Diversity of views in regard to strictness in excommunication led to their division into the "Fine" or "Strict" and "Coarse" or "Mild" (1554–61). The "Mild" are the Waterlanders, taking their name from their locality. The "Strict" have many subdivisions. The milder party also divided on the questions between Calvinism (the Apostoolists) and Arminianism (the Galenists), 1664. In 1801 the parties united, the Galenists forming the major part, and (1811) strengthened the theological seminary in Amsterdam. In Holland there are about 120 congregations; in Germany the number of Mennonites is estimated at 14,000, probably half of whom are in the province of West Prussia. In Prussia they were freed 1802 from the obligation to bear arms, and in 1827 from the necessity of taking official and judicial oaths. In 1867 the North German federal constitution again imposed on them the obligation of military service. In 1783 many emigrated from Prussia to the Russian dominions, settling first on the Dnieper. In 1870 they had reached the number of 40,000. They enjoyed several privileges; among others, freedom from military service. They were rich, and they were generally reckoned among the best subjects of the Russian crown. But in 1871 they lost their privilege of freedom from military service, and the choice was given to them between conscription and emigration. They chose the latter, and in 1873 the first troop arrived in New York, and settled in Minnesota and Kansas. At last the czar was compelled to give in in order to stop the movement. (For the history of the Mennonites see Schyn (1723), Mattschoen (1729), Hunzinger (1831), Bouterweck (1864), and the literature under ANABAPTISTS and BAPTISTS. For the theory of their points of contact with the Waldenses see Halbertsma and Blaupot ten Cate (1844) and the writings of Menno Simons, the best and completest edition of which is that of Amsterdam (1686, in fol.).) In the U. S. the Mennonites are a body of considerable strength. On the invitation of Penn many immigrated in 1683–98, and founded their first settlement at Germantown, near Philadelphia. In 1735 there were about 500 families settled in Lancaster co., Pa. By reason of being subject to the conscription in 1871 large numbers of the Russian Mennonites, as above mentioned, emigrated to America. The translation of the Dort Confession of 1632 tended to remove many prejudices against them. They number in America about 200,000, of whom 150,000 are settled in the U. S. and 25,000 in Canada. The Amish or Omish Mennonites (1693) are rigid in discipline and in dress, proscribing even buttons as carnal vanities. The Reformed Mennonites arose in Lancaster co., Pa., in 1811. Their aim is to restore the ancient faith and practice of their Church. There are other subdivisions, of later origin. C. P. KRAUTH.

Menobranch′us, Proteus of the Lakes, or **Fish-Lizard,** a batrachian of the order Amphipneusta, has the head and mouth large; the upper jaw and palate thickly set with small sharp teeth; a short neck, with three branchial tufts on each side; tail compressed laterally, and fringed with a delicate membrane; four limbs, each having four toes without nails; small eyes, without lids; thick and fleshy lips; a large tongue, immovable except at the tip and edges; small nostrils; a long body, and a smooth skin. Two species are found in the fresh waters of the U. S.—*M. maculatus*, twelve inches long, with sub-circular dark-gray spots, in the lakes and streams of the St. Lawrence system; and *M. lateralis*, characterized by a dark band passing from the nostrils along the sides to the tail. It is found only in the Southern waters tributary to the Mississippi. It has rudimentary lungs, and is able to support life out of water two or three hours.

Menom'inee, city, cap. of Menominee co., Mich. (see map of Michigan, ref. 3–F, for location of county), on Green Bay, at mouth of the Menominee River, and on the Chicago and North-western R. R., is an important shipping-point for lumber to Chicago and the Eastern markets, and is engaged in mining iron and quarrying marble. Pop. in 1880, 3288; in 1884, 5578.

Menom'onee, cap. of Dunn co., Wis. (see map of Wisconsin, ref. 4–B, for location of county), on branch of Chicago St. Paul Minneapolis and Omaha R. R., 23 miles N. W. of Eau Claire, has excellent public schools, a foundry, machine- and carriage-shop, sash-factory, etc. It is a dépôt for the fur-trade. Pop. in 1880, 2589.

Menomonees, a tribe of American Indians of the Algonkin stock, in 1884 numbered 1400 souls, placed upon a reservation of 31,680 acres in the Green Bay region of Wisconsin. In 1884, 1600 acres were cultivated by the Menomonees, producing 200 bushels of wheat and 1000 bushels of corn. They have made considerable progress in civilization.

Menop'oma, a tailed batrachian reptile peculiar to the fresh waters of North America, which seems to form a connecting link between the perennibranchiate amphibians and the salamander. It has a large and flat head; two concentric series of minute teeth in the upper jaw, and one series in the under jaw; a branchial orifice on each side; rudimentary branchiæ: four limbs, the anterior having four and the posterior five short palmated toes; and a loose skin folded on the sides of the body. The commonest species, *M. Alleghaniense*, known as hell-bender, mud-devil, ground-puppy, young alligator, or tweeg, abounds in the waters of the Ohio and its tributaries, and was formerly classified as *Protonopsis horrida*. It attains a length of two feet, has a slaty-gray color with dark spots, feeds chiefly on fish, worms, and mollusks, is fierce and voracious, and erroneously regarded as poisonous. The species *M. fuscum* (Holbrook), found in Western North Carolina, is brownish-white above and yellowish-white below.

Menstruation. See CATAMENIA.

Mensura'tion [Lat. *mensura*, a "measuring"], that part of practical geometry which teaches how to measure the area of figures and volume of solids by measuring certain lines and angles of the figures and solids. As every rectilinear plane figure can be decomposed into triangles, and every solid bounded by planes can be decomposed into pyramids, the measurement of the area of such figures and of the volume of such solids resolves itself into the determination, by the methods of elementary geometry, of the sides and angles of certain triangles. But the determination of the length of curved lines, the area of plane surfaces bounded by lines which are not all right, of the area of curved surfaces, and of the volume of solids bounded by surfaces which are not all plane, requires the aid of the integral calculus.

Mental Philosophy. See PSYCHOLOGY.

Menta'na, a small place with an old castle, 13 miles to the N. E. of Rome, noted on account of the battle which took place here Nov. 3, 1867. The small army of volunteers under Garibaldi, numbering about 3500 men, and purposing to take Rome and unite the Papal States to the kingdom of Italy, had defeated the papal troops at Monterotondo (Oct. 26), and was about to push on towards Rome, when on the 28th and 29th the French fleet landed the detachment of Failly at Civita Vecchia. Garibaldi, who was before the Roman gate of St. Jean on Oct. 30, retreated to Monterotondo and Mentana, and began to intrench this position. On Nov. 2 he pushed one detachment towards Corresa and another towards Tivoli. This latter fell in with 3000 papal troops, followed by 2000 French troops. The volunteers retreated to Mentana, and here began a fight which lasted four hours, and in which they were completely defeated by the papal troops, aided by the French. Their loss was very heavy, principally on account of the Chassepot gun, with which the French infantry had recently been provided, and which were tried here for the first time. Garibaldi had only infantry, ill-armed people without discipline. His adversaries had all three weapons, regular troops, and were superior in numbers. On the retreat the volunteers met with the Italian army, which had entered the Papal States; they were disarmed, and Garibaldi himself was taken prisoner and brought to the fortress of Varignano, near Spezzia. In honor of this victory the pope instituted the Mentana medal, a silver cross with the inscriptions, *Fidei et Virtuti* and *Hinc Victoria*, which was given to all who had participated in the battle. AUGUST NIEMANN.

Men'tchikof (ALEXANDER DANIELOVITCH), PRINCE, b. at Moscow Nov. 27, 1672, in humble circumstances, and apprenticed to a pie-baker; attracted the attention of Lefort by his spirited face; enlisted in the regiment of Preobashenski; discovered a conspiracy among the Strelitzes; distinguished himself at the capture of Azov; accompanied the czar on his journey to Holland and England; gained by degrees his confidence; became after the death of Lefort his most intimate friend and adviser, and was made a prince in 1707 and field-marshal in 1709. He was a man of superior talent, both as a statesman and as a military commander. He won the decisive battle of Kalisz 1706, contributed much to the victory of Poltava 1709, conquered Pomerania in 1712, took Stettin in 1713, and his influence was felt in all branches of the civil government of Russia. But his rapacity was amazing; and when in 1713 he abandoned Stettin to Prussia without the consent of the czar, he was tried by a court-martial; his general conduct underwent investigation, and he was sentenced to death. The czar changed this verdict to a heavy fine, and even appointed him governor of St. Petersburg, but he had lost his influence. Once more, however, he came into power on the accession of Catharine I. in 1725, and when in 1727 she was succeeded by the young Peter II., he obtained absolute control of the government of Russia. He was just about to marry his daughter to the czar when he was overtaken by a conspiracy headed by the family of Dolgoruki, Sept., 1727; his property was confiscated, and he and his family were banished to Berezov, in Siberia, where he d. Nov. 2, 1729.—His great-grandson, ALEXANDER SERGEIVITCH MENTCHIKOF, b. in 1789, d. May 3, 1869; was aide-de-camp to the emperor Alexander in 1812–14, governor of Finland in 1831, minister of marine in 1836, and commander-in-chief during the Crimean war. He lost the battles of Alma and Inkerman, but defended Sebastopol with success for several months. He retired on account of ill-health, and was succeeded by Gortchakof. In politics he belonged to the Old Russian party, and was averse to all reforms.

Mentone' [Fr. *Menton*], town of France, in the department of Alpes-Maritimes, is beautifully situated on a bay of the Gulf of Genoa, and celebrated for its delicious climate, being surrounded on the three sides by the Sea-Alps, here between 3000 and 4000 feet high. Although it has no regular harbor, it carries on a brisk trade in fruits, fish, and perfumeries. Pop. about 11,000. Close by are the famous bone-caves, 88 feet above the Mediterranean, and rich in pre-historic remains. On Mar. 26, 1872, a fossil human skeleton was found here, 21½ feet from the surface, supposed to belong to the Palæolithic age. It was six feet long, and showed a facial angle of nearly 85°. It was placed in the Museum of Natural History in Paris.

Mentz [Ger. *Mainz*; Fr. *Mayence*; anc. *Moguntiacum*], city of Germany, in Hesse-Darmstadt, on the left bank of the Rhine, nearly opposite the influx of the Main. It was founded in the second century by the Romans and destroyed in the fifth by Attila, but was restored by Charlemagne. Shortly after it became the seat of an archbishop, and in course of time the archbishop became one of the three ecclesiastical electors of the empire. During the Thirty Years' war it was taken by the Swedes in 1631, by the Imperialists in 1635, and by the French in 1644. It is surrounded on all sides by a system of strong fortifications consisting of fourteen immense bastions and four detached forts, which command both sides of the Rhine. Its streets are generally crooked and narrow, though a large portion of the city has been rebuilt since the conflagration in 1857 in a thoroughly modern fashion; but it contains many interesting buildings—among which is the cathedral, a Romanesque structure with many Gothic details, of the fourteenth century—and many beautiful promenades and public places, such as the Gutenberg Place, with the magnificent bronze monument, by Thorwaldsen, of Johann Gutenberg, who was born and died here, and whose house is still preserved. Among its manufactures, those of carriages, furniture, and musical instruments enjoy great repute, and its trade is very considerable. Pop. 60,905.

Me'nu, or **Manu** [Sans. *man*, "to think"], the mythical ancestor of the human race in the Vedas and other sacred books of India. Several other Menus are recognized in Hindoo mythology, forming a succession of ten or fourteen personages, each of whom was said to have created the world, and perished with it after a period of incalculable ages, called a *manwantara*, or "age of Menu." The authors of the Brahmanical code of social and religious ordinances gave their work the name of *Institutes of Menu* to conciliate the support of the Vedic Aryans, thereby intimating that this code had been handed down from the earliest times; but at a later period, when the *origines* of the Vedic and Brahmanic religions had been confounded together by the sacred caste which arrogated to itself the exclusive custody and interpretation of the ancient books, Menu was represented as the author of the code bearing his name. Hence, some European scholars have supposed that a real Menu lived and promulgated laws at the transition period between the Vedic and Brahmanic periods, but this opinion is wholly unsupported and unnecessary. The *Institutes of Menu* (translated by Sir William Jones) are the sacred books of the Brahmans, and chiefly devoted to the establishment of the system of caste and the definition of the social and religious duties of the members of the four castes.

The following new and striking derivation of this primitive mythological word is given in Mr. S. P. Andrews's recent work, *Radical Etymology, or the Origin of Language and Languages:* "Throughout the Indo-European family of languages, the syllable MA (changeable to *me, mi, mo, mu*) means 'great,' and NA (changeable to *ne, ni, no, nu*) means 'small,' as to their primal sense. Hence Mana, Mena, Menu, etc. mean 'great-small,' and thence '*ratio*' or '*proportion*,' allied with tapering or spindle-form, the cone, pyramid, or triangle. Compare Lat. *men-sa*, 'a surveyor's triangular measuring-board,' *me*(*n*)*ta*, 'anything conical;' *mon-s*, Eng. '*moun-tain*;' Lat. *men-s*, Eng. 'mind'—*i. e.* 'ratio;' Sansk. *mā*, Lat. *men-sura*, Eng. '*meas-ure*,' hence Sansk. *mana*, 'to think.' *Manu*, the mythic ancestor of the human race; Eng. 'man,' Ger. *mensch*, etc." Compare also Sansk. *men*, "the moon"—*i. e.* "the measurer," traceable perhaps in Manah, an Arabian goddess; Mana, Mania, Manes, early Etruscan and Italian deities; Mannus, ancestor of the German race; Manes, founder of a Persian religion; Men, or Mene, a Phrygian divinity mentioned by Homer; Menes, founder of the Egyptian monarchy; Meni, a Babylonian divinity (Isa. lxv. 11, margin); and the Cretan lawgiver, Minos. (See this root in Chaldean, Hebrew, and Egyptian weights and measures.) Porter C. Bliss.

Menur'idæ [from *Menura*, *μήνη*, "crescent," and οὐρά, "tail," and *-idæ*], a family of birds of the group Passeres or Coracomorphæ, distinguished by the peculiar form of the vomer, which, according to Huxley, is "broad and rounded off in front and deeply cleft behind. The maxillopalatines are altogether obsolete, or at any rate unossified. The sternum has a well-developed and forked manubrium, but its posterior edge is strongly convex, and only exhibits a slight notch on each side. The furcula has no median process, and its scapular ends are comparatively little expanded." The bill is moderately slender and pointed; the gape quite well cleft; the nostrils linear, and advanced beyond the middle of the bill; the tarsi quite long, but stout; the toes normal; the tail very peculiar in the male, simulating the ancient lyre in appearance, the external feathers being full and sigmoidally curved, and the intermediate ones with distant barbules diverging from the shafts. There is but one known species (*Menura superba*), which is an inhabitant of Australia; it generally lives in pairs, and feeds upon insects. Theo. Gill.

Menza'leh, the largest lake or lagoon of Lower Egypt, 50 miles long, 25 miles broad, situated E. of Damietta, and separated from the Mediterranean by a narrow row of sandbanks. Its depth is only from 2 to 5 feet, but it is rich in fish and fowl, and its many islands are densely peopled and celebrated for their fertility. The Suez Canal runs straight through the lake for 27 miles.

Men'zel (Wolfgang), b. June 21, 1798, at Waldenburg, Silesia; served as a volunteer in the campaign of 1815; studied philosophy and history at Jena and Bonn; was an enthusiastic disciple of Jahn, the founder of the German Turners; lived from 1820 to 1824 as a teacher at Aarau, Switzerland, but settled in 1825 at Stuttgart, where he devoted himself exclusively to literature, and d. Apr. 23, 1873. His productions are very varied, comprising tales and romances—*Rübezahl* (1829), *Narcissus* (1830), *Furore* (1851); historical and mythological works and travelling sketches, sometimes consisting of several volumes, of which *Geschichte der Deutschen* ("History of the Germans," 3 vols., 1824–25) was translated into English by G. Horrocks (London, 1849); and finally, criticisms in the form of essays in the *Literaturblatt*, which he edited for many years, and also in the form of books, such as *Streckverse* (1823), *Die Deutsche Literatur* (1828), translated by C. C. Felton in Ripley's *Specimens of Foreign Literature* (Boston, 1840).

Mephistophiles is the name of a personification of the principle of evil, first occurring in the popular books and puppet-plays of the Middle Ages. Its etymology is uncertain, but most probably it is derived from a Hebrew root which signifies "one who loves lies."

Mep'pel, town of the Netherlands, province of Drenthe, has some manufactures and trade. Pop. 8238.

Mercadan'te (Saverio), b. at Altamura in 1797, and educated at the musical college of San Sebastio in Naples; attracted first attention in 1818 by a cantata performed at Naples; was appointed director of the Italian opera in Madrid in 1827; chapel-master at the cathedral of Novara in 1833; director of the conservatory of Naples in 1840; became entirely blind in 1862, and d. at Naples Dec. 18, 1870. He was a very prolific composer, vivacious and graceful; none, however, of his fifty operas is now performed; only some of his sacred compositions have survived.

Mer'cantile Law. That department of the municipal law which relates particularly to mercantile persons and contracts is termed the mercantile law, or the law merchant, and sometimes commercial law. The mercantile law is often spoken of as though it were a code of regulations existing by itself, separate and distinct from the general law of the country, and possessing an independent authority, derived either from the customs of traders or from some foreign legislation. This is an entirely erroneous conception. The various rules which control the business acts of mercantile persons, and prescribe the effect and operation of mercantile contracts, and which for purposes of convenience and general description merely have been denominated the mercantile law, are and must be originated and made authoritative in exactly the same manner as any other rules of the municipal law; that is, in the U. S. and in Great Britain they must either be directly enacted by the legislature or must be uttered by the superior courts while rendering their judicial decisions. The mistaken view mentioned above results from the habit, very prevalent among careless writers, of confounding the process of creating the law, the legislative act by which rules become mandatory and compulsive, with the sources from which these rules are derived, from which the material is taken and added to the constantly growing fabric of the national jurisprudence. Numerous special subjects are embraced within the purview of the mercantile law which may be properly classified as pertaining to the persons who are engaged in trade and commerce, the peculiar kinds of things which are the objects of mercantile ownership, such as ships, and the different species of contracts which are ordinarily used in the transactions of business. The following are the most important of these subdivisions included within the general denomination of mercantile law when used in its broadest sense according to the extension given to it by the modern modes of carrying on trade and commerce: The law as to sole traders, partnerships, corporations, and joint-stock companies, these being the forms in which merchants themselves may engage in trade, either singly or in combination with others. Of contracts, the principal ones are agency, sale, bailments, and especially hiring, common carriage, and pledge, bills, notes, and other negotiable paper, guaranty, suretyship, marine, fire, and life insurance, and all the contracts connected with the ownership of shipping and its use in foreign and inland commerce, including charter-parties, bills of lading, bottomry bonds, the rights, powers, and duties of part owners, masters, and seamen, and all the various maritime liens resulting either from contract or from tort, and the enforcement thereof in admiralty. To these must be added certain peculiar remedies, some of which apply to all mercantile persons and to all kinds of property, while others are strictly maritime—namely, bankruptcy, stoppage *in transitu*, and lien, to the last of which may be referred the whole subject of admiralty jurisdiction so far as it is concerned with private commerce and the transactions of business. It is plain from the foregoing enumeration that the mercantile law covers a wide field and embraces a vast variety of particulars; and yet there is in it, as a whole, a remarkable unity and simplicity, since its rules, although many and minute, are derived from a comparatively few general principles of equity and justice, and are based upon customs and usages almost identically the same among mercantile men in all parts of the civilized world. If we compare this department of our own jurisprudence with that portion of the law of all other enlightened nations which deals with the same subject-matter, we shall discover a close resemblance, a marked similarity, running through them all, often extending not only to the general doctrines, but even to the minute detail of rules. This likeness results both from the nature of the subject-matter itself, and from the common origin whence the legislation of all commercial and maritime states originally derived the regulations which make up the mercantile law of each. The great transactions of trade and commerce are necessarily international, and cannot, from the necessity of the case, be confined within any one territory or jurisdiction. Antecedent to all legislation, and independent of all positive national law therefor, it was inevitable that merchants of all lands should fall into the same methods of doing business, and should adopt the same usages and customs to which they voluntarily conformed in their mutual intercourse; and a violation of these customs would be prevented by the common opinion among them, since all commerce depends upon complete good faith and implicit trust. When such a body of customs and usages was formed for the regulation of all foreign commerce, it was equally natural and inevitable that the same should extend to the internal trade of any given country; and thus it is known as a historic fact that in all the commercial, and especially the maritime cities and districts of Europe prior to the action of the English courts and prior to any universal legislation, the same code of rules was voluntarily adopted and followed in the transactions of both external and internal traffic; and this body of regulations constituted the original "law merchant"—a law to the merchant in every country, not always imposed by his own government, but acquiesced in by him and his fellow-traders throughout the civilized world. These rules were not arbitrary, they had no historic and tribal origin like the law concerning land, but they were founded upon equity and good faith, and upon the considerations of convenience which experience had shown to be most conducive to the freedom and regularity of trade. This voluntary code, these customs of merchants, were transferred into positive law and incorporated into the jurisprudence of England by the action of the higher courts, and the whole proceeding forms the most striking and instructive example of their creative function, of their inherent power to legislate for the nation. The process of transformation was commenced during the time of Lord Chief-Justice Holt, but it was under Lord Mansfield that the broad foundations of the mercantile law were laid and a large part of the superstructure was erected. The original usages of the merchants were taken as the basis, but they were enlarged, extended, and improved as the increasing extent and requirements of commerce demanded. Although the legislation of other European countries was conducted in a different manner—that is, by legislatures rather than by courts—yet it closely adhered to the original model, and thus from motives of expediency a mercantile law has been developed in each nation similar in its fundamental doctrines, and often in its special rules, to that which exists in every other state. The same likeness extends to the law of our own country; and although in certain States some minute changes have been made by the legislature, some departures from the common type, yet on the whole the same rules, in respect to the subjects above enumerated as contained within the mercantile law, prevail in all the commonwealths. Among the most important and immediate sources from which the modern mercantile law, at the commencement of its development, was borrowed, were certain maritime codes into which the customs of the Middle-Age merchants had been collected, and which, although promulgated by single and often small states, were at one time accepted, either by acquiescence or by express legislative recognition, in all the countries of Europe that bordered upon the ocean or the Mediterranean Sea. After the overthrow of the Western Roman empire, and even during the almost universal establishment of feudalism, a few cities preserved much of their old municipal institutions, and through the eleventh, twelfth, and succeeding centuries they and other towns of a later growth became the centres of an extensive commerce, and grew to be independent, rich, and flourishing republics. On the shores of the Mediterranean were Amalfi, Venice, Pisa, Genoa, Marseilles, Barcelona, and others engaged in a vast commerce with the East, while on the shores and tributaries of the Baltic Sea, the German and Atlantic oceans, were Wisby, Lubeck, Hamburg, Bremen, Ghent, Cologne, which traded with England as well as with the interior and S. of Europe. The traditionary customs prevailing in these commercial cities were in several instances consolidated into "codes," which, originally local, at length acquired, as has been said, a universal authority. The earliest of these compilations was made by the republic of Amalfi, which partially collected the existing sea-customs into a legislative form; but its independence and trade were both destroyed about the middle of the twelfth century, and its laws were supplanted by others more extensive and important which subsequently appeared. The customs of maritime traffic prevailing in all the Southern cities were gathered and arranged in a written code, and published about the middle of the thirteenth century under the name of *Il Consulato del Mare*. The exact local origin of this celebrated complication is disputed, but it was undoubtedly a gradual and progressive work, obtaining its material from different authors and from various cities, and was at length promulgated in a completed condition either at Pisa or at Barcelona. It acquired the authority of law in France and in the Italian states, and has contributed more than any other single source to give shape and character to the maritime law which now prevails throughout Christendom. Its provisions contained the then existing rules applicable to trading vessels in time of peace, and to neutral and belligerent vessels in time of war. They are of course very few and meagre when compared with the enormous development which has taken place since the epoch of its first appearance, but they state the principles which were the germs of that development. Similar codes arose from like causes among the cities of Northern Europe. The first in time was the *Laws of Oléron.* The small island of Oléron, on the N. coast of France, was a flourishing commercial centre, and here this code appeared. It was introduced into England by Richard I., became common law in France, and was even adopted in Spain. The *Laws of Oléron* bear a close resemblance to the *Consulato del Mare*, although in some matters more full and minute. Among the topics of which it treats are the powers and duties of shipmasters and of seamen, the rights and duties of owners, partial and total losses by the perils of the sea; and, in fact, it touches upon all the most important subjects which are covered by the more elaborate legislation of the present day. Although never acquiring the authority of absolute law in England, it was one of the depositories from which the judges drew their material at an early day, and it has even been cited by the courts in modern times. A second compilation was made about A. D. 1290 at Wisby, then an exceedingly flourishing, rich, and splendid town on the Baltic, but of which hardly a vestige now remains. It differs little from the *Laws of Oléron*, and portions of it were extracted from that code. A third of these Northern codes was promulgated in 1614 by the Hanseatic Confederation, which embraced Lubeck, Hamburg, Bremen, and other important cities on the coasts and the German rivers. It was chiefly borrowed from the *Laws of Oléron*, and of course had the force of positive law within the jurisdiction of that confederacy. The effect of these several compilations was to fix and establish the mercantile usages of Europe, especially those relating to purely maritime subjects, and a common system was thus created and preserved adapted for the use of modern courts and legislatures.

John Norton Pomeroy.

Mercanti'ni (Luigi), b. at Ripatransone, in the Marches, in 1821. Destined by his father for an ecclesiastical career, he renounced it before taking orders. At the age of twenty he was already professor of the humanities in Arcevia; from thence went to Sinigaglia to teach Latin and Italian literature; in 1848 composed the popular song of the Italian volunteers known as "Tre Colori." Having taken part in the revolutionary movements of 1848–49, he was driven into exile, and retired to Corfu, where he published a volume of poetry; returned in 1853 to Turin, where he gave lessons in the most distinguished families; from Turin went to Genoa to take charge of the female institution of the Peschieri, and occupied himself at the same time with the direction of a woman's journal entitled *La Donna*. During this period he published his touching little patriotic poems *Tito Speri*, *La Spigolatrice di Sapri*, and the popular poems entitled *Il Buon capo d'anno del pellegrino Italiano* and *La Madre Veneziana*. In 1861, Mercantini was named professor of æsthetics in the Academy of Fine Arts at Bologna, and soon after he accepted a professorship in the University of Palermo. D. at Palermo in 1872.

Mercap'tan and **Mercaptans**, a peculiar and interesting class of compounds discovered by Zeise in 1833. (The name is a contraction of *Mercurio corpus aptum*, a fanciful name founded on its powerful reactions with mercury compounds.) The fact should be well impressed by the student upon his mind that these bodies contain no mercury. They have gained an interest of late from the announcement of their detection among the products of the distillation of coal and the constituents of coal-gas. *Sulphur-alcohols* and *sulphuretted alcohols* are other names that have been applied to them. Ethylic sulphohydrate is a name also applied to Zeise's original mercaptan by those who follow the hypothesis of the compound alcohol-radicals. Zeise's compound is C_2H_6S. Wöhler formulates it as C_2H_5,HS; according to which we must have here another imaginary radical, HS, of the class of the so-called "hydroxyle," HO, of the prevailing school of organic chemists, according to which school common alcohol is marsh-gas, in which one hydrogen molecule is replaced by *methyle*, CH_3, and another by *hydroxyle*, both of which are unknown substances, common alcohol being $C(HH.CH_3.HO)$, while mercaptan must be $C(HH.CH_3.HS)$. On the homologic view, common alcohol being $H_2O,2H_2C$, mercaptan would be $H_2S,2H_2C$. We certainly have the one advantage, if no other, in this latter case, of having to admit but one unknown molecular group in constructing the two compounds. The decision as to which view, if either, conveys the truth is yet in the future, to be revealed through discoveries yet to appear of the true molecular structure of chemical compounds in general. Common mercaptan is prepared by distilling together a salt of ethyl-sulphuric acid and an alkaline sulphide. It is a very thin, colorless liquid, immiscible with water, and of a highly offensive and persistent smell, resembling onions.

Mercaptides.—This name is applied to compounds formed by the action of metals and their oxides upon mercaptans. Common mercaptan gives with potassium and sodium, with evolution of hydrogen gas, solid mercaptides of potassium and sodium. If the alcohol, or substituted marsh-gas and alcohol-radical type, is preserved here, it would seem inevitable that further admissions of unknown radicals must be made—KS and NaS, namely. On the homologenic doctrine, on the other hand, we have $KHS,2H_2C$ and $NaHS,2H_2C$. H. WURTZ.

Mercati (MICHELE), b. at San Miniato, in Tuscany, Apr. 8, 1541, belonged to a family which through several generations had distinguished itself by learning and literary accomplishments. He studied philosophy and medicine at Pisa, and after taking his degree, in 1561, he obtained employment from Pope Pius V. He founded the museum of natural history in the Vatican and laid out the botanical garden in Rome. When Cardinal Aldobrandini, whom he once accompanied on a mission to Poland, ascended the papal throne, under the name of Clement VIII. (1592), he was made his first physician, but d. not long after, in Rome, June 25, 1593. He wrote *Instruzzioni sopra la Peste, Podagra, e Paralisi* (Rome, 1576), *Metallo Theca,* a description of the mineralogical department of the museum (published after his death), an essay on the obelisks found in Rome, etc.

Mercat'or (GERARD; his real name was KRÄMER), b. Mar. 5, 1512, at Rupelmonde, Flanders; studied philosophy, mathematics, and the art of engraving at Louvain; first attracted attention by two superb globes he made in 1541 for Charles V., but which were destroyed by fire; moved in 1559 to Duisburg, where he was appointed cosmographer to the duke of Cleve; published several valuable geographical works giving maps and descriptions of the world, Europe, France, Germany, and the British Isles; and d. Dec. 2, 1594. His principal works are *Tabulæ Geographicæ ad mentem Ptolemei Restitutæ* (1578) and *Atlas, sive Geographicæ Meditationes* (1595). By those works he exercised a decisive influence and contributed much to free the student of geography from the yoke which Ptolemy had laid upon him. When he became older, he became theological, and wrote *Harmonia Evangelistarum adversus Molinæum,* and other works which were put on the *Index,* though they are really insignificant.

Mercator (MARIUS), an ecclesiastical writer who flourished in the first half of the fifth century and played a conspicuous part in the Pelagian and Nestorian controversies. Of his personal life very little is known. He is mentioned only by Augustine (Ep. 193; *Quæst. ad Dulcit.,* 3) and Posidius (*Indic. Lebr. August.,* 4), and it is doubtful whether he was a priest, a monk, or a layman. In 418, during the pontificate of Zosimus, he lived in Rome, and, having there become acquainted with the chief representatives of Pelagianism, he wrote two books against them, one immediately after the other. He sent them both to Augustine, and received praise and encouragement from him; but they seem both to have been lost, unless the *Adversus novos hæreticos* be identical with the *Hypomnesticon,* generally printed among the works of Augustine and generally ascribed to him. Ten years later on, in 428, he went to Constantinople—probably on some official mission, perhaps as the agent of Celestine I.—and there he spent a large portion of his life fighting the Pelagians. He wrote in Greek a memoir, *Commonitorium,* which he presented to the emperor Theodosius II., and the result of which was the banishment from Constantinople of Julian of Eclanum, Celestius, and other Pelagian leaders. He continued, however, to write against them, and in 431 they were formally condemned by the synod of Ephesus. He translated into Latin as well his own writings as other documents belonging to the controversy—several sermons by Nestorius, his epistle to Celestine, the *Symbolum Theodori Majis.,* Cyril's *Apologeticus advers. Orientales* and *Apologeticus advers. Theodoretum,* etc.—and those translations are of the greatest importance for the true understanding of the history of the Church during that period. For a long time, however, they were not known at all. It seems that they were used in the ninth century during the controversy between Gottschalck and Hincmar, and in the Pseudo-Isidorian fabrications (whence arose the fable of an Isidorus Mercator), but after that time they were entirely forgotten or ignored until Holstenius, in the sixteenth century, again drew attention to them. The best edition of them is that by Baluze (Paris, 1684).

Mercator (NICHOLAS), a German mathematician and mechanician, b. at Cismar, in Holstein, about 1620, studied philosophy and mathematics in Copenhagen and Rostock, visited England in 1660, and was made one of the first members of the Royal Society in London. He afterward settled in France and was made superintendent of the construction of the fountains of Versailles, but, as he would not embrace Romanism, his salary was not paid him. He d. in Paris in 1687. He published *Cosmographia sive descriptio cœli et terræ* (Dantzic, 1651), *Trigonometria ephoricorum logarithmica* (Dantzic, 1651), *Rationes mathematicæ subductæ* (Copenhagen, 1653), *Hypothesis astronomica* (London, 1664), *Institutiones astronomicæ* (London, 1676), besides several essays and memoirs in the *Transactions Philosophiques.* He also published a new edition of Euclid.

Mercator's Chart, a map of a portion of the earth's surface in which meridians are represented by parallel straight lines, and circles of latitude by lines perpendicular to the meridians. Longitudes are plotted from a scale of equal parts, and latitudes from a varying scale so adjusted that the plot of a ship's course or of a rhumb shall be a straight line making with the meridians an angle equal to the course or the angle of the rhumb. The principle on which the projection is made is as follows: The length of a minute of longitude in any latitude is equal to the length of a minute of longitude at the equator multiplied by the cosine of that latitude. Now, the length of a minute of longitude being represented by a constant distance, the length of a minute of latitude must be represented by the same distance multiplied by the secant of the corresponding latitude. A scale constructed according to this law is called a scale of meridional parts. (See MERIDIONAL PARTS.) In projecting a chart of this kind the earth is supposed to be a perfect sphere, and 1 minute of longitude at the equator, or 1 geographic mile, is taken as a unit. The parallels of latitude at the bottom and top, commencing at some meridian, are divided into equal parts, each of which contains some convenient number of minutes; the extreme meridians are divided into parts which continually increase in passing from the equator towards the pole, in accordance with the law heretofore explained; these parts are taken from a table of meridional parts (Table iii. Bowditch's *Navigation*), each division corresponding to a convenient number of minutes, usually the same number that is employed on the parallel of latitude; the corresponding points are united by straight lines, and the outlines of continents, islands, oceans, and the like are then laid down from their known geographical positions, with such other information as may be useful to the navigator. If any two points on such a chart are joined by a straight line, and a right angle formed by drawing a meridian through one extremity, and a parallel of latitude through the other extremity, we shall have the triangle of Mercator's sailing. The side parallel to a meridian is the augmented latitude, the other side about the right angle is the longitude, and the angle at the base is the course. W. G. PECK.

Mercator's Sailing is the method of solving problems in navigation in accordance with the principles of Mercator's chart. W. G. PECK.

Merca'to San Severi'no, town of Southern Italy, province of Salerno, in a fruitful district, about 9 miles from the town of Salerno. It was once the capital of an extensive feudal territory. Pop. 9840.

Merced, cap. of Merced co., Cal. (see map of California, ref. 4–B, for location of county), 139 miles E. of San Francisco, on the Visalia division of Central Pacific R. R., has planing-mill, machine-shop, and is the point of departure for tourists visiting the Yosemite Valley and Falls and the Mammoth Tree Grove. Pop. in 1880, 1446.

Mercer, R. R. junction, cap. of Mercer co., Pa. (see map of Pennsylvania, ref. 3–A, for location of county), 60 miles from Pittsburg. Pop. in 1870, 1235; in 1880, 2344.

Mercer (Gen. CHARLES FENTON), LL.D., b. at Fredericksburg, Va., June 6, 1778; graduated at Princeton 1797; was commissioned by Gen. Washington captain of cavalry in 1798, in anticipation of war with France; studied law; travelled in Europe 1802–03; became aide-de-camp to the governor during the war of 1812; commanded the defences of Norfolk 1813, with the rank of brigadier-general; served in the general assembly of Virginia 1810–17; was chairman of the committee on finance in 1816, when he introduced the bill for the construction of the Chesapeake and Ohio Canal, and became president of the canal company; was elected a member of Congress as a Federalist in 1816, and remained in that body till 1840, a longer period of continuous service than that of any of his contemporaries. In 1853 he visited Europe, and conferred with the leading men of several countries in the interest of the complete abolition of the slave-trade. He was a leading protectionist. D. at Howard, near Alexandria, Va., May 4, 1858.

Mercer (Gen. HUGH), b. at Aberdeen, Scotland, about 1721; educated at the University of Aberdeen, became a physician, and served as assistant surgeon in the army of Prince Charles Edward, the "Young Pretender," in 1745.

In consequence of the failure of the rebellion he emigrated to America in 1747, and settled as a physician near the present town of Mercersburg, Pa. He volunteered in Braddock's campaign; was appointed captain; was severely wounded in the battle on the Monongahela, July 9, and being unable to keep up with the fugitives from that disastrous field, wandered through the wilderness alone for several weeks, until he finally reached Fort Cumberland, 100 miles distant. He received a medal from the corporation of Philadelphia for his courage upon this expedition. In 1758 he was made lieutenant-colonel: accompanied Gen. Forbes to Fort Duquesne (Pittsburg), and commanded that post for some time. He then settled as a physician at Fredericksburg, Va.; was actively engaged in drilling and organizing the minutemen of Virginia in 1775 and the militia in 1776; was appointed colonel of the 3d Virginia regiment Feb. 13, 1776, and at Washington's request was chosen by Congress brigadier-general June 5, 1776. He commanded the column of attack at Trenton, and advised the night-march upon Princeton, in which he led the advance, and at daybreak on Jan. 3, 1777, was mortally wounded at the commencement of the action of Princeton, and left for dead on the field. Removed to a neighboring farmhouse, he d. Jan. 12, 1777, in the arms of his aide-de-camp, Major Lewis. His funeral at Philadelphia was attended by 30,000 people. A monument was erected to his memory in Laurel Hill Cemetery, 1840.—His son Hugh (d. 1853) was educated at the expense of Congress.

Mercer (Maj. James), b. in Aberdeenshire, Scotland, in 1734: was educated at the University of Aberdeen, where he obtained an extensive knowledge of Greek literature; embraced the military career; served in Germany during the Seven Years' war; retired from the army with the rank of major in 1772; resided a few years in the S. of France, and passed the remainder of his life in literary seclusion in Aberdeenshire, where his society was sought and highly prized by the most eminent Scottish writers of the time. Maj. Mercer wrote poems of exquisite beauty, the first edition of which was published without his consent. D. in 1804, in which year a second edition of his poems was issued.—He married Miss Katherine Douglass, a sister of Lord Glenbervie, a lady whose extraordinary beauty and accomplishments were long proverbial in Scotland.

Mercer (Jesse), b. in Halifax co., N. C., Dec. 16, 1769; moved to Georgia, and after being ordained to the Baptist ministry took pastoral charge of a church in Wilkes co. in 1789; was an eloquent preacher, and perhaps did more to build up his denomination in the Southern States than any other one man. His collection of hymns, in a volume entitled *Mercer's Cluster*, is still in use in almost all the Southern Baptist congregations; wrote *History of the Georgia Baptist Association* (1836), and edited for many years the *Christian Index* of Georgia. He was one of the most prominent and useful members in the constitutional convention of 1798. Having acquired a considerable estate, and being without children, he founded by a liberal donation an institution of learning which was named Mercer University. This was at first established at Pennfield, but has since been moved to Macon, Ga. D. Sept. 6, 1841. (See his *Memoir*, by C. D. Mallory.) A. H. Stephens.

Mercer (John Francis), b. in Virginia in 1758; was a Revolutionary soldier; member of the Continental Congress 1782–85; delegate to the convention which framed the Federal Constitution 1787, which he did not sign; member of Congress from Maryland 1792–94; governor of Maryland 1801–03. D. at Philadelphia Aug. 30, 1821.—His daughter Margaret, b. at Annapolis, Md., 1791, freed her slaves and sent them to Liberia, and for twenty-five years supported herself by teaching school; author of *Studies for Bible Classes*. D. in 1841.

Mer'cersburg, Franklin co., Pa. (see map of Pennsylvania, ref. 6–E, for location of county), on the Cumberland Valley R. R., 10 miles W. by N. of Greencastle, and 22 miles S. W. of Chambersburg, is the seat of Mercersburg College. It was formerly the seat of Marshal College and the Theological Seminary of the German Reformed Church (1835). "Mercersburg theology," headed by Dr. Nevin, and advocated in the *Mercersburg Review* (1851), developed a peculiar type of thought, and created much commotion and controversy in the Reformed Church. Mercersburg College was organized after the removal of Marshal College to Lancaster, Pa. (1853), and occupies the same building. Pop. in 1870, 971: in 1880, 970.

Merchant Vessels, Register Tonnage of. See Naval Architecture.

Merchant, Commission. See Factor.

Mer'cia, the largest and most powerful of the seven Saxon kingdoms in England, comprised the whole central part of the country from the Thames to Yorkshire. It was an independent state from 585 to 825, with the exception of a short period when it was subdued by Northumbria. In 825 it was conquered and merged into the kingdom of Wessex.

Mer'cury [Lat. *Mercurius*, from *merx* and *mercari*], in Roman mythology, the god of commerce and gain, corresponding to the Greek Hermes, and became in course of time completely identified with him. A temple was built in Rome to Mercury as early as 495 B. C., and an altar was raised to him near the Porta Capena, by the side of a well to which the merchants repaired on the festival of the god (May 25) to sprinkle themselves and their goods with the magic waters of the well, that they might be purified and yield a large profit. In the Vicus Sobrius stood a statue of *Mercurius malevolus*, the ill-willed; no shop was allowed to be kept in this street, and milk was offered to the god in this place instead of wine.

Mercury, the planet which travels nearest to the sun, unless, indeed, reliance can be placed upon the accounts which some observers have given of the transit of dark bodies other than the sun-spots across the disk of the sun. Mercury travels at a mean distance of 35,392,000 miles from the sun, but the eccentricity of his orbit is considerable, amounting to 0.205618, and thus his greatest distance, 42,669,000 miles, differs from his least distance, 28,115,000 miles, by 14,554,000 miles, or by more than half his least distance. As the earth's mean distance from the sun amounts to 91,430,000 miles, Mercury's distance from the earth when he is nearly on a line between the earth and sun varies from about 63,300,000 miles to about 48,760,000 miles; but when thus placed he is invisible. He is most favorably placed for observation when at a distance of about 85,000,000 miles, at his greatest elongation from the sun, at which time he appears as a half disk. He is always seen near the sun, however, his maximum elongation amounting only to about 27°, while his minimum amounts only to about 18°. In northern latitudes, moreover, Mercury is always S. of the sun when he attains his maximum elongation, and is therefore less favorably seen. Mercury completes a sidereal revolution in 87.9693 days; his mean synodical period (the interval separating his successive returns to inferior conjunction) amounting to 115.877 days. His orbit is inclined 7° 0′ 8″ to the plane of the ecliptic—an inclination greater than that of any of the primary planets, but far surpassed in the case of several of the planetoids or asteroids. Telescopic observation of Mercury has revealed very little of interest. Schröter, by careful study of the phases of Mercury, was led to the conclusion that the planet rotates on his axis in 24*h.* 5*m.* 30*s.*, but very little reliance can be placed either on this result, or on the estimated inclination of the axis of Mercury to the plane of his orbit. Still, it is worth mentioning that in 1801, Harding discovered a streak on the southern hemisphere of Mercury, the careful observation of which resulted in his obtaining a rotation-period almost identical with Schröter's. The figure of Mercury shows no sensible compression. There would seem to be mountains of great size on the planet's surface, for, if Schröter's observations can be trusted, one mountain on Mercury has a height equal to $\frac{1}{128}$th of the planet's radius, or to about 12 miles. But later observers, using telescopes of the best modern construction, have failed so completely in recognizing the marks described by Schröter that great doubt necessarily rests on the accuracy of his conclusions. Mercury passes between the earth and sun more than three times in each year, and when, during one of these passages, Mercury is near one or other of the points on his orbit, called his nodes, where he crosses the plane of the ecliptic, he appears to pass across the face of the sun. Such an occurrence is called a transit of Mercury, and, though of less interest than a transit of Venus, is yet of use to astronomers—first, as a means of determining with great accuracy the motions of the planet; and secondly, because indicating the nature of the phenomena to be expected during the more important transits of Venus. Transits of Mercury occur at intervals of 13, 7, 10, 3, 10, 3, etc., years, always either in May or November. R. A. Proctor.

Mercury, Compounds and Nature of [Lat. *Mercurius*]; synonyms, *Hydrargyrum* (which is its Latin name, from the Greek name ὑδράργυρος, "liquid silver"), *Quicksilver, Argentum vivum;* Ger. *Quecksilber;* Fr. *mercure*, the only yet-known simple metal which assumes naturally a melted or liquid form—that is, which has a fusing-point below our average normal range of temperatures over the middle zones of the globe. It occurs as a native metal, like gold, silver, copper, etc., and has been known to mankind, therefore, from time immemorial. Its chlorides were also known of old—*corrosive sublimate* and the *red oxide* to the Arabians, and *calomel* to the alchemists. Its sulphide, *cinnabar*, has been used as a pigment from the most ancient times.

Occurrence and Preparation.—Besides the native metal, it occurs chiefly as cinnabar, its most abundant ore. The most famous American localities are in California, New Almaden and New Idria, named after the two most productive European localities, Almaden in Spain and Idria in Carniola. There are, however, numerous other undeveloped cinnabar-bearing regions in the Pacific States of America. Cinnabar is reduced to metallic mercury either by distilling with lime to combine with the sulphur, or by simply distilling in a current of air, which oxidizes the sulphur to sulphurous acid gas, leaving the mercury free. Metallic iron has also been used to combine with and retain the sulphur. The reduced liquid metal is sent into commerce in bottles of wrought iron closed with screw stoppers, containing about seventy-five pounds each.

Chemical and Physical Nature.—It is justly to be ranked among the "noble metals," from the fact that when pure it does not waste away or rust in ordinary air, resembling in this respect gold, silver, and platinum. Of course, however, the inconvenience arising from its liquidity renders it impossible that it should become generally a repository of value or a medium of exchange, like the precious metals, though it *has been* used as such in emergencies. Pure mercury is almost silver-white, of mirror-like lustre, which lustre it preserves perfectly in air free from sulphur. Like silver, it is tarnished superficially by sulphurous emanations. Dust also may adhere and tarnish it, but it is readily restored to perfect brilliancy by straining, or even by pouring through a glass funnel, to which the dust or tarnish-films will adhere. The worst enemies to its purity are *other metals*, and ignorance of this fact often leads to the ruin or great deterioration in value of large amounts of mercury. No metal should ever be allowed to touch it except iron or platinum. The smallest proportion of some common metals, especially lead, tin, and zinc, and even copper to a less extent, causes it to tarnish constantly and lose its lustre, and injures its perfect liquidity, making it somewhat viscous and adherent to other bodies, so that it will "drag a tail" behind when flowing over a surface, rendering it useless for nearly all its practical applications without purification by processes which are none too easy. In such cases, however, if the amount of base metal is minute, it may be removed by agitating with a diluted solution of perchloride of iron for some time. The mercury is thus "floured" or finely divided into globules, extending its surface so greatly that the base metal is soon converted into chloride and dissolved out. On washing then repeatedly with clean water, the globules will usually coalesce again. If some of them refuse to do so, it is best to add a minute quantity of *amalgam of sodium*, which causes *instant* coalescence of the minutest globules. Mercury which gets into this state of fine division, so that it will not run together spontaneously, is lost in immense quantities in mining countries by being washed away in suspension in water and mingled with sand and "tailings." This is the chief cause of the final loss of the mercury which passes into commerce; and great saving of wealth would follow from the practice of methods that would obviate this—*a fortiori*, from the fact that in these cases the floured mercury is generally charged, usually very richly, with the *precious metals* it has taken up in its comminglement with the ore. Mercury when pure has a density varying, according to the best determinations (those of Biot and Arago, Kuppfer, Kopp, and Regnault), from 13.58 to 13.59 in the liquid form, but contracting so greatly when frozen, to between 14.4 and 14.5 (Schulze and Biddle), that it suggests passage into an allotropic or polymeric modification (a circumstance in which both silver and lead resemble it). When it is frozen, which requires a reduction of temperature to just about 39° F. below zero, according to Hutchins (=−39.44° C.), it forms a tin-like mass, which is crystalline, but nevertheless malleable. It boils, when pure, at a temperature variably stated at from 346.5° (Crichton) to 360° (Dulong and Petit), yielding a transparent colorless vapor 6.7 times as heavy as air. Some believe that minute impurities raise its point of ebullition, which may account for these variable figures. Mercury, when exposed to the air at or near its boiling-point, is slowly oxidized to the red oxide; which, when exposed again to a still higher heat, is again decomposed into its elements.

Uses of Mercury.—The most important of these is in the working of the ores of GOLD and SILVER. (See these heads.) It is also used in the amalgamation of the zincs of voltaic batteries, in making looking-glasses, in barometers, thermometers, steam-gauges and other pressure-gauges, in dental amalgams (with copper). In the laboratory it is a valuable agent also in eudiometry (for confining gases), in mercurial pumps, and in other ways. It is used for preparing several important medicinal compounds.

Compounds of Mercury.—Several of the *amalgams*, or compounds of mercury with other metals, are useful substances. The dental amalgam, with *copper*, has already been mentioned. That with *tin* forms the coating on looking-glasses. *Sodium-amalgam* is used in the laboratory for a multitude of purposes, and in the arts in the amalgamation of the ores of the precious metals, and in the recovery of mercury which has been employed for this purpose. The two chlorides of mercury, known commercially as *corrosive sublimate* and *calomel*, have already been described under their appropriate heads. The protoxide or red oxide of mercury, known as *red precipitate* in medicine, is formed both by heating mercury in the air and by applying heat to the nitrate. The only other compound of importance is the sulphide, which, when artificially prepared, forms the beautiful pigment known as *vermilion*, and as found native is the mineral CINNABAR, already described. (See that head.) HENRY WURTZ.

Mercury, Medicinal Uses of. The medicinal uses of compounds of mercury are various, depending on the different physiological effects of different preparations. These have therefore to be studied seriatim. But there is a general affection of the system called *mercurialization*, induced by the steady impregnation of the blood with the metal, which is essentially the same whatever be the preparation of mercury used. This will, then, first be considered. Physiologically, the symptoms of mercurialization are briefly as follows: There are first a metallic taste in the mouth, a soreness of the gums, with swelling and redness of the same, and a peculiar fetor in the breath. Next comes a tendency to increase of the secretions, especially of the saliva, to be followed by a general inflammation of the structures of the mouth, swelling of the salivary glands, excessive and foul-smelling salivary secretion, and accompanying fever. If the poisoning continue, this condition, known as *salivation*, may lead to most disastrous consequences. Ulcers, gangrene, caries of the teeth, and hæmorrhages may occur in the affected parts; and now also the general nutrition of the body will be profoundly disturbed. Diarrhœa, emaciation, grave impoverishment of the blood, with absorption of newly-formed tissues, may result, establishing a state of general devitalization, from which the sufferer will but slowly recover. While in this condition the internal organs are liable to inflame, or, in common parlance, the individual is apt to "take cold." If the poisoning have resulted from breathing mercurial vapors, as in the case of artisans working with mercury, the symptoms of the mercurial infection are somewhat different. Salivation does not occur, but the poison attacks the nervous system, producing a peculiar trembling of the limbs, called "mercurial tremor." This may be so severe as to render the sufferer unable to stand, or even to use the hands for any useful purpose. Therapeutically, the induction of moderate grades of general mercurialization was formerly one of the commonest practices of the physician, being systematically resorted to in almost all inflammations, under the idea that thereby the inflammatory process could be checked, or at least controlled in severity, and the absorption of its morbid products hastened. But of late years this practice has been steadily losing favor, the treatment of inflammations without mercury apparently giving as good and even better results than the mercurial system. Very many physicians therefore limit the medicinal use of general mercurialization to the single disease syphilis, in which its extraordinary power has been overwhelmingly demonstrated. But even here the old habit of pushing the drug to actual salivation has been wholly abandoned, and the development of a slight sponginess and tenderness of the gums is recognized as the utmost physiological limit of therapeutic mercurialization.

Other special properties and uses of mercurial preparations are as follows: In general, the *mercuric* compounds are intensely irritant, corrosive, and highly poisonous to all forms of life, animal and vegetable. When swallowed in poisonous dose they produce intense gastro-intestinal inflammation, with extremely severe burning pain, vomiting, purging, cramps, excessive prostration, and death. If the sufferer live several days, salivation from absorption of the mercurial may occur. The antidote in mercuric poisoning is some form of albumen, as white of egg, milk, flour and water. But as the insoluble albuminates thus formed are again redissolved if left in the alimentary canal, the poison must be got rid of by emetics. The effects on the system are to be treated on general principles. The mercuric compounds used internally in medicine are mercuric chloride (corrosive sublimate), mercuric iodide (red iodide), and mercuric cyanide. These are employed in minute dose, largely diluted, to induce therapeutic mercurialization in syphilis, and in weak solution or in ointment as external applications in many forms of chronic skin disease, especially where depending on the presence of a parasite. Corrosive sublimate in exceedingly small doses is also used internally in certain digestive derangements with diarrhœa. In striking contrast with the mercuric are the mercurous compounds and preparations of the metal itself. Those used internally in medicine are mercurous chloride (calomel), mercurous iodide (green iodide), blue pill or blue mass (metallic mercury thoroughly rubbed into a pasty mass with confection of roses and liquorice-root), and mercury with chalk or "gray powder" (metallic mercury rubbed into a grayish powder with prepared chalk). These preparations have not the corrosive and poisonous properties of the higher compounds—a fact probably largely due to their great insolubility. Given in small repeated dose, they are in some way slowly dissolved in the juices of the alimentary canal, become thus absorbed, and readily induce general mercurialization. They are accordingly much employed for this purpose in syphilis. In single large dose the tendency of the present group is to a cathartic effect, strongest in the case of calomel, weakest in mercury with chalk. When so operating the mercurial is itself discharged before there is time for its solution and absorption, and hence this mercurial purging is unattended by any general infection with the metal. The stools produced are yellow and green, apparently from the presence of bile—an indication that the cathartic action extends to the duodenum, and thus the bile contained in that part of the intestine is discharged *per rectum* instead of being reabsorbed. Calomel is a good deal used, either alone or with other cathartics, as a purgative, and calomel, blue pill, and mercury with chalk often prove curative in many intestinal derangements, especially in that condition commonly called "biliousness;" but the philosophy of their curative action is not fully made out. Many other preparations of mercury are used for certain special purposes. Mercurial or blue ointment (metallic mercury rubbed thoroughly with lard and suet) is much used as a means of producing general mercurialization in syphilis, a small piece of the ointment being rubbed into the skin daily. It is also employed for purely local purposes in many skin diseases and for the killing of parasites. A solution of mercuric oxide in oleic acid forms a more elegant preparation for the same purposes. Mercurous oxide (black oxide) and mercuric sulphide (cinnabar) are sometimes used to mercurialize in syphilis by the process of "fumigation," the compounds being volatilized by heat and allowed to precipitate upon the naked skin of the patient; calomel is also used for the same purpose. Mercuric oxide and ammoniated mercury (white precipitate) are used only externally as gently irritant applications to sluggish sores. They are generally used made into ointments. Citrine ointment, containing mercury in the form of nitrate, is used for the same purposes. An acid solution of mercuric nitrate is used as a powerful caustic, and finally the yellow sulphate, or "turpeth mineral," is a prompt and non-nauseating but harsh and unequal emetic. Edward Curtis.

Mercy, Sisters of, or **Order of Our Lady of Mercy,** a religious order founded in 1831 by Catharine McAuley at Dublin, adopted in 1835 the rule of St. Augustine, somewhat modified in accordance with the practical purpose of the order, and was confirmed in 1840 by Pope Gregory XVI. After a preliminary postulancy of six months and a novitiate of two years the sisters become members of the order by taking the vows, binding for life, of poverty, chastity, obedience, and the service of the poor, sick, and ignorant. Wherever sufficient means are procured a House of Mercy is established, in which destitute girls of good character are taken care of, and from which help, spiritual and bodily, is administered to the sick and poor. All such houses within one diocese form one body under a common superior, elected by the sisters and subject to the bishop of the diocese. But there is no common superior for the whole order. The members are divided into two classes, choir-sisters and lay-sisters. The former do the active missionary work of the order, elect the superior of each diocese, etc.; the latter are occupied with the duties of the house. The first House of Mercy in America was established at St. John's, Newfoundland, in 1842; the first in the U. S. was founded at Pittsburg in 1843. The order has now houses, schools, asylums, and hospitals all over the U. S. In Europe it has also spread very rapidly. (See *Ceremonial for the Reception and Profession of the Sisters of Mercy*, Baltimore, and *Leaves from the Annals of the Sisters of Mercy*, New York, 1881, 3 vols.)

Meredith (George), b. in Hampshire, England, about 1828; was educated in Germany; studied law, but early devoted himself to literature; published *Poems* (1851), *Farina, a Legend of Cologne* (1857), *The Ordeal of Richard Feveril* (1859), a philosophical novel, *Modern Love, Poems and Ballads* (1862), *Emilia in England* (1864), *The Adventures of Harry Richmond* (1871), *The Egoist*, a novel (3 vols., 1879), *The Tragic Comedians* (2 vols., 1881), a novel founded on the life of Ferdinand Lasalle, the German socialist, and numerous other novels, and *Poems and Lyrics of the Day of Earth* (1883).

Meredith (Louisa **Twamley**), b. at Birmingham, England, 1812; received an artistic education; published in 1835 a volume of poems, and in 1836 *The Romance of Nature, or the Flower Seasons Illustrated*, both illustrated by her own pencil. In 1839 she was married to Mr. Charles Meredith, and emigrated with him to Australia. After residing five years at Sidney, they settled in Tasmania, where Mr. Meredith became colonial treasurer. She published *Notes and Sketches of New South Wales* (1844), which appeared in Murray's "Home and Colonial Library," and was highly commended; *My Home in Tasmania* (1852), with illustrations; *Some of My Bush Friends in Tasmania* (1859), *Over the Straits* (1860), and *Loved and Lost*, a volume of verse, illustrated by herself.

Meredith (William Morris), LL.D., b. in Philadelphia June 8, 1799; graduated at the University of Pennsylvania; began legal practice about 1820; attained a wide reputation; was much in public life in Pennsylvania; secretary of the U. S. treasury 1849–50; attorney-general of Pennsylvania 1861–67; presided over the Pennsylvania constitutional convention; declined a position as counsel for the U. S. at the Geneva conference. D. at Philadelphia Aug. 17, 1873.

Meres (Francis), b. in England about 1570; was author of *Wit's Treasurie* (1597), *Wit's Academy, a Treasurie of Goulden Sentences, Similies, and Examples* (1634), and of a translation of the *Sinner's Guide* by Fray Luis de Granada (1598–1614). The first-named work was a "comparative discourse of our English poets with the Greek, Latin, and Italian poets," which became popular as a schoolbook, and is celebrated as containing the earliest critical references to Shakspeare. The time and place of Meres's death are unknown.

Mergan'ser, a name given to several birds of the family Anatidæ and the genus *Mergus*. Six species are recognized by G. R. Gray. The hooded merganser of North America (*Mergus cucullatus*) is a beautiful water-fowl, known as hairy-head, water-pheasant, and hooded sheldrake. The red-breasted merganser, *M. serrator*, is common to both continents. They differ from the true ducks by their more slender bill, which has a small but evident hook at the tip and many notches on the edges of both mandibles.

Merg'er [Lat. *mergere*, "to sink"], in law, is the absorption or extinguishment of one estate or contract or interest by another of a higher grade, when both become vested in the same person in one and the same right. The most extensive and general application of this doctrine is in the law of real estate. Whenever a greater and a less estate coincide and meet in the same person, without any intervening estate, the latter is absorbed, or, as it were, swallowed up by the former, which is therefore the only estate which the owner of the property is subsequently deemed to have. Thus, if a tenant for years acquire the reversion in fee simple in his own right, the estate for years is merged in the fee, and he ceases to be longer *lessee*, having become the absolute owner of the property. So if the mortgagee of an estate acquires the equity of redemption, merger will take place and he will become vested with the entire estate. The same result will follow if the mortgagor takes an assignment of the mortgage or becomes otherwise vested with the mortgagee's interest. It is a general principle that whenever a legal and an equitable estate in the same land unite in the same person, the latter will merge in the former. In courts of equity, however, the strict legal rules of merger are not invariably adhered to, and may be disregarded when they would work injustice or frustrate the lawful intentions of the parties. If it is for the advantage of the person in whom the estates unite that they should be kept distinct interests, and the rights of other parties will not be unwarrantably prejudiced, equity will usually prevent the operation of merger. An estate in land may become merged as to a part of the premises, but still subsist as to the remaining part; as if, for example, a tenant for life or years acquire the reversion in part of the property held under the tenancy. He will in such a case become the absolute owner of one portion of the land, while he remains tenant of the other. If the several estates by act of the law unite in the same person, but not in the same right or interest, no merger will occur. If, therefore, an executor who has a reversion in his own right acquire a term for years in his capacity as executor, the two estates will not merge. So if a reversioner marries the tenant for years, no merger will take place, as he holds the reversion in his own right, but the term in the right of his wife. The several estates must also be immediately expectant upon each other as a general rule, though there are some exceptions at common law when the intervening estate is a contingent remainder.

Instances of the application of the doctrine of merger occur also in other branches of the law. Thus, if a contract of specialty, as a bond, be given by a debtor, binding him to the payment of a debt founded upon simple contract, the remedy upon the specialty supersedes or extinguishes that upon the original agreement, inasmuch as the substituted obligation is of a higher nature. For a like reason the recovery of judgment upon a claim arising out of simple contract extinguishes the original ground of indebtedness, and the only subsequent remedy available is an action upon the judgment if it be not previously satisfied. So a valid award by arbitrators is a bar to a suit for the original cause of action. But no merger will take place when both securities are of the same character or degree. Thus, one chattel-mortgage would not extinguish another. A lien upon chattels is generally extinguished if the property to which it attaches is purchased by the lienor. The term "merger" is also employed in the English law in a somewhat different sense from those which have been hitherto illustrated. Thus it is there a rule that when a felony has been committed which entitles the party injured to bring a civil action for redress, as well as to institute a criminal prosecution, the remedy by action is merged in the remedy by prosecution, or, as it is briefly expressed, the trespass is merged in the felony. But this does not mean that the civil remedy is extinguished, but only that it is superseded or postponed until the criminal proceedings are terminated. After the end of the prosecution the action is maintainable. This rule is established in order that the party injured may be induced to prosecute the public offence, which he might avoid doing if he were first permitted to recover satisfaction for his private injury. The fact that private persons generally act as criminal prosecutors in England makes this rule important. But in the U. S., where the prosecution of criminal offences is generally committed to special public officials, the English rule has been generally abolished.

George Chase. Revised by T. W. Dwight.

Mergui, one of the three Tenasserim provinces of Farther India, belonging to Great Britain, and consisting of a territory stretching along the coast of the Bay of Bengal from lat. 10° to 13° N., and an innumerable multitude of small islands known as the Mergui Archipelago. The islands are all high and mostly naked, but rich in edible birds' nests, tortoise-shell, and pearls. The territory of the mainland produces sapan-wood and ivory, and is rich in tin and zinc. It is occupied by two mountain-ranges which run nearly parallel to each other, and between which the Tenasserim winds its way to the sea. The coast-land between the sea and the mountains presents in some places fine rice-plains, but is mostly mangrove swamps. The mountain-country may be described as one continuous forest. Of the total area of the province, 7810 square miles, only 73 square miles are under cultivation. Pop. 51,846. The capital is Mergui, situated on an island in the delta of the Mergui River, in lat. 12° 26′ N. It has a good harbor and some trade, but with the exception of the house of the governor, the hospital, and the barracks, it contains only mean and miserable houses. Pop. 8000, consisting of Burmese, Siamese, and Chinese settlers.

Mer'iam (Ebenezer), b. at Concord, Mass., June 20, 1794; became a manufacturer of saltpetre in Kentucky, and was afterwards a merchant of Zanesville, O.; removed in 1838 to New York, and became a successful soapmaker and chandler. For more than thirty years he kept records of the weather, which he observed with unusual care; was also remarkably charitable and kind to the poor. He established in 1841 the *Municipal Gazetteer*, a periodical, and wrote many scientific articles, mainly printed in the *Journal of Commerce*. D. at Brooklyn, N. Y., Mar. 19, 1864.

Mer'ian (Matthæus), b. at Bâle in 1593; lived in Paris and Frankfort, and d. at Schwalbach June 19, 1653. His topographical work, giving perspective views of European cities, drawn, engraved, and described by himself, commenced in 1640 and continued after his death, is of great value, while his illustrations of the Bible, Gottfried's *Chronicle*, etc. have only small interest.—His daughter, Maria Sibylla Merian, acquired great skill in painting insects, caterpillars, and butterflies with water-colors on parchment. She was b. at Frankfort Apr. 6, 1647; went to Surinam, where she spent two years studying the insects of the tropical zone; published *Metamorphosis Insectorum Surinamensium* (1705), for which she engraved the illustrations. D. at Amsterdam Jan. 13, 1717.

Mer'ida [anc. *Augusta Emerita*], town of Spain, province of Badajoz, on the Guadiana. During the Roman empire it was the capital of Lusitania and a magnificent city; it is still interesting for its remains of that time, among which are the superb bridge over the Guadiana, 2575 feet long and containing 81 arches, and the triumphal arch of Trajan in the middle of the city. Of the magnificent aqueduct from the laguna of Albuera thirty-seven enormous piers are still standing, with ten arches in three tiers built of brick and granite. Of the circus, measuring 1356 by 335 feet, eight rows of seats still remain. Pop. 7390.

Merida, city of Mexico, capital of the state of Yucatan, 25 miles from the Gulf of Mexico, is handsome and well built, with a fine cathedral dating from the sixteenth century, and several other elegant buildings—the bishop's palace, the Franciscan monastery, etc.—with several good educational institutions, schools of law, medicine, and pharmacy, besides an ecclesiastical seminary, a literary institute, etc.; and with flourishing manufactures of tobacco, sugar, leather, and rope, and a brisk trade. A railroad connects Merida with the port of Progreso. Pop. 32,000.

Merida, town of Venezuela, South America, capital of a province of the same name, is beautifully situated on an elevated plain, the climate of which is described as an everlasting spring, and which produces all fruits and vegetables of the tropical and the temperate zones. The city was entirely destroyed by an earthquake in 1812, but is now rebuilt and is in a flourishing condition. Its coffee and its cotton fabrics are widely appreciated. Pop. 6000.

Mer'iden, city of New Haven co., Conn. (see map of Connecticut, ref. 6–D, for location of county), on the New York New Haven and Hartford R. R., 94 miles N. E. of New York. The growth of Meriden is principally due to its manufactures, which employ a capital of $10,000,000, and annually produce goods to the value of $25,000,000 or $30,000,000. Meriden contains extensive manufactures of silver-plated wares, woollen goods, steel pens, glassware, organs, table and pocket cutlery, gas-fixtures, guns, machinery, malleable iron, iron and brass castings, etc. The State Reform School is located here. The city is supplied with waterworks and has a paid fire-department and a local R. R.—the Meriden and Cromwell—built by the manufacturers to tidewater. The post-office of South Meriden is about 3 miles S. W. of the business-centre of Meriden. Pop. in 1880, 18,340. Ed. "Republican."

Meridian (degree of). See Geodesy.

Meridian, R. R. junction, cap. of Lauderdale co., Miss. (see map of Mississippi, ref. 7–H, for location of county), 85 miles E. of Jackson, has 2 female seminaries, furniture, sash, door, and blind factories, iron-foundry, plough-factory, cotton-yarn factories, steam corn mills, and machine-shop. Pop. in 1870, 2709; in 1880, 4008.

Meridian, on R. R., cap. of Bosque co., Tex. (see map of Texas, ref. 3–H, for location of county), near Bosque River, 39 miles N. W. of Waco. Pop. in 1880, 395.

Meridian Circle. See Transit Circle.

Meridian [Lat. *meridies*] **Curve of a Surface of Revolution,** the intersection of the surface with a plane passing through its axis. All such curves on the same surface of revolution are equal. W. G. Peck.

Meridian, Degree of. See Geodesy.

Meridian Distance of a Point, in surveying, the distance of a point from some assumed meridian line, usually the one through the extreme E. or W. point of the survey. W. G. Peck.

Meridian of a Place, the intersection of the earth's surface with a plane passing through the place and the earth's axis. It is a N. and S. line. If the plane of the meridian of a place is prolonged to intersect the celestial sphere, the line in which it cuts that sphere is the celestial, or astronomical, meridian of the place. The *magnetic meridian* of a place is the intersection of the earth's surface with a vertical plane passed through the axis of a freely-suspended magnetic needle at the place. The angle between this meridian and the true meridian is called the *declination* or *variation* of the needle. W. G. Peck.

Meridian Plane of a Surface of Revolution, any plane passing through the axis of revolution.

Merid'ional Parts, parts of the meridian, as used in Mercator's system, extending from the equator, and computed for all latitudes differing by 1 minute up to some limit, usually 83°. These parts are tabulated, and are used in this form for projecting charts and for solving problems in Mercator's sailing. The method of computing a table of meridional parts is as follows: Starting from the equator and taking 1 geographical mile as a unit, the length of the first minute of latitude is the natural secant of 1′, the length of the next minute is the secant of 2′, the length of the next minute is the secant of 3′, and so on; hence, the distance from the equator to lat. 2′ is equal to sec. 1′+ sec. 2′, the distance from the equator to lat. 3′ is equal to sec. 1′ + sec. 2′ + sec. 3′, and so on. The results obtained in this way are only approximate, and the process of computation is somewhat tedious. Other methods of computation have been devised that are more accurate, and at the same time of easier application; but the method just given shows more clearly the nature of the table in question. The best method of computing a table of meridional parts is from the formula

$$M = 7915'.70447 \log \cot \tfrac{1}{2} (90^\circ - L),$$

in which L is any latitude, and M the corresponding meridional part. (See Coffin's *Navigation.*) W. G. Peck.

Merimée′ (Prosper), b. at Paris Sept. 28, 1803; studied law and was admitted to the bar, but did not practise; held various positions in the civil service; succeeded M. Vitet in 1831 as inspector of the archæological and historical monuments of France, and d. Sept. 23, 1870. Besides a number of travelling sketches, originally reports to the minister of his professional researches, such as *Voyage dans le Midi de la France* (1835), *Voyage dans l'Ouest de la France* (1836), *Voyage en Auvergne et dans le Limousin* (1838), and *Voyage en Corse* (1840), he wrote several valuable archæological and historical works—*Monuments Historiques* (1843), *Peintures de l'Église Saint-Savin* (1844), *Histoire de Don Pedro I., Roi de Castille* (1843), *Episode de l'Histoire de Russie* (1854), *Mélanges Historiques et Littéraires* (1855). He made his appearance in literature in 1825 with *Théâtre de Clara Gazul*, which was followed in 1826 with *La Guzla*, a collection of lyrical poems. Both were published simply as translations, the former from the Spanish, the latter from the Illyrian, and for many years the secret remained undiscovered; but their influence in propagating the taste and the ideas of the romantic school in France was nevertheless very considerable. Afterwards followed a series of novels or small romances, often based on some historical data, and delineating the character of the nation and the age with wonderful precision and vividness. *Colomba* may be mentioned as his masterpiece in this style. After his death a very intimate but somewhat peculiar correspondence with an unknown lady was published, under the title *Lettres à une Inconnue;* an autobiography was also found.

Merino Sheep. See Sheep.

Mer′ioneth, county of North Wales, bordering on Cardigan Bay. Area, 663 square miles. Pop. 38,963. It is covered with mountains, the highest peak of which, Arran Mowddy, rises 2955 feet. The soil is generally poor, and suited only for pasturage, but some lead and copper are found, and considerable limestone and slate. Cap. Dolgelly.

Merionid′idæ [from *Meriones*—μηρός, "thigh"—the typical genus, a family of the order of rodents and sub-order Simplicidentata, closely related to the Muridæ. The skull is moderate; the infraorbital foramen large, elliptical, and oblique, and giving passage to the masseter muscle, as well as infraorbital nerve; the lower jaw has the coronoid and condyloid processes and descending ramus distinct, and in nearly the same plane, but the last is twisted and angulated inward; molar teeth $\frac{4}{3} \times 2$, the upper anterior one very small; the hind legs are much enlarged, adapting the animal for progression by leaps, with the tibia and fibula united below, and the metatarsal bones separated from each other; a cæcum is developed. This family has been constituted for the genus *Meriones*, F. Cuvier (= *Jaculus*, Wagler, and *Zapus*, Coues). Its chief character is the development of the hind limbs and the separate metatarsal bones. The *Meriones Hudsonius* is the well-known jumping mouse of the U. S. and Canada; this animal is about three inches long from nose to tail, and the tail is rather more than five inches long. It progresses with amazing rapidity by great leaps. Theo. Gill.

Mer′ivale (Charles), D. D., b. in 1808; was educated at Harrow, Haileybury, and St. John's, Cambridge, where he was an honor-man, a fellow, university preacher (1839–41), Hulsean lecturer (1861), and Boyle lecturer (1864–65); rector of Lawford 1848–70; chaplain to the Speaker of the Commons 1863–67, and in 1869 became dean of Ely. He wrote *The Fall of the Roman Republic* (1853), *History of the Romans under the Empire* (1850–62), *Conversion of the Roman Empire* (1864), *Conversion of the Northern Nations* (1865), a translation of the *Iliad* in rhymed verse (1869), *A General History of Rome* (1875), and *Lectures on Early Church History* (1879).

Merivale (Herman), C. B., D. C. L., elder brother of Charles, b. in 1806; was educated at Harrow and Trinity College, Oxford, where he graduated with high honors in 1827; became a fellow of Baliol College; was called to the bar at the Inner Temple 1832; was professor of political economy at Oxford 1837–42; under-secretary for the colonies 1848–60; was perpetual under-secretary for India; author of *Five Lectures on the Principles of a Legislative Provision for the Poor in Ireland* (1838), *Lectures on Colonization and Colonies* (London, 1841, 2 vols.), the most elaborate and complete work on the subject, *Historical Studies* (1865), *Life of Sir Henry Lawrence* (1873). D. in London Feb. 9, 1874.

Meriwether (David), b. in Virginia in 1755; served in the Revolutionary army; was taken prisoner at the siege of Savannah; settled in Georgia in 1785; was several times a member of the State legislature; was Representative in Congress 1802–07, where he was a prominent supporter of Jefferson, by whom he was appointed in 1804 a commissioner to treat with the Creeks, and was associated with Gen. Jackson and Gov. McMinn of Tennessee in negotiating with the Cherokees the treaty of July 8, 1817, by which the State of Georgia acquired a large territory W. of the Appalachee River. He was a Presidential elector in 1817 and 1821, and d. near Athens, Ga., Nov., 1825.

Merle, the European Blackbird (which see).

Merle d'Aubigné. See D'Aubigné (J. H. M.).

Mer′lin, a little hawk of Europe, the *Falco æsalon.* It is swift and courageous, as well as docile in confinement, and hence it was once extensively employed for hawking at small game. It is represented by the pigeon-hawk in the U. S.

Merlin (Ambrosius), an ancient Welsh prophet and enchanter, traditionally stated to have lived in the fifth century A. D. The legendary history of Merlin is given by Geoffrey of Monmouth in his *Historia Brittonum*, where he is represented as having sprung from the intercourse of a Welsh princess with a demon, to have been the adviser of Kings Vortigern, Uterpendragon, and Arthur. He figures largely in all the Arthurian poems from Spenser to Tennyson. A collection of prophecies ascribed to him were printed in French in 1498, in English in 1529, and in Latin at Venice in 1554.—Another Merlin, called *Caledonius*, or "the Wild," was said to have lived at Strathclyde in Scotland in the sixth century, and his grave is still shown at Drummelzier on the Tweed, where he was killed on returning from an incursion into Northumbria. He seems to have been a copy of his Welsh prototype, and his prophecies are almost identical with those of the former. An ancient metrical *Life* of this Merlin, consisting of 1500 lines, was published by the Roxburghe Club.

Merluci′idæ [from *Merlucius*, Latinized from the Fr. *mer*, "sea," and *luce*, "pike"], a family of teleocephalous fishes of the sub-order Anacanthini, typified by the common hake of Europe. The body is elongated, covered by small cycloid scales; the lateral line a continuous tunnelled groove, covered by a membranous linear roof; the head conical; the frontal bones separated, with a triangular frontal excavation, bounded laterally by ridges which converge into the occipital crest; the opercula distinct externally; the mouth deeply cleft; the teeth or jaws biserial, largest in the inner row, and movable; branchial apertures extensive; branchiostegal rays seven; dorsal fins two, the first short, the second long; anal like dorsal; pectorals slender; ventrals sub-brachial. The family is chiefly (if not exclusively) represented by the genus *Merlucius*, whose species are found in the cooler seas of both the northern and southern hemispheres. The peculiar dentition and skeleton isolate it. The neural spines are largely developed, and wedged one into the other. Theo. Gill.

Mer′maid ("sea-maid"), an imaginary marine being, having the form of a woman to the waist, and ending in the tail of a fish. Mermen, the males of this supposed species, are also described. The probability is that the appearance of the dugong or some other marine animal in places where it was not well known may have given rise to the stories regarding this fabulous being. The sirens, nereids, and water-nymphs of poetry are all forms of the same creature.

Mer′oë, the name of a modern dilapidated village, of an ancient city, and of an ancient kingdom in the upper valley of the Nile, above the fifth cataract. The village is in lat. 17° N., and occupies a part of the site of the ancient city, which was the capital, or one of the capitals, of the ancient kingdom. The territory of the kingdom was called an "island," bounded E. by the desert, W. by the Nile, and N. and S. by the Atbara and Azrek, the two main branches of the Nile. The country was noted for its fertility and wealth. The kingdom became prominent in the time of the Ptolemies. The Candace of the New Testament (Acts viii. 27) is supposed to have been one of the queens of this kingdom. Pyramids and ruins of temples attest its former greatness. R. D. Hitchcock.

Me'rom, the biblical name (Josh. xi. 5) for *Huleh*, a lake in Northern Palestine, triangular in form, the apex pointing southward, about 4 miles long, and at its greatest breadth 3½. The best description of it is in Macgregor's *Rob Roy* (1866). R. D. HITCHCOCK.

Merop'idæ [from *Merops*, the typical genus], a family of "coccygomorph" or cuckoo-like birds, popularly called "bee-eaters." (See BEE-EATER.) They have a peculiar physiognomy; the head moderate; the bill longer than the head, curved, and acutely pointed at the tip; the gape is not deep; the nostrils basal, rounded, and partly hidden by the short bristles; the tarsi very short; the toes long, the second, third, and fourth anterior, and more or less united at the bases, the first posterior; the tail is long and broad. "In *Merops*," according to Huxley, "the long and slender palatines are devoid of any postero-external elongations. The maxillo-palatines are slender and expanded at the end, as in passerine birds, but they unite in the middle line with one another and with the ossified septum." The species are tropical or sub-tropical birds, confined to the Old World. Three genera are generally recognized—viz. *Merops*, with about 20 species; *Melittophagus*, with 6 species, peculiar to Africa; and *Nyctiornis*, with 7 species, in the Indian mainland and archipelago, as well as Africa. They feed upon insects generally. THEO. GILL.

Merovin'gians, the first Frankish dynasty in Gaul, derived their name from Merwig or Merovæus, who was supposed to have founded a Frankish empire on the soil of Gaul in the middle of the fifth century, which CLOVIS or CLODWIG (which see) greatly extended and perfectly consolidated. The most characteristic events in the history of the Merovingian dynasty are the perpetual division and subdivision of the empire in Austrasia and Neustria; the horrible feuds originated by the rivalry and hatred of Brunehild and Fredegonda, and so vividly depicted by Augustin Thierry in his *Récits Merovingiens* (1839); and the establishment of a peculiar office, that of *major domus*, which occasioned the overthrow of the dynasty. In 752, Pepin the Short, *major domus* to Childeric III., confined the king in a monastery and seated himself on the throne by the aid of the pope. Pepin was a man of enormous energy, of great courage, and with a subtle understanding of time and circumstances. He felt that the dire emergencies of the country demanded a vigorous ruler, and he understood that in the eyes of the people the clergy could legitimatize even a revolution. He consequently induced Pope Zacharias to become a member of the conspiracy, and Boniface crowned and consecrated him. Thus the Carlovingian succeeded the Merovingian dynasty.

Merrick (JAMES), b. at Reading, England, Jan. 8, 1720; educated at Trinity College, Oxford, where he obtained a fellowship; took orders in the Church of England; was author of *Poems on Sacred Subjects* (1763), *Annotations, Critical and Grammatical, on the Gospel of St. John* (1764–67), *The Psalms Translated or Paraphrased in English Verse* (1765), *Annotations on the Psalms* (1767), and other poetical and theological writings. His translation of the Psalms displayed learning and cultivated taste. An amusing little poem by Merrick, entitled *The Chameleon*, has been frequently included in poetical miscellanies. D. at Reading Jan. 5, 1769.

Merrick (JAMES LYMAN), b. in Monson, Mass., Oct. 11, 1803; graduated at Amherst College 1830, and at Columbia Theological Seminary 1833; was a missionary to Persia 1835–45, and pastor of the Congregational church at Amherst, Mass., from 1849 till his death, June 18, 1866. Author of a volume of poems, *The Pilgrim's Harp* (1847), *Life and Religion of Mohammed* (1850), and a *Genealogy of the Merrick Family* (1860). He translated *Keith on Prophecy* into Persian (1846), and left his property to found Persian scholarships in Amherst College and Columbia Seminary.

Merrick (PLINY), LL.D., b. at Brookfield, Mass., Aug. 2, 1794; graduated at Harvard in 1814; became a lawyer of Worcester, Mass., in 1817; practised also in Swanzey and Taunton; a judge of the common pleas 1843 and 1851; judge of a municipal court 1844; of the Massachusetts supreme court 1853–64; was president of the Worcester and Nashua R. R., and left large sums for the benefit of the schools of Worcester, Mass. D. at Boston, Mass., Feb. 1, 1867.

Mer'rickville, post-v. of Lanark and Grenville cos., Ontario, Canada, 45 miles S. W. of Ottawa, on the Rideau Canal. It has extensive water-power and 1 weekly newspaper. Pop. in 1881, 819.

Mer'rill (AYERS PHILIPS), M. D., b. at Pittsfield, Mass., Apr. 17, 1793; graduated at Fairfield Medical College, N. Y., was at once appointed surgeon's mate in the U. S. army, and served with his regiment to the end of the war of 1815. He then resigned and settled at Natchez, Miss. In 1850 he removed to Memphis, Tenn., where he was the most active in organizing the medical college of that city, in which he occupied the chair of the theory and practice of medicine, and also edited the Memphis *Medical Recorder*. In 1864 he returned to New York, and spent his remaining days in that city. He wrote on yellow fever, scurvy, epidemic diseases, mercury, chloroform as an internal remedy, etc. D. in New York Nov. 3, 1873. PAUL F. EVE.

Merrill (JOHN WESLEY), D. D., b. at Chester, N. H., May 9, 1808; graduated in 1834 at Wesleyan University; studied divinity at Andover, Mass.; was president of McKendree College, Lebanon, Ill., 1837–41; professor of ethics, metaphysics, etc. in the Biblical Institute, Concord, N. H., 1854–68; held various pastorates in the Methodist Episcopal Church, chiefly in Massachusetts.

Merrill (STEPHEN M.), D. D., b. in Jefferson co., O., Sept. 16, 1825; entered the Ohio conference as a travelling preacher in 1846; was elected editor of the *Western Christian Advocate*, the official paper of his denomination, at Cincinnati in 1868; and consecrated bishop at the General Conference of 1872.

Merrill (WILLIAM E.), b. at Fort Howard, Brown co., Wis., Oct. 11, 1837; was graduated from the U. S. Military Academy in 1859 at the head of his class, and appointed brevet second lieutenant of engineers; first lieutenant 1861, captain 1863, major 1867, lieut.-col. 1883. Served in the civil war as assistant engineer in Va. and O., and subsequently as chief engineer of Army of the Cumberland; engaged in the battles of Chickamauga, Missionary Ridge, Knoxville expedition, etc., until July, 1864, when he was appointed colonel of the engineer regiment of veteran volunteers, which he had organized, and with which command he was engaged in fortifying important points on the lines of military railroads in Tennessee, Alabama, and Georgia. Since the close of the war he has served as chief engineer on the staff of the lieutenant-general of the army, and on important duty with his corps in the improvement of rivers, surveys, etc. in the West. Author of *Iron Truss Bridges for Railroads, Non-Tidal Rivers*.

Merrill, on R. R., cap. of Lincoln co., Wis. (see map of Wisconsin, ref. 3-D, for location of county). Pop. not in census.

Merrimac, Mass. See APPENDIX.

Mer'rimack River, in New Hampshire and Massachusetts, is formed by the union of the Pemigewasset and Winnipiseogee rivers at Franklin, N. H. It flows southward into Massachusetts, where it curves towards the N. E., and reaches the ocean in lat. 42° 48′ 27″ N., lon. 70° 48′ 46″ W. On its banks are the thriving cities of Concord, Manchester, and Nashua, N. H., and Lowell, Lawrence, Haverhill, and Newburyport, Mass. It is a navigable tidal stream as far as Haverhill, 15 miles; and above this point its channel is being fitted for navigation by the U. S. government. At its mouth there is a bad and shifting bar which impedes commerce. The river below the dam at Lawrence has valuable fisheries, but its chief industrial importance is from the immense water-power it affords.

Merritt (WESLEY), b. in New York in 1836; graduated from the U. S. Military Academy, and entered the army as brevet second lieutenant of dragoons 1860; captain 2d Cavalry 1862. In the early part of the civil war he had much valuable experience on the staff of cavalry commanders, and in Apr., 1863, accompanied Stoneman's raid to Richmond; was appointed a brigadier-general of volunteers in June, and brevetted major the week following for Gettysburg and subsequent pursuit of the enemy; in the Richmond campaign of 1864 was in command of a division under Sheridan, and subsequently at Opequan, Cedar Creek, and Fisher's Hill, where he won the brevet of major-general; again at Five Forks, Sailor's Creek, and final surrender was distinguished, and promoted to be major-general from date of Five Forks. Subsequent to the close of the war he served as chief of cavalry in various departments till Feb., 1866, when he was mustered out of the volunteer service. Became lieut.-col. of 9th Cavalry July, 1866; col. of 5th Cavalry July, 1876; supt. of U. S. Military Academy at West Point Sept. 1, 1882.

Mer'ry (ROBERT), b. in London in Apr., 1755; educated at Harrow and at Christ's College, Cambridge; studied law at Lincoln's Inn; bought a commission in the Guards; settled for some years at Florence, Italy, where he became a member of the famous Della Crusca Academy; contributed to the *Florence Miscellany*, and returning to London began to publish plays and poems under the *nom de plume* of "Della Crusca," which met with some imitators, and thus gave occasion to Gifford to satirize the "Della Crus-can school." Merry married in 1791 Miss Anne Brunton, an actress, with whom he came to the U. S. in 1796, and d. at Baltimore, Md., Jan. 24, 1798. His widow married William Warren, the comedian. Merry is said by Dr. R. W. Griswold to have exercised great influence upon American taste in poetry.

Mer'seburg, town of Prussia, in the province of Saxony, on the Saale. Its cathedral, adorned with four beautiful towers, is a noble structure of the thirteenth century. Merseburg is famous for its beer, which is considered the best made in Germany. Pop. 15,205.

Mersey, a river of England, rises in the N. part of the county of Derby, flows in nearly a westerly direction, expanding at Runcorn into a broad estuary, on the N. side of which is Liverpool; below which it joins the Irish Sea. It has an entire length of about 60 miles, and is navigable to its junction with the Irwell, its principal affluent.

Mer'thyr Tyd'vil, town of Wales, in the county of Glamorgan, on the Taff, is a dirty and unhealthy place, but important on account of its ironworks and coal-trade. Pop. 48,857.

Merton, de (Walter), b. at Merton, in Surrey, England, early in the thirteenth century; educated at the convent of his native place; took holy orders; obtained several benefices; was appointed lord chancellor 1258, deprived of his office by the barons 1259, reappointed 1261, superseded 1263, and again reinstated in Nov., 1272. He was appointed bishop of Rochester Nov., 1274, when he resigned the great seal. He was reputed a man of great learning. D. Oct. 27, 1277. Chancellor Merton established at Basingstoke a hospital for poor travellers and decayed ministers, and founded at Oxford (Jan. 7, 1264) Merton College, gave it a further endowment in 1270, and saw it completed in 1274. Its distinctive feature was that of a literary not a sacerdotal institution, and the students were not to be monks. It became the archetype upon which most subsequent colleges at Oxford were modelled, and celebrated its sexcentenary in 1864.

Meru, in Hindu mythology, was a fabulous mountain in the centre of the world, 80,000 leagues high, and surmounted by the heaven of Vishnu, which was invested with every conceivable attraction. So far as the myth has any geographical basis, it undoubtedly referred to the highest peaks of the Himalaya range.

Merv, a district of Central Asia, situated in lat. 37° 30′ N. and lon. 62° E., 250 miles N. of Herat and 360 miles S. of Khiva, but close to Akhal, which in 1881 was incorporated with Russia. It is an oasis of wonderful fertility, formed by the Murghab, and surrounded W., N., and E. by the most arid parts of the Kara-Kum desert, while to the S. it communicates with the valley of the Tejend or Herirud. That river rises in Afghanistan, passes by Herat, forms the boundary between Afghanistan and Persia, and breaks at Sarakhs through the Paropamisus into Turcomania, where it finally loses itself in the Kara-Kum desert; but its valley everywhere bears testimony of former cultivation. The Murghab rises on the northern side of the Paropamisus, runs parallel to the Tejend, and likewise loses itself in the Kara-Kum desert, having spent its waters on the formation of Merv. The inhabitants of this oasis are Turcomans of the Tekke tribe, numbering about 40,000 tents, or between 200,000 and 250,000 souls. The great fertility of the country made Merv at times a marvel of prosperity, but at present the Tekkes feel it necessary to add to the productions of their agriculture and manufactures (arms, silver-ware, superior carpets, felts, coarse cloths, etc.) by pillaging their neighbors. They have no political organization, no government. They are as yet independent, but in 1869 the Russians began the establishment of that line of stations which from Krasnovadsk leads directly to Herat, and of which Merv, so to speak, forms the real point of support.

Merville', or **Merghem',** town of France, department of Nord, on the Lys, carries on a varied manufacturing industry, comprising linen, velvet, salt, spirits, leather, beer, and tiles. Pop. in 1881, 7028.

Merycopotam'idæ [from *Merycopotamus*—*i. e.* a ruminating hippopotamoid—*μηρυκίζειν*, to "ruminate," and *ποταμός*, "river"], an extinct family of artiodactyle ungulates, in some respects intermediate between the ruminants and Omnivores, but in its dentition resembling the former. The representatives seem to have been moderately stout animals; the skull had an elongated snout; the lower jaw was contracted in front of the ascending ramus, and provided with a deep preangular expansion directed forward; the molars were of the ruminant type—*i. e.* with two pairs of crescentiform ridges on each half; those of the upper jaw comparatively broad, and of the lower narrower, the last with a supplementary posterior lobe; the canines comparatively small and cylindro-conic. The typical species of the family (*Merycopotamus dissimilis*) was originally referred to the genus *Hippopotamus* by Falconer; and even when he established a new genus for it, he was still led to retain it near *Hippopotamus*, being undoubtedly chiefly influenced by the form of the lower jaw. There can, however, be little doubt that it was a ruminant of the same group as the Areodontidæ of Miocene North America. The remains of the species of *Merycopotamus* have been obtained in the Tertiary deposits of the Sewalik Hills of India. Theo. Gill.

Mescala, a river in Mexico, emptying into the small but commodious port of Zacatula on the Pacific. Rising in the state of Tlascala, as it passes Puebla it is known as the *Atoyac*, then as *Rio Pablano*, and next, or chiefly, as the *Rio de las Balzas* in its course through Guerrero and as the boundary-line between that state and Michoacan. With a general direction of S. S. W. and S., it is 450 miles long, and navigable in the last section, where it is locally known as *Rio Zacatula.* Engineers regard it as open to easy improvement, and an important part of a practicable water-way across Mexico. Its bed has furnished rich gold-placers on the Pacific slope, and it traverses a rich mineral region. Several of its affluents are considerable streams, and its fish are particularly esteemed. Thomas Jordan.

Mesembryanthema'ceæ, otherwise named Ficoideæ, a natural order of succulent exogenous herbs and shrubs, of nearly 400 species, largely from South Africa. In Spain and North Africa they yield much barilla. The ice-plants of greenhouses and gardens are the most familiar representatives of this order.

Mes'entery [Gr. μέσος, "middle," and ἔντερον, "intestine"], a double fold of the Peritoneum (which see) which attaches the small intestine to the spinal column, but so loosely as to allow much freedom of motion. The corresponding support of the large intestine is the *mesocolon*, with the *mesorectum.* The mesentery contains between its folds numerous blood-vessels, nerves, lacteals, and lymphatics, and the ganglia known as mesenteric glands, which are connected with the lymphatico-lacteal system. It is about four inches wide, and extends nearly the whole length of the intestine.

Me'sha, a king of Moab in the reigns of Ahaz, Ahaziah, and Jehoram, tributary to the kingdom of Israel, to which he annually paid "a hundred thousand wethers and a hundred thousand rams with their wool." On the death of Ahaziah he seems to have revolted, and Jehoram made an alliance with Jehoshaphat, king of Judah, against him. The two kings overran Moab with the exception of one stronghold, which Mesha successfully defended after offering his first-born son as a burnt-offering to his god Chemosh. An inscribed tablet of this king, the famous Moabite Stone (which see), was discovered in 1868 at Dibon, which commemorates the deliverance hinted at in 2 Kings iii. 27.

Mesh'ed, city of Persia, the capital of the province of Khorassan, situated on an elevated but fertile plain in lat. 36° 17′ N. and lon. 59° 25′ E. To some extent Meshed derives its importance from the circumstance that it contains the mausoleum of Imâm Riza, who was the founder of the great Mohammedan sect of the Shiites. This mausoleum and the mosque built over it, with its gilded domes and minarets, its doors of silver, its rails of gold, and forests of columns of marble and porphyry, is among the most magnificent buildings of the East, and is annually visited by thousands of pilgrims. But besides being a holy city, Meshed is a great trade-centre. Caravans are coming and going every day, carrying loads of the most costly merchandise from India, China, Persia, Arabia, and Europe; and in several branches of industry its own manufactures are celebrated; its carpets, shawls, light silks, and sword-blades enjoy a high reputation; also certain kinds of earthenware, glass, and porcelain. Pop. about 70,000.

Mes'mer (Franz, or, according to others, Friedrich Anton), b. at Itzmang, on the Lake of Constance, May 23, 1733, or, according to others, at Meersburg in Suabia in 1734. Neither his name nor the date and place of his birth is known with certainty. Educated at Dillingen and Ingolstadt, he studied medicine at Vienna, took the degree in 1766, and commenced his famous magnetic cures (see Mesmerism) in 1772; went to Paris in 1778; made an enormous sensation and a great fortune, but lost his reputation here by the unfavorable report made on his method by a royal committee of the greatest French physicians and scientists; practised for some time in London, though with less success; returned to Germany, and d., almost entirely forgotten, at Meersburg Mar. 5, 1815.

Mesmerism. Dr. Mesmer expounded as early as the year 1773 the results of certain experiments made by him, advancing the theory that some individuals might be rendered temporarily unconscious by others. He claimed that this state was a species of animal magnetism, and that the passage of powerful magnets over the surface of the body of some persons would induce in them a trance state. This condition received his name. About the same time Pusegne, his student, discovered somnambulism, and really explained the peculiar state Mesmer had described before in a very unsatisfactory manner. He eliminated magnetism and other fallacious parts of Mesmer's doctrine. Pusegne accomplished many cures by mesmerism. For a number of years it was looked upon as a species of witchcraft, and was forbidden by the French and German governments and discountenanced by the Church. Although commissions were appointed by the former government to investigate the matter, our own countryman, Franklin, being a member of one of them, it was not till the year 1840 that the subject received proper attention. Before this it was considered dangerous to the morals of the people and productive of licentiousness. Of late years it has been practised by clairvoyants and other quacks as a branch of the healing art. Notwithstanding its interest as a peculiar psychic state, it has been degraded and remained a comparatively unstudied subject. The claims of those who practise it are so extravagant, and are based upon such an unscientific ground, that it receives but little notice from reputable medical investigators. Among the many foolish theories of ignorant pretenders is that of animal magnetism. This supposed physiological quality is made by these people to account for table-tipping, so-called spiritual manifestations, and other doubtful performances. "Animal magnetism" is an ambiguous term. Science has demonstrated that a species of electricity is the product of the body, and is generated in the animal system. Du Bois Reymond and Radcliffe have elucidated this by many striking experiments upon frogs, but these do not prove that there is any connection between psychic phenomena and electricity. Mesmerism and somnambulism can undoubtedly be induced, but are only peculiar mental states. The former is based upon the predominance of one idea over all others. So absorbing is the fixation of the mind on this idea that the subject is unmoved by all outside influences. The popular belief in the mesmerizer, and his exercise of power by the simple use of will to produce this state in another, is a somewhat erroneous one. The first individual must resign or "give himself up" entirely, and simply be influenced afterwards by the mesmerizer. This condition may be produced by looking fixedly at any small bright object held close to the face. After a few minutes the person will become very sleepy and the eyelids will droop. Numerous mesmerists have insisted that the object should be made of copper and zinc, or two other opposite electrical elements; but anything will do for the purpose, so that it be bright.

Probably one of the most able and conscientious observers was Mr. Braid of England, whose system was known as *Braidism* or *hypnotism;* and Dr. Carpenter of London, after investigating it, testified to its feasibility and occurrence, but this system differs very little from the other. When the mesmeric state is produced—that is to say, the condition of induced sleep—it will be found that there is a remarkable exaltation of one or more of the senses, so that the person mesmerized is very ready to receive suggestions implied by the tone of the voice, by the peculiar emphasis and manner of the mesmerizer. Many extraordinary answers are given which astonish the bystanders. In these states any very slight irritation of the muscles, whether by the touch of the operator to the skin or the blowing of air over the surface, will be followed by tonic muscular contractions, so that the subject will support weights, allow his arm to remain in an extended position, or even himself lapse into a cataleptic state. The curative effects of mesmerism are *nil.* It often does much harm, and produces very disagreeable results upon nervous, excitable individuals.

A person mesmerized presents a peculiar appearance. There is first restlessness, faintness, and trembling, dilatation of pupils, and turning upward of the eyeballs, and finally sleep. The susceptibility of individuals varies greatly, there being about one in twenty who may be so influenced. A weak, nervous person or one possessed of sufficient faith is the best subject. Numerous stories are cited of certain individuals who by looking fixedly at others induce in them a species of mesmeric sleep. Schele de Vere relates the case of Jean Paul, who while sitting with a large company by merely looking at a lady caused her to fall asleep. Other anecdotes are told of people who were able to exert this power upon others sitting at a distant part of a public hall in which they were. It is very certain that all human beings exert a remarkable unconscious influence upon each other. Every one has undoubtedly witnessed the contagion of a gape, and may have made others gape by simply opening their hands in imitation of jaws. Other performances seemingly wonderful may be explained by the observers of mental phenomena; for example, we have been told by many of the believers in animal magnetism that if a button or ring be suspended from the finger by a fine thread in their immediate neighborhood, so-called animal magnetism will make it sway to and fro, and strike the hour of the day in spite of the effort of the person who performs the experiment to stop it. This may be tried by any one, and it will be found that the ring will oscillate, but will never strike the proper hour unless the individual has previously made himself acquainted with it. It is impossible to keep the ring from moving, and as long as expectation is aroused so long will it strike. This is a species of unconscious influence exerted by expectant attention, and instead of being the result of any magnetic power, is simply an ideo-motorial impulse. This theory of unconscious influence, a result of expectant attention, fully accounts for so-called clairvoyance, mind-reading, mesmerism, and other astonishing performances. In all of the conditions "the directing power of the will is suspended, the intellect is in a state of exalted excitement, and the reflex power of the cerebrum stimulated. The mind is in a condition to receive ideas from outside, suggestions through the senses or evolved by the inner consciousness of the individual. In whatever mode the ideas have been brought before the consciousness, it is the essential characteristic of these states that the mind is entirely given up to that which may happen to be before it at the time; which consequently excites an uncontrolled directing power over the actions, there being no antagonistic agency to keep it in check." Numerous writers and champions of mesmerism advance the theory that there is a universal fluid that carries a peculiar force akin to the so-called animal magnetism. This has been called by some *odyl, etherium,* or other high-sounding and inappropriate names. It is needless to say that there are no physical laws that account for the existence of any such fluid.

The literature of magnetism is certainly sensational as well as interesting. Anecdotes are told of people in the mesmeric sleep who correctly describe the faces of people they have never seen—minutely describe their dress and tell where they are. A case of this kind is mentioned by Schele de Vere: the subject accurately pictured the house of a friend in New South Wales; the description was afterwards found to be correct in every particular. States identical with the mesmeric have been produced in nearly every country, and form an element of the literature of every nation. The Chinese believe in a quality that is possessed by every one, which it is possible to diffuse, one individual having the power to communicate it to another. This corresponds to our magnetism, and is called *yu-yang.*

The advocates of mesmerism prove the divine origin and antiquity of the art by numerous quotations from the Bible. Frequent reference is made to the laying on of hands, which is supposed by them to be identical with the first steps of mesmerism. Ezekiel (i. 3) says, "The hand of the Lord was upon me in the evening." It was certainly known among the ancients. Plutarch mentions it, as well as other writers, and it is clearly proved to have entered largely into the religious rites of the ancients. It is useless to refer to many of the extraordinary conditions which some writers have said to belong to the mesmeric state. One that has received much notice is exaggerated intelligence during the mesmeric sleep. A case is related of a child who had heard some person play a violin a long time before. During the trance state she repeated some of the pieces almost note for note. This does not seem impossible when we consider that in some forms of rare nervous disease patients have been known to quote long extracts and sentences from books they may have heard but once during their previous lifetime, and even in other languages than their own. What is more remarkable, some of them before their illness were notably dull and devoid of usual intelligence.

ALLAN MCLANE HAMILTON.

Me'sola [Lat. *Mensula* or *Mesula Magna*], town of Italy, province of Ferrara. From its marshy situation near the Po it is subject to continual fever. Pop. 6399.

Mesolonghi. See MISSOLONGHI.

Mesopota'mia [Gr. μέσος, "middle," and ποταμός, "river"], the name generally given in ancient times to the territory lying between the Euphrates and the Tigris, and which the Arabs call *El Jezirah,* "the island." It forms a low and level plain, with only a few hilly tracts towards the N., and it consists mostly of dry steppes. It is only along the rivers, where artificial irrigation is employed, that the soil shows fertility; elsewhere it affords only meagre pasturage. The whole region belongs to Asiatic Turkey, and is divided into eyalets or governments.

Mesozo′ic [Gr. *μέσος*, "middle," and *ζωή*, "life"] **Time,** the great Reptilian Age of geology, which succeeded the Palæozoic and preceded the Cainozoic. It was divided into three periods—the Triassic (the oldest), the Jurassic, and the Cretaceous. In it the molluscan and reptilian types of animals reached their culmination, and began to decline. The same is true of the cycads among plants. Palms and angiospermous plants, osseous fishes, birds, and mammals all first appear in the Mesozoic strata.

Mesquite′ Grass, a name given in the South-western U. S. to rich pasture-grasses of the genus *Aristida*. They require a hard soil, without shade, and are of great value to stock-raisers, but are unfit for hay-making. The mesquite grasses are spreading eastward. They are procumbent or running in character, and do not stand high.

Mesquite Tree, the *Prosopis dulcis* or *Algarobia glandulosa*, a small thorny and gnarled tree of Texas, New Mexico, Arizona, and Mexico. It is of the order Leguminosæ, sub-order Mimoseæ. Its hard wood affords good fuel, and its branches yield abundantly a gum which is a good substitute for gum arabic. It appears sparingly in commerce, and is called mesquite gum. The long pods abound in a thick, sweet, edible pulp. Both bark and wood are rich in tannic acid, and are excellent materials for use in tanning hides. Another mesquite is the *Prosopis odorata* (screw mesquite); its beans are eaten by the Indians, and the wood is of great value on the South-western desert plains. It is a shrub or small tree, considerably resembling the above.

Messagn′e [anc. *Messapia*], town of Southern Italy, in the province of Lecce, situated in a charming plain about 9 miles from Brindisi. It is well built and surrounded by a strong wall. Ancient sepulchres and shattered columns are found in its neighborhood. Pop. in 1874, 8511.

Messali′na, or **Messallina** (Valeria), b. at Rome in 23 A. D., was a daughter of Marcus Valerius Messala Barbatus and Domitia Lepida. In 38 she was married to Claudius, who became emperor in 41, and in 48 she was put to death. The picture which Tacitus, the elder Pliny, Juvenal, and Dion Cassius give of her profligacy, avarice, and atrocity would be incredible were it not that these writers agree with one another, and were not the portrait drawn by Tacitus with a vividness and consistency which a purely ideal delineation—that is, an artistic conception—might have, but which slander and gossip could never obtain, even by the aid of the greatest literary talent.

Messe′nia, an ancient territory of Greece, consisted of the south-western part of the Peloponnesus, between the sea and Laconia. After two fierce wars with Sparta (from 743 to 724 B. C. and from 685 to 668 B. C.), the Messenians were subdued by the Spartans; a portion emigrated to Sicily, where they conquered Zancle, afterward Messana, but the rest were reduced to slavery. When the power of Sparta was finally broken by Epaminondas, this noble man restored the Messenians to freedom, and founded and fortified their new capital, Messene. Of the descendants of those who had emigrated 300 years before many returned, and the country flourished anew as an independent state until conquered by the Romans in 146 B. C.

Mes′ser (Asa), D. D., LL.D., b. at Methuen, Mass., in 1769; graduated at Brown University 1790, where he became tutor 1791, professor of languages 1796, of mathematics and natural philosophy 1799, and president 1802, holding that position until 1826, when he resigned. He was licensed to preach 1792, and ordained 1801, but was never settled as a pastor. Several of his sermons and orations were published. He filled several civil offices at Providence, and d. there Oct. 11, 1836.

Messerve (Col. Nathaniel), b. at Portsmouth, N. H., early in the eighteenth century; rendered good service at the siege of Louisburg (1745) as lieutenant-colonel of Moore's regiment; commanded the New Hampshire regiment in the Crown Point expedition 1756, and defended Fort Edward; embarked in 1758 for the second siege of Louisburg, and d. of smallpox June 28, 1758. He was an eminent shipbuilder.—His son George was stamp-agent for New Hampshire and collector at Boston and Portsmouth; was a loyalist, and went to England 1777.

Messi′ah is the name in the sacred Scriptures and in the usage of Jew and Christian ascribed to that holy Person in whom the hopes of redemption centre. מָשִׁיחַ in the Old Testament, used as an adjective, is applied to the high priest (Lev. iv. 3; vi. 15, etc.) as the one anointed with the holy oil; but as a substantive, to the theocratic king (1 Sam. ii. 10; Ps. xviii. 50, etc.), and so by the reflection of the poets to the patriarchs as the ancestors of the theocratic king (1 Chron. xvi. 22; Ps. cv. 15); and thus by eminence to that Person in whom the functions of priesthood and royalty culminated (Ps. ii. 2; cx. 1, 4; Dan. ix. 26). In the New Testament, ὁ Μεσσίας is used in John i. 42; iv. 25, but generally מָשִׁיחַ is rendered by its Greek equivalent Χριστός, which with the article refers to Jesus as the expected Messiah, but without the article, especially in the Epistles, became a proper name of Jesus Christ, the historical Messiah. Now in the New Testament it is easy to separate the person of Christ from his redemptive work and the last things; but this cannot be carried out in the Old Testament, because the person of the Messiah is ever involved in the future redemption, and the last things embrace both advents. Hence we must treat of the Messiah under the more general head of *Messianic Prophecy*, which may be defined as the revelation of the fulfilment of redemption through the Messiah.

Messianic Prophecy begins with the dawn of human history and unfolds in the Mosaic, Davidic, and prophetic periods of biblical theology.

I. *The Mosaic Period.*—Immediately after the Fall, in the midst of the condemning sentences of God, the hope of redemption was planted as a precious seed wrapped up in the shell of the curse.

(1) The Protevangelium (Gen. iii. 15) is a generic prophecy, bringing into contrast the seed of the woman and the seed of the serpent; the human race struggling, suffering, but finally victorious over the forces of evil. And as these forces of evil culminate at the end as well as the beginning in the serpent, the devil, so implicitly the human race is to be conceived as culminating in a personal head at the victorious end as well as at the sad beginning. (See Rom. xvi. 20; 1 Cor. xv. 25; Rev. xii. 9 *seq.*; xx. 2 *seq.*)

(2) As a new era begins with the departure from the ark, so there is an appropriate advance in the promise of redemption. The blessings of Noah (Gen. ix. 25–27) rise up over against his curse. Regarding אֱלֹהִים as the subject of יִשְׁכֹּן, (after Onkelos, most Jews) (Baumg., Hofm., Schultz, Conant, *et al.*), the blessing of Shem is the presence and indwelling of God, whose advent is promised to dwell in the tents of the Shemites. Here the divine line of Messianic prophecy begins, which develops side by side with the human line until they converge in the God-man at his advent. The advent of God is prepared by the theophanies and the dwelling enthroned above the cherubim, and is fulfilled in the incarnation (John i. 14; Eph. ii. 22; Rev. xxi. 3).

(3) Abraham's blessing (Gen. xii. 1–7; xiii. 14–17; xv. 4–5; xvii. 2–8; xxii. 15–19; xxviii. 13–15) unfolds the Protevangelium. It is a divine call, with the institution of a covenant relation and a promise which includes a promised land, a promised seed, and a blessing to all nations through the seed. The promised seed is now viewed as to its unity as a generic term, and we must conceive of it as unfolding the seed of the woman, with a culminating head (Gal. iii. 16); then it is resolved into its members—many nations, peoples as the stars and sand for multitude—and so we must think of the children of Abraham by faith (Matt. iii. 9; John viii. 39; Acts ii. 39; Rom. iv. 16; Gal. iii. 29). The promised land was Canaan (Gen. xiii. 15), involving the spiritual Canaan (Heb. xi. 10 *seq.*; Rev. xxi.).

(4) The patriarch Jacob on his deathbed divides the promised land among his sons, singling out Judah as the one through whom the covenant blessings especially unfold (Gen. xlix. 8–12). Taking שִׁילֹה as an accusative of place, with most recent interpreters, we see the blessing of the promised land unfolding through the designation of a place therein where the lion of Judah rests after victory, receives the submission of the nations, and enjoys the richest fruits of the land. Shiloh is the historical place of this resting, which passes over into Jerusalem and the new Jerusalem, where all the conditions are fulfilled in the lion of Judah (Rev. v. 5), who is the great conqueror (Eph. iv. 8; Col. ii. 15), leads to the true resting-place (Heb. iv. 1 *seq.*), and bestows final blessings (Rev. xxii.).

(5) On the arrival of Israel at Mount Sinai, prior to the giving of the law, a covenant relation was established (Ex. xix. 1–6), by which Israel becomes God's purchased possession (סְגֻלָּה), a kingdom of priests, and a holy nation. As such, they fulfil the third factor of the Abrahamic covenant, and become a blessing to the world in their ministry in sacred things. This calling is inherited by the Church (1 Pet. ii. 9), and realized in the latter days (Rev. i. 6; xx. 6).

(6) The same factor in the Abrahamic promise fully unfolds on another side through the foreign prophet Balaam (Num. xxiv. 15–24), who sees a star or sceptre rising out of Jacob, subduing the nations far and near. Those mentioned are the most prominent of the time, representing,

in accordance with the constant usage of prophecy, the opposing nations of all time. The sceptre or star is a generic reference to Israel as the kingdom of God, with the culminating head (Rev. xxii. 16).

(7) Moses is the suitable organ of the final Messianic prophecy of this period. The mediator of his people, establishing the typical institutions of salvation and proclaiming a divine law, which was no less prophetic, he was in his own person the most appropriate type of the prophet who was to fulfil his work, his institutions and revelations. This prophet (Deut. xviii. 15–19) to be raised up by Jehovah will be like his brethren, like Moses especially, and will speak the divine word with the divine authority. That prophet is Jesus, according to Acts iii. 22–26; Heb. iii. *seq.*, who fulfils the law and the prophets as the Mediator of the new covenant, the final goal and ultimate realization of the old covenant (Matt. v. 12; Rom. x. 4; Gal. iii. 24; Heb. xii. 24).

II. *The Davidic Period.*—A new era begins with the organization of the kingdom of David and the establishment of the religious and political centre at Jerusalem. The desire of David to build Jehovah a house is the occasion of the fundamental prophecy (2 Sam. vii. 12–16; 1 Chron. xvii. 11–15). Jehovah will build the seed of David into a house of everlasting sovereignty. That seed will build Jehovah's temple, and in the peculiar relation of sonship will never be forsaken, though chastised for sin. The seed of David is generic as the seed of the woman and of Abraham, with a culminating head. The dynasty of David is ever the theocratic house of sovereignty, becoming eternal through Christ (Acts v. 31; Rom. i. 3–4; Heb. i. 8; 1 Cor. xv. 26; Eph. iv. 8–10). The seed of David, beginning with Solomon, ever erected, restored, and cared for Jehovah's temple, which becomes eternal through the erection of Christ (John ii. 19–21). The seed of David was ever involved in sin and chastisement, and peculiarly bore the mercy of God; the chastisement and mercy culminate in Christ, who, though sinless, suffers for the sins of the entire line and world, and becomes the ultimate bearer of the divine mercy (2 Cor. v. 21; Gal. iii. 13; 1 Pet. ii. 24). The ideas of this and all previous Messianic prophecies now develop in the Psalter, where the *experience* of the psalmist becomes the typical form to set forth the Messianic ideas; and this either in the simple type, the experience being purely historical, or in the typico-prophetic psalm, the psalmist's real historical experience becoming the basis of an ideal prophetic experience.

A. *The Davidic Psalms.*—(1) Ps. cx. cites a divine oracle and oath, and from these as a basis represents the Messiah going forth to battle, engaged in the struggle, and triumphant. He is a priest-king after the order of Melchizedek, the Lord of David, exalted to a position of peculiar dignity at the right hand of Jehovah, whilst he subdues all his enemies under his feet. (Comp. the typical Psalms xx., xxi., and lx., and for the fulfilment Matt. xxii. 41–45; Mark xxii. 35–37; Luke xx. 41–44; Acts ii. 34–36; Heb. i. 13; vii. 17 *seq.*; x. 12–13; Eph. i. 20; 1 Cor. xv. 25; Rev. xix. 11–16.) The typico-prophetic viii. psalm presents the ideal man, made to fall a little short of the divine, destined to have dominion over all creatures. Ps. cx. and viii. are thus united in the citation Heb. ii. 7 *seq.*

(2) Ps. lxviii. describes Jehovah's march and conquests, with the blessings of his advent, with a more general reference to all Israel (comp. the typical Ps. xxiv. and Eph. iv. 8); whilst in Ps. xviii. (comp. Ps. xlv.; Rom. xv. 9) this general reference arises out of a particular reference to the history of the psalmist himself.

(3) A group of Messianic psalms arises from David's experience of suffering as an innocent victim of unjust persecution. They describe sufferings which transcend anything in David's historical experience, and with a minuteness of detail that cannot be explained from a figurative description of it. We can only understand them from that experience, and yet we cannot but find mingled therewith the experience of the man of sorrows. In the depths of his own sorrows David comes to woes of which he has an ideal experience through foreboding and presentiment in anxiety respecting his son. The Messianic features are—(*a*) Cruel reproaches of malicious enemies (Ps. lxix. 26; xli. 7–8; xxii. 7–8; comp. Matt. xxvii. 39 *seq.*). (*b*) He is persecuted because of his consecration to the divine will as the acceptable sacrifice (Ps. xl. 6–8; comp. Heb. x. 8 *seq.*; Ps. lxix. 7–12; comp. Matt. xxvii. 29 *seq.*; John ii. 17; vii. 5; Rom. xv. 3). (*c*) The sufferings are the stretched body, feverish frame, intense thirst, offering of gall and vinegar, division of his garments, agonizing cry, and broken heart (Ps. xxii. 1, 12–18; lxix. 20–21; comp. Matt. xxvii. 39 *seq.*). (*d*) Notice also the traitor and his doom (Ps. xli. 9; comp. John xiii. 18; Ps. lxix. 23 *seq.*; comp. Acts i. 20 and Ps. cix. 8). (*e*) Observe also the praise of the delivered one and the worldwide significance of the sufferings (Ps. xxii. 22; comp. Heb. ii. 12; Ps. lxix. 30 *seq.*; xl. 9; comp. John xvii. 4).

(4) The hopes of the Psalmist respecting communion with God after death in the typical Ps. xxxi. 5 (comp. Luke xxiii. 46; Ps. lxi. 7); xvii. 15 and xvi. 9–11 become typico-prophetic in his experience of preservation from corruption in the grave and life in the divine favor. (Comp. Acts ii. 26.)

B. *Psalms of Solomon and his Singers.*—(1) In Ps. ii. the Messiah is represented calmly seated at the right hand of Jehovah on Mount Zion, in the relation of sonship, citing a divine decree entitling him to this position, with its prerogatives of sovereignty and inheritance. (For the fulfilment see Acts xiii. 33; Rom. i. 4; Heb. i. 5; comp. Acts iv. 25.) Ps. lxxii. presents the aspirations of the Messiah and their realization, as righteousness, mercy, and peace everywhere prevail, his dominion extends over the whole earth, the soil yields its abundance, and all nations unite in grateful tributes of praise and adoration. Ps. xlv. represents the Messiah espousing the nations through the type of the marriage of Solomon with Pharaoh's daughter; describes the glories of the godlike bridegroom, the splendors of the bridal procession, and the joys of the marriage. (See John iii. 29; Eph. v. 25; Rev. xix. 7–9; comp. Heb. i. 9.)

(2) A group of psalms describes the reign of Jehovah in the holy city. Ps. xlvi. represents the safety and security of the city under the rule of Jehovah, who subdues all enemies and stills the commotions of the nations. Ps. xlvii. presents the throne of Jehovah as surrounded by the princes of all nations, whilst the shields of their heroes are hung up in his palace. Ps. xlviii. describes the glories of Mount Zion as the residence of the great King, as well as the justice, mercy, and blessedness of his reign, extending to the ends of the earth. Ps. lxxxvii. describes the adoption of the nations into the family of God and their enrollment as citizens of Zion.

C. Psalms reflecting the sad experience of the disastrous times of Rehoboam, which the aged singers pour forth in mournful strains of plaintive expostulation and yearning for Jehovah's advent. Ps. lxxxix. bases its pleading on the faithfulness and mercy of Jehovah, the covenant with David, and the present humiliation of the Davidic throne. Ps. lxxx. touchingly alludes to Israel as the flock of Jehovah, the vine of his planting, in order to plead for the restoration of prosperity and the establishment of the man of the right hand (Ps. cx. 1), the son of man (Ps. viii. 4). Ps. lxxxv. anticipates the brighter times when mercy and truth, righteousness and peace, now far apart, may meet and kiss in harmony in the land and people. Ps. cxxxii. quotes the Davidic covenant in order to the plea in terms of the old battle-cry of Num. x. 33 *seq.* for the advent of Jehovah on his throne, with the consequent blessings upon priests and people, and above all the horn of David, the anointed of Jehovah, which last reference is re-echoed in the words of Zacharias (Luke i. 6 *seq.*).

III. *The Prophetic Period* begins with the decline of Israel, and is subdivided by the various stages of that decline.

Stadium 1st.—Joel declares the advent of Jehovah. (*a*) Chap. ii. 28–32, in the outpouring of his Spirit, with the manifold gifts of prophecy, upon all classes and conditions of men, in the exhibition of wonders in heaven and on earth to herald the approach of the judgment, and as the establishment of deliverance in Jerusalem for all who call upon his name. The fulfilment is claimed in Acts ii. for the day of Pentecost, and is applied in Rom. x. 12, 13 to the gospel call and salvation, whilst the heralding wonders reappear in Matt. xxiv. 29. (*b*) The advent in judgment is described (chap. iii.) as an assembly of all nations before the throne, as if to battle in the valley of Jehoshaphat; as a harvesting and treading of the winepress amidst the confusion of the multitudes and the elements; as the establishing of the enemies as a desolate waste, and of the people of God as an exceedingly fertile land, fructified by the living waters flowing forth from the house of God in Zion. (See Matt. xxiv.; Rev. vi. 12; xiv. 14 *seq.*; xvi. 16 *seq.*; xx. 11 *seq.*; xxii. 23 *seq.*)

(2) Amos (chap. ix.) represents the house of David, which has been reduced to a ruined hut, as rebuilt, as taking possession of the remnant of the nations for an inheritance, and as realizing the blessings of the promised land. Acts xv. 16 refers it to the erection of the kingdom of Christ and the gathering of the Gentiles by apostolic labors.

(3) Hosea, the Jeremiah of the northern kingdom, carries out the idea of the Pentateuch, that idolatry is whoredom, in three symbolical transactions: (*a*) The prophet takes a symbolical wife of whoredoms, who bears children of whoredom. These, through their significant names, Jezreel, Lo-ruhamah, and Lo-ammi, represent on the one

hand the condition of Israel as forsaken of Jehovah—*e. g.* scattered, unpitied, not my people; and on the other as restored—*e. g.* sown in the field of Jehovah's planting, pitied, my people, sons of the living God. In this connection Israel and Judah recognize one another as sisters, and under the one head, the second David, march up out of the land of captivity. (Comp. Rom. ix. 25 and 1 Pet. ii. 10.) (*b*) Mother Israel, guilty of adultery with Baal, is disciplined in the wilderness as at the Exodus, then comforted by Jehovah, who leads her through the valley of Achor into the holy land. The reunion is a marriage of which the divine attributes are the bands. The instruments of war are destroyed, a covenant is made with the animal kingdom, and all nature responds to the voice of Jehovah. (Comp. Rom. viii. 19–23 and Rev. xii.; xxi. 3 *seq.*) (*c*) The faithful love of Jehovah to unfaithful Israel is emphasized. She remains many days without settled government and institutions of worship, but finally returns trembling to Jehovah and David her king. (Comp. Rom. ix.–xi.)

Stadium 2d.—Israel having gone into exile, the moral struggle is more immediately about Jerusalem as a centre until the exile of Judah. There are two revivals, accompanied with Messianic prophecies—one in the reign of Hezekiah, the other in that of Josiah. The former (1) is introduced by Micah, whose prophecy unfolds in three sections: (*a*) iv. 1–7 represents the temple-mount as rising from its degraded condition, exalting itself above the proudest peaks of earth, as the mountain of the world, up which all nations flow in pilgrimage, and from which the divine law, word, and judgment go forth, producing universal peace. This is the temple of Christ's body (John ii. 19–22; Eph. i. 20–23; ii. 22). (*b*) iv. 8–13. There is a mingling of the shepherd-tower of David, the daughter of Zion in childbirth, the bullock with iron horns and hoofs, threshing the nations—all representing the exaltation of the humbled and despised kingdom of David. (Comp. Rev. xix. 14–16.) (*c*) Chap. v. Little Bethlehem is exalted in that One whose outgoings were from everlasting, makes his historical appearance from thence, delivering Zion from her enemies, the Shepherd of his people, the peace of the nations. Matt. ii. 5 *seq.* applies it to the babe of Bethlehem who is our Peace (Eph. ii. 14).

(2) Isaiah, the greatest of all prophets, takes up the entire body of previous Messianic prophecy in order to reproduce it in new forms and fresh development. Part I. is composed of several groups of prophecies (i.–xxxix.), and presents the varied phases of the Messianic idea. (1) In ii. 1–5 the exaltation of the temple-mount is briefly stated in terms of Mic. iv. 1 *seq.* Another turn to the idea is given in xxviii. 16, where we have the Messianic cornerstone of Zion. (Comp. Ps. cxviii. 22, a favorite term of the New Testament; Matt. xxi. 42; Acts iv. 11; Rom. x. 11; 1 Pet. ii. 6 *seq.*) The Messianic person is distinctly brought out (*a*), vii. 14–16, as a wonderful Child, called Immanuel, the bearer of the divine deliverance, until whose maturity distress will continue in the land. (Comp. Matt. i. 20–25.) (*b*) ix. 1–7. A wonderful Light shines on the northern frontier, which exalts that people as highly as they had been previously brought into contempt as the first of the Jews to go into exile: a great deliverance, transcending that of Gideon in the day of Midian, is wrought, a Child of the house of David is born, named Wonderful, Counsellor, Divine Hero, Everlasting Father, Prince of peace, who reigns on the throne of David in righteousness for ever. (Comp. Matt. iv. 15–16; xi. 23; Luke x. 15.) (*c*) xi. A twig comes forth from the stump of Jesse; a shoot from his roots bears fruit. The sevenfold gift of the Spirit rests upon him, endowing him to fulfil his work of judging the poor with spiritual discernment and the wicked with the word of his mouth. Girded with righteousness and faithfulness, he establishes universal peace in the earth, in which the animal kingdom shares. He becomes the standard of the nations; a deliverance like that of Egypt takes place; the ransomed assemble from all lands, marching up on highways of redemption. Matt. ii. 23 applies the נֵצֶר of our passage, with the corresponding צֶמַח of Jer. xxiii. 5; xxxiii. 15; Zech. iii. 8; vi. 12, to the Nazarene, as the one who grew up in that obscure place to which the line of David had wandered as a shoot from a neglected stump. (Comp. John i. 32; xii. 32; Rom. viii. 22; xv. 12; Rev. i. 16.) The nations share in Messianic blessings. Ch. xviii. 7 points to the conversion of Ethiopia; xix. 18–25 represents Egypt and Assyria as united with Israel as the people of God, speaking the holy language and serving Jehovah with altar and sacrifices; xxiii. 18 predicts the consecration of the merchandise of Tyre. (2) The advent of Jehovah is in judgment; the earth reels to and fro like a drunken man, the heavenly lights are in commotion, the heavens dissolve and roll together as a scroll, their host fall as the foliage, the great ones of earth seek refuge in dens and caves, the host of the high on high (evil spirits?) are imprisoned in the pit, the wicked suffer in unquenchable fire, the smoke of their torment ascending for ever (chs. xxiv. and xxxiv; comp. Rev. vi. 12–17; xiv. 11; xxi. 8). Jehovah's advent is to refine and purify his people, so that the remnant becomes holy and blessed (iv. 2–6). There is a resurrection of the pious dead, whose shades the earth brings forth under the quickening influence of the dew of the divine glory (xxvi. 14 *seq.;* comp. Ez. xxxvii. 1–14; Rev. xx. 4–6). They sing songs of victory over the world's metropolis and the destruction of sorrow and death (xxv. 1–8; comp. xxxv. 10; Rev. xv. 3–4; xix. 1, 2; 1 Cor. xv. 54). Zion becomes the quiet habitation of Jehovah, the glorious judge, warrior, and king, a place of streams, where no hostile navies appear from fear of Jehovah (xxxiii. 10–24), who dwells among them on Mount Zion (iv. 5, 6), before his elders in glory (xxiv. 23; comp. Rev. iv. 43). The land becomes wonderfully fruitful (iv. 2), the wilderness a fertile garden, a highway of holiness is established, and sorrow and sighing are exchanged for joy and gladness (xxxv.).

The second part of Isaiah (xl.–lxvi.), assigned by Ewald and his school to the Great Unknown, is really an organic whole, weaving into one web about the person of the servant of Jehovah the previous Messianic references. This servant, referred by the Jews and many Christians to Israel as a whole, or the pious portion of Israel, by others to the prophetic order, is really, like the terms Son and Seed of the Psalter and Pentateuch, a generic term, with a culminating head. Jehovah calls him from the womb to be his servant, anoints him with his Spirit. He is the gentle preacher and saviour of the poor, the meek, and brokenhearted. He restores the remnant of Israel, is a covenant of the people, a light of the Gentiles, Jehovah's salvation to the end of the earth (xlii. 1–9; xlix. 5–8; lxi. 1–3; comp. Matt. xii. 17–21; John viii. 12; Heb. viii. 6; ix. 15; Luke ii. 32; iv. 18 *seq.*). He is a suffering servant (chap. liii.), without form or majesty, despised and rejected of men, a man of sorrows and acquainted with grief—one covering his face as a leper, an outcast. He is an *innocent* sufferer, bearing his people's sorrows, pierced for our transgression, crushed for our iniquities, and his stripes were for our healing and peace. (Comp. Ps. xxii. 16; lxix. 26; Zech. xii. 10; Gal. iii. 13; 1 Pet. ii. 24.) All were wandering sheep. Jehovah laid on him, the uncomplaining lamb, the iniquities of all. (Comp. John i. 29; Acts viii. 32; 1 Pet. i. 19; Rev. v. 6; vii. 14, etc.) His contemporaries did not consider this, but assigned him his place with the wicked in his death, but were overruled in that he was buried with a rich man on account of his innocence. (Comp. John xix. 38–41; 1 Pet. ii. 22.) The divine purpose was that he should be a *guilt-offering*, a substitute for transgressors, and then reap his reward in his exaltation, his spoils of victory, and his prosperous ministry. (Comp. Heb. ii. 10–13; Matt. xx. 28; John x. 11–17; Rev. i. 18; Heb. xii. 2.) Chap. lv. gives the Messianic invitation to the free grace of the gospel (Rev. xxii. 17). The sure mercies of David, the everlasting covenant, are offered in him who is the witness, prince, lawgiver of the people. (Comp. John xviii. 37; Rev. i. 5; iii. 14; Acts v. 31; xiii. 34.) The seed of the righteous servant enjoy the riches of the Gentiles as they become the priests of Jehovah and minister clothed in the garments of salvation; righteousness and praise spring forth before all nations (lxi. 9–11), who come up to the holy places from the most distant parts, even China (Sinim, xlix. 12). Hunger and thirst, the violent heat of the sun, together with all sorrow and mourning, are banished from the land (xlix. 10; lxi. 3. Comp. iv. 3; Rev. vii. 16–17). In lxiii. the exalted servant is represented as treading his enemies in the winepress of his wrath. (Comp. Rev. xix. 11–16.)

The advent of Jehovah is no less prominent. In xl. 3–11 we see the herald of the advent. Zion and Jerusalem become evangelists. Jehovah comes as the gentle shepherd. This is applied to the Baptist and Jesus in Matt. iii. 3. (Comp. John x. 1–18; Luke xv. 3–7.) In liv. 5 *seq.* and lxii. 5 Jehovah takes Israel as the wife of his youth and rejoices over her as his bride; and in lx. 1 *seq.* he becomes the light and glory of his people, instead of the sun and moon (Rev. xxi. 23–26). So in lxii. 1 *seq.* the righteous of Zion and her salvation becomes a bright and shining light to the nations; she is called by a new name (Rev. ii. 17), becomes a crown of glory in the hand of the Lord, and is named Hephzibah and Beulah. Jerusalem is rebuilt with precious stones (liv. 11 *seq.;* comp. Rev. xxi. 18–21); her walls are salvation and her gates praise; they are open day and night, whilst kings and nations enter therein (lx. 11 *seq.;* Rev. xxi. 25), and great is the peace of her children as they are taught of Jehovah (liv. 13; comp. John

vi. 45; 1 Thess. iv. 9; 1 John ii. 20). In lix. 15–18 Jehovah appears as a warrior armed with vengeance for his enemies and redemption for his people. He pours out his Spirit as water upon the offspring of the people (xliv. 3–5; comp. lix. 21), and puts his words in their mouth for ever, and they spring up as willows by the watercourses, whilst the Gentiles claim to belong to Jehovah and enroll themselves as his people. The call goes forth to the ends of the earth, and the oath is sworn "that unto me every knee shall bow and every tongue shall swear" (xlv. 22 *seq.*), and the sons of the stranger come to the holy mount, offering their sacrifices in the house of prayer for all nations (lvi. 6 *seq.*; comp. Rev. viii. 3–5; Heb. xiii. 15, 16). Chap. lxv. 17–27 predicts the creation of a new heaven and earth, as well as a new Jerusalem, in which there is no more weeping or crying, but length of days, prosperity, and communion with God, in which the animal kingdom shares (2 Pet. iii. 13; Rev. xxi. 1). Ch. lxvi. now describes the final catastrophe and glories. On the one side all flesh assemble in one immense congregation every Sabbath, as at the great feasts, before the throne (Rev. v. 11 *seq.*; vii. 9–12, etc.); on the other side, the carcasses of transgressors are cast out into the unquenchable fire and to the never-dying worm. (Comp. Matt. xxv. 41 *seq.*; Rev. xx. 10 *seq.*; xxi. 8 *seq.*)

The second revival under Josiah has its Messianic prophets, Habakkuk, Zephaniah, and Jeremiah, the two former merely reproducing the ideas of Joel and Isaiah, Jeremiah giving a new advance. (1) Ch. iii. 14–17, Jehovah the Saviour marries his exiled people, selecting one from a city and two from a tribe, restores them to Zion, setting over them shepherds after his own heart. (Comp. John xxi. 15–17.) Rachel, weeping for her children (xxxi. 15 *seq.*), is comforted with the promise that they will come again out of the land of the enemy (Matt. ii. 18). Jehovah will sow both the house of Judah and the house of Israel in their own land again (xxxi. 27 *seq.*; comp. Hos. ii. 23). They will come together out of the land of the north, and inherit the goodly heritage of the host of the Gentiles (iii. 18; comp. Hos. i. 11). Jehovah makes with them a new covenant (xxxi. 31 *seq.*), the law being written in the heart, so that all shall know him. (Comp. Hos. ii. 18 *seq.*) New institutions are established (iii. 17), entire Jerusalem is called the throne of Jehovah instead of the ark; and all nations gather into it (Rev. xxi. 2; xxii. 3 *seq.*). The whole city and suburbs become holy as the temple (xxxi. 38–40), even the hill Gareb, the abode of the lepers, and the valley of Hinnom, the place of refuse. (2) The sprout of Isa. xi. 1 *seq.* is taken up and clothed with new ideas. He is called the righteous branch, Jehovah our righteousness (xxiii. 5 *seq.*) as the bearer of that righteousness, and so the New Jerusalem bears the same name as the divine throne (xxxiii. 16; comp. Isa. vii. and Ex. xvii. 15). The exodus from Egypt is no more remembered for the greater exodus from all countries of the dispersion to the land of their inheritance (xxiii. 7–8). The monarchy and priesthood become eternal (xxxiii. 17).

Stadium 3d.—The period of the exile and restoration is rich in Messianic prophecies, which assume the symbolical and apocalyptic form. (1) Ezekiel develops both sides of the subject. (*a*) The tiara of the high priest and the crown of the king are removed until the coming of the One appointed by Jehovah (xxi. 25–27), until whose advent there will be a constant overturning of the nations. The second David as the faithful Shepherd will recover the scattered sheep, and restore them to their own land again (xxxiv. 23 *seq.*; comp. Matt. xviii. 11; John x.; Heb. xiii. 20). (*b*) Jehovah is the temple of the exiles for a while, until he restores them to their own land (xi. 14 *seq.*), after purging away their abominations, giving them a new heart, a heart of flesh, with the sprinkling of clean water upon them and the baptism of the Spirit (xxxvi. 25 *seq.*; comp. Isa. xliv. 3), and so they keep his commands and become his people, and he their God. The restoration is represented by several symbols: (*α*) A cedar twig is planted on the mountains of Israel, growing to an immense tree towering above the land (xvii. 22 *seq.*; comp. Ps. lxxx. and Mic. iv. 1). (*β*) There is a resurrection of the dead through the Spirit of Jehovah (xxxvii. 1–14; comp. Isa. xxvi. 19; Dan. xii. 2). (*γ*) Two sticks are joined together, and so under one head, the second David, Israel and Judah unite; a new and everlasting covenant of peace is made with them, and the sanctuary of Jehovah abides in their midst for ever (xxxvii. 15–28; comp. Hos. i.). There is a final conflict with Gog and Magog, with nations from the ends of the earth (xxxviii. and ix.), accompanied with the outpouring of the spirit of Jehovah on the house of Israel. (Comp. Joel iv. and Rev. xx. 7–10.) There is a prolonged description of the new temple, its arrangements of worship, the wonderful fertility of the land, and its division among the tribes (xl.–xlviii.). This is a transfiguration of the temple and land of Solomon. (Comp. Rev. xx.–xxii.) The forms of worship differ from the Mosaic in the removal of the great sin-offering to the beginning of the year. The stream of life is described in its marvellous increase in depth, the quickening power of its waters, and the wonderful fruit and leaves of the tree of life on its banks.

(2) Daniel represents (*a*) the kingdoms of the world in conflict with the kingdom of the Messiah. These four kingdoms, united in one great and terrible image (ii. 31 *seq.*), or as four beasts (vii. 2 *seq.*), are variously interpreted, probably to be referred to the empires of Babylon, Persia, Greece, and Rome—the latter viewed first in its unity, and then in its subsequent divisions in the ten horns of the last beast, the little horn representing Antichrist. The stone cut out of the mountain without hands, that breaks in pieces all these kingdoms, is the kingdom of Christ erected at Pentecost (comp. Mic. iv. 1), which is growing in order to fill the earth. The Ancient of days, Jehovah, comes in judgment on a flaming throne, with a stream of fire issuing from it. (Comp. Rev. xiii. and xvii.) The Son of Man comes in the clouds to the Ancient of days, and receives the everlasting dominion (referred to the second advent, Acts i. 11). (*b*) The times of chs. ix. 24–27 and xii. are difficult of interpretation. It is better to regard the sixty-nine weeks as from the decree of Cyrus to the advent, the final week as the advent week, in the midst of which the Messiah is cut off, the Old Testament worship brought to an end, the holy city destroyed, and the new covenant established. In this connection Daniel sees the end of the world, as indeed Jesus connects these events (Matt. xxiv.)—a time of trouble transcending all previous trouble, followed by the resurrection of the dead and the final judgment. The time, times and a half, and the 1290 and 1335 days, then, refer to the events of the last weeks of affliction, and there may be here a hint of the expansion of the final week, as the 70 years of Jer. xxix. 10 expanded into the 70 weeks of Daniel. Similar numbers occur in Revelation. They are not to be interpreted as years, but as symbolical numbers of fixed times known to God alone (Acts i. 7).

The restoration is accompanied by the prophets Haggai, Zechariah, and Malachi.

(3) *Haggai.*—The promise is made to shake all nations, and indeed the heavens and earth (ii. 6–9), that the kingdoms of the heathen may be overthrown, and the nations will bring their choicest treasures into the house of Jehovah, and the glory of the latter house will be greater than the former.

(4) Zechariah, like Isaiah, reproduces and unfolds previous Messianic prophecies: (*a*) The daughter of Zion rejoices at the advent of her King, who comes just and victorious, meek and riding upon an ass's colt (ix. 9–10; Matt. xxi. 5); all the instruments of war are destroyed. He speaks peace to the nations, and his dominion is from sea to sea and to the ends of the earth. The shoot and branch of Isa. xi. and Jer. xxiii. is introduced as the *servant* of Jehovah (Isa. liii.), who is priest as well as king, who builds the temple and secures the promised blessing to Israel and the nations (iii. 8 *seq.*; vi. 12 *seq.*). He is the Good Shepherd rejecting his flock, breaking the staves Beauty and Bands (xi. 7 *seq.*), having been rejected by them, estimated at the miserable price of thirty pieces of silver (Ex. xxi. 32), which is cast to the potter in the house of Jehovah (Matt. xxvii. 3–10). The shepherd, the associate of Jehovah, is smitten by his sword (xiii. 7–9), in consequence of which Jehovah's hand is turned in protection over the little ones (Matt. xxvi. 31–32; Mark xiv. 27; John x. 15). The house of David and inhabitants of Jerusalem grieve in penitence, influenced by the spirit of grace and supplication, looking upon Him whom they have pierced, and mourning for him as for an only begotten (xii. 10–xiii. 1; comp. John xix. 37; Rev. i. 7; Matt. xxiv. 30). The fountain for sin and uncleanness is opened by which all sins, moral and ceremonial, may be washed away (1 John i. 7; v. 6; Eph. v. 26; Tit. iii. 5). (*b*) Jehovah is a wall of fire round about Jerusalem, a glory in her midst (ii. 5 *seq.*; Isa. iv. 5; Jer. iii. 17). Jehovah dwells in the midst of Jerusalem, which is inhabited by old men and little children (viii. 3 *seq.*). His people will come from the east and west, and many strong nations will join the Jew in worshipping Jehovah in Jerusalem; which under the Malaak Jehovah will overthrow all nations besieging it (xii. 1–9). There will be a final judgment on the Mount of Olives (xiv. 4 *seq.*), which will be cleft in twain when Jehovah comes with his saints. The wicked will flee in terror; a glorious light will dispel the darkness; living waters will flow eastward and westward; Jehovah will reign King over all the land; the remnant of nations will go up yearly to worship the King at the feast of tabernacles. Even the bells of the horses and every vessel in Jerusalem will be as holy as the high priest's tiara, and nothing unclean can enter any more. (Comp. Rev. xxi. and xxii.)

(5) Malachi introduces the herald of the advent, "my messenger" (iii. 1), "Elijah the prophet" (iv. 5)—who is John the Baptist, according to Matt. iii. 1–12; xi. 10; xvii. 11; Luke vii. 27—turning the hearts of parents and children to one another. The coming one is הָאָדוֹן ("the Lord"), and the Malaak Jehovah, both terms referring to Jehovah, the divine Messiah. The advent is in judgment as the refiner's fire and fuller's ley, purging the sons of Levi, to offer acceptable sacrifices. It is a day of fire, burning up the wicked as stubble, whilst to the god-fearing the Sun of righteousness arises with healing in his wings. (Comp. Ps. lxxxiv. 11; Isa. lx. 19; Ex. xxv. 20; Deut. xxxii. 11.) This divine Messiah is Jesus Christ, according to the Baptist (Matt. iii. 11–12 and John i. 30).

The advent began with the birth of Jesus Christ, and continues throughout these latter days of the dispensation of grace until the second advent in glory at the end of the world. This distinction of advents is not made in the Old Testament, but first by the advent itself and the prophecies of Christ and his apostles. Hence, whilst the first advent fulfils all those references on the divine side to the outpouring of the Spirit, the establishment of a new covenant with new institutions of salvation, and the growth of the kingdom under Jehovah's favor, and on the human side to the more humble features, as of the prophet like Moses, the suffering servant of Jehovah, etc., yet the great mass of Messianic prophecy is referred by the New Testament writers to the second advent—on the divine side in judgment, on the human side in glory. And yet the human and the divine lines, which in the Old Testament remain ever apart, converge in Jesus Christ the God-man at his first advent, who in his first state of humiliation and his final state of glory either has fulfilled, or is yet to fulfil, all the law and the prophets.

The *literature* is abundant upon portions of the subject, but there are few full and complete discussions. Of the latter are—J. Pye Smith, *Scripture Testimony to the Messiah* (2 vols., London, 1818–21; 5th ed., Edinburgh, 1859); Hengstenberg, *Christologie des alt. Test.* (3 Bde., Berlin, 1829–32; 2d ed., 1854; translated in Clark's *Foreign Theological Library*); J. Bade, *Christologie des alt. Test.* (3 Bde., Münster, 1850–51); J. Stähelin, *Die messian. Weissagungen des alt. Test.* (Berlin, 1847); L. Reinke, *Beiträge zur Erklärung des alt. Test.* (4 Bde., Münster, 1849–55); *Die messian. Psalmen* (2 Bde., Giessen, 1857–58); *Die messian. Weissagungen bei den grossen und kleinen Propheten* (4 Bde., Giessen, 1859–62); Gloag, *The Messianic Prophecies* (Edinburgh, 1879); Adeney, *The Hebrew Utopia* (London, 1879); Delitzsch, *Messianic Prophecies* (Edinburgh, 1880); Boehl, *Christologie des Alt. Test.* (Wien, 1881); Orelli, *Die alttest. Weissagung. von der Vollendung des Gottesreiches* (Wien,. 1882). Of the latter are—Hofmann, *Weissagung und Erfüllung* (Nördlingen, 1844); Auberlen, *Der Prophet Daniel und die Offenbarung Johannis in ihrem gegenseitigen Verhältniss betrachtet* (2te Auf., Basel, 1857); McCaul, *The Messiahship of Jesus* (Warburton Lectures, 1852); G. Baur, *Geschichte des alttestament. Weissagung.* (Giessen, 1861); Anger, *Vorlesungen über die Geschichte des messianischen Idee* (Berlin, 1873); E. Riehm, *Die messian. Weissagung., ihre Enstehung, ihr zeitgeschichtlicher Charakter und ihr Verhältniss zu den neutestamentlichen Erfüllung* (Gotha, 1875; in Clark's Foreign Library, 1875). Besides these there are valuable articles by Auberlen, *Die messian. Weissagung. der mosaischen Zeit* (*Jahrb. für deutsche Theol.*, 3 Bd. 778 ff.); Bertheau, *Die alttestamentliche Weissagung. von Israel's Reichsherrlichkeit in seinem Lande* (*Id.*, 4 Bd. 627 ff.); Diestel, *Die Idee des theokrat. Königs* (*Id.*, 8 Bd. 685 ff.); Riehm, *Zur Charakteristik d. messian. Weissagung.*, *Studien und Kritiken* (1865 and 1869); Martineau, *Early History of Messianic Ideas* (*National Review*, 1863). See also the able article of Oehler, *Messias*, in Herzog's *Real-Encyklopädie* (Bd. 9, p. 408 ff.): the biblical theologies of H. Schultz (Frankfort, 1869), Ewald (Leipsic, 1871–76), Oehler (Tübingen, 1873; translated in Clark's *Foreign Theological Library*); the biblical dictionaries of Winer, Kitto, Smith, and Riehm, under "Messiah" and "Messias;" and the commentaries of Hengstenberg on the Psalms (Berlin, 1849–52), and especially of Delitzsch on Isaiah (Leipsic, 1866) and Psalms (1867), and Moll on the Psalms in Lange's *Bible Work* (American edition, Scribner's, 1872). The Jewish views of the Messiah, and the expectations respecting him at his advent, are discussed in Schöttgen, *Horæ Hebr. et Talmudicæ* (2 vols., 1873–74); also, *Jesus der wahre Messias* (Leipsic, 1748); Robert Young, *Christology of the Targums* (Edin., 1853); A. Wünsche, *Die Leiden des Messias* (Leipsic, 1870); Colani, *Jésus Christ et les Croyances messianiques de son Temps* (2e éd., Strasbourg, 1864); Holtzmann, *Die Messiasidee zur Zeit Jesu*, in the *Jahrb. f. deutsche Theol.* (xii. p. 389 ff.); Hilgenfeld, *Die jüdische Apokalyptik in ihre geschictlichen Entwickelung* (Jena, 1857); *Messias Judæorum* (Lips., 1869); Drummond, *Jewish Messiah* (London, 1877). Compare also Jost, *Geschichte der Judenthums und seiner Sekten* (Leipsic, 1858); Neumann, *Die messianischen Erscheinungen bei den Juden* (Bleicherode, 1865); Ewald. *Geschichte Christus und seiner Zeit* (Göttingen, 1867); Keim, *Geschichte Jesu von Nazara* (1867); E. Schürer, *Lehrbuch der Neutest. Zeitgeschichte* (1874). C. A. BRIGGS.

Mess'ina, province of Sicily, occupies the north-eastern corner of the island, and has an area of 1500 square miles, with 420,649 inhabitants. It is mountainous, but the valleys are very fertile, and produce excellent wheat, flax, hemp, wine, oil, and fruit. Sulphur abounds.

Messina, a large seaport town of Sicily, which gives name to the province. It lies in lat. 38° 17′ 38″ N., lon. 15° 35′ E., and rises amphitheatre-like from the sea, backed by the rocky extremity of the Siculo-Calabrian Apennines. The tongue of land on which it stands curves inward on the right; on the left projects the historic Pelorus or Cape Faro, and thus is formed the *sickle* from which the original town was named *Zancle* by the Greeks. The harbor of Messina, the largest and safest in the kingdom of Italy, is deep, spacious, well furnished with quays, and defended by a fort and citadel. The annual amount of shipping it receives is over 6000 vessels, the imports being chiefly cotton and woollen goods, hardware, etc.; the exports, fruits, wine, oil, silks, etc. Messina, having suffered so often from earthquakes and bombardments, now consists in the main of fine new buildings, with well-paved streets and spacious squares, flanked by stately palaces and adorned with fountains and statues. There are many noteworthy churches, and the old cathedral is one of the most interesting monuments of the city, the exterior being very quaint and curious, and the interior decorated with the rarest marbles, porphyry, jasper, lapis-lazuli, etc. Messina existed as a town long before the foundation of Rome. It suffered severely during the Punic wars and during the Roman civil wars, also from the Goths and the Saracens. In 1282, 12,000 Frenchmen perished here in the terrible Sicilian Vespers. In 1783 the town was almost totally destroyed by an earthquake. In 1848, Messina threw off the Bourbon yoke, but was reduced to submission after an obstinate and destructive resistance. In 1860 it was restored to liberty by the arms of Garibaldi. The climate of Messina is delightful, and the views are magnificent. Pop. 126,497.

Messina, Strait of [It. *Faro di Messina;* Lat. *Mamertinum fretum*], a narrow channel of water connecting the Ionian and the Tyrrhene seas, and dividing Sicily from Calabria. Its length is 26 miles, its greatest width 12 miles, its least 2 miles. The tide is most irregular in this strait, the eastward current being vastly stronger than the westward, and the flood and ebb succeed each other with great rapidity. There is a dream of a bridge to be thrown some day across this strait at its narrowest point, thus connecting the city of Messina with the mainland. (For a curious phenomenon witnessed here, see FATA MORGANA. See also SCYLLA and CHARYBDIS.)

Mesti'zo [Sp., "mixed"], in Spanish America, a half-breed, the offspring of a white father and an Indian mother. The white characters usually predominate. The offspring of an Indian father and a quadroon mother (three-fourths white, one-fourth negro, the latter by the female side) or a quinteroon mother produces what is called a brown mestizo. A mestizo-claro is the offspring of an Indian father and a mestizo mother. (See MIXED RACES, and also HYBRIDITY.)

Mes'tre, town of Northern Italy, province of Venice, lying a little less than 2 miles N. of the lagoons, and 7 miles from the city of Venice, on the canal that leads to Marghera. It is an old town, was for a time an appanage of Treviso, became a part of the Venetian republic early in the fourteenth century, and has since shared the fortunes of Venice. It is now a place of considerable industry with iron-foundries, saw-mills, etc. Pop. 9930.

Meszaros (LAZAR), b. at Boja, Hungary, Feb. 20, 1796; was educated first for the Church, then for the bar, but followed in 1813 the summons of the emperor, Francis I.; entered the Austrian army as a volunteer; made the campaigns of 1814–15; rose slowly, as he was without connections, but acquired a solid reputation in the army, and was made a colonel in 1844. When, in 1848, Count Bathyani formed a separate Hungarian ministry, he chose Meszaros as head of the military department, and although he at first opposed the separation of the Austrian and Hungarian armies, he organized the Hungarian army with great rapidity and skill when the decision was taken. After the declaration of independence (Apr. 14, 1849), he left the ministry and received an active command, and after Gorgei's surrender at Vilagos (Aug. 13, 1849) he fled to Turkey; was sentenced to death by an Austrian court-martial, and hanged *en effigie* at Vienna. He afterward lived in France, England, and the U. S. D. at Eywood, Herefordshire, England, Nov. 16, 1858.

Me'ta, town of Southern Italy, in the province of Naples, delightfully and healthfully situated on the beautiful road leading from Castellamare to Sorrento. The town is of Greek origin; in the time of the emperors it was a favorite summer resort. Pop. 9229.

Met'aline is a name that has been given to a series of substances intended for application to all kinds of machinery where friction is encountered, obviating the necessity of oil or other lubricant. Its appearance is that of a soft, dark, metallic compound. It is prepared originally in the form of a fine powder, and is then moulded into any shape required by hydraulic pressure. After moulding it may be cut or turned to suit any form of application. It is usually applied to journal-boxes in the form of cylindrical plugs or disks from $\frac{1}{8}$ to $\frac{5}{16}$ of an inch in diameter, inserted in holes bored near together over the whole inner surface. In small bearings, such as spindle-bolsters and the journals of sewing-machines, it is pressed into longitudinal slots or creases. Several varieties of metaline are manufactured, differing in composition and adapted to use under the various conditions encountered in running machinery, such as steel on brass, steel on cast iron, etc. Metaline was invented and patented by Dr. Stuart Gwynn of New York, the patents being dated Apr. 12, 1870, and numbered 101,861 to 101,869, inclusive. It is applicable to all bearings—the shafts of steamships, axles of car, locomotive, and carriage wheels, steam-engines, drawbridges, saws, centrifugal machines, cotton-spindles, etc.—and entirely obviates the use of oil, and avoids its attendant cost and dangers. C. F. CHANDLER.

Metallammoniums. This rather inelegant term has been used to designate a class of chemical compounds whose (hypothetical) mode of derivation is explained under the head of METAMERISM, below. Under that head will be found a tabulation illustrating the assumed mode of derivation of complex "compound ammonias" from ammonia itself, through successive removals and replacements of the three hydrogen equivalents of the ammonia by equivalents of the (hypothetical) "organic radicals." Metallammoniums have their existence, derivation, and constitution explained by an expansion of this same theory, so far as it goes (and in this case it must go much farther than in the other), by taking the real compound radical, ammonium, NH_4 or NHHHH—which, in combination at least, has a *demonstrable* existence—and substituting for its hydrogen equivalent quantities of certain heavy metals. It happens that among the compounds which have been maintained to be thus formed, occur two quite useful and important substances. One is common "white precipitate," so called in medicine, which is formed by precipitating a solution of corrosive sublimate, $HgCl_2$, with solution of ammonia. By the metallammonium hypothesis,

$$(NH_4)_2O + 2HgCl_2 = H_2O + \overset{\text{Dimercurammonic chloride.}}{2(NH_2Hg,Cl)}.$$

It should be observed that mercury, Hg, as a dyadic or bivalent element, is equivalent to, and therefore replaces, H_2. The other compound is the so-called *cuprammonium*, formed by the action of ammonia on cupric compounds. Copper being also a dyad, we have a similar exhibition of equivalency with H_2:

$$(NH_4)_2O + CuSO_4 = \overset{\text{Cuprammonic sulphate.}}{(N_2H_6Cu)SO_4} + H_2O.$$

This latter product constitutes one of the cuprammonium solvents for cellulose, as paper, cotton, etc., now coming into use in the arts.

The difficulty in accepting the metallammonium view consists in the *infinite* complexity of the consequences which would ensue. If we are forced to admit that not only are hydrogen equivalents replaceable by elementoid radicals, but that also the hydrogen equivalents in these radicals themselves are further replaceable by elements, and therefore also by elementoid radicals, and so on without end, we must convict nature of working by a system whose results are so far removed from the *simplicity* of plan in the molecular structure of chemical compounds which our past experience has led us to expect as to excite both the suspicion and the hope that we are here off the right track. HENRY WURTZ.

Met'allurgy [Gr. μεταλλουργός]. is the science and art of preparing metals from their ores. In very ancient times the word probably included all the operations of mining, smelting, and the subsequent manufacture of the metal into articles of use. Mining has for many centuries been recognized as an entirely distinct and different calling, though metal-working, such as copper-beating and founding, gold and silver smithing, and blacksmithing, continued for a much longer time to be regarded as metallurgical. As these became more commonly practised, they were looked upon as mechanical trades, each of which, with the expansion of metal-working, attained a separate existence and took a separate name. As the word is now used by those who follow the calling, the "metallurgist" is strictly one who prepares metals from their ores, and performs in addition such other operations as are necessary to the production of a finished raw material. Thus, in the metallurgy of iron is included not only the smelting of the ores, but also the manufacture of wrought iron and steel from the first product, and such processes of refining as are necessary to obtain the different marketable grades of iron and steel. Only in a few instances does the metallurgist carry his work so far as to produce a finished article ready for immediate use, thus adding metallurgical engineering to the productive branch of his calling. These exceptions are nearly all confined to the manufacture of bulky and low-priced goods, when economy requires the immediate union of the smelting-works and the finishing-shop. The production of railway iron is the most prominent example of this practice. On the other hand, true metallurgical establishments are frequently producers of finished articles which properly belong to chemical manufactures and other branches of technical industry, such as sulphuric acid, arsenic, paints, etc., but these are by-products, obtained from substances occurring in the ore which yields the metal, and their manufacture belongs to other branches of technology than metallurgy. From the foregoing it will be seen that while the meaning of the word "metallurgy" has in the process of time become restricted to the mere production of metals, instead of its old application to all the arts of working in metals, the practice of the metallurgist has extended so as to embrace the work of the chemist and the manufacturer of products which in former times were not classed as metallurgical.

The minerals from which the useful metals are obtained do not form more than $\frac{1}{100}$th of the earth's mass, so far as known. The basic elements of the remaining 99 per cent. include such metals as aluminium, sodium, potassium, etc., which, though employed to a limited extent, are not technically classed among the "useful metals." The list of the latter has, however, been greatly extended by the increasing use of metals in modern civilization. At present, iron, copper, lead, zinc, tin, silver, gold, mercury, nickel, antimony, bismuth, and perhaps platinum, may, either on account of common use, employment as currency, or importance of application, be ranked among the useful metals; while arsenic, potassium, sodium, aluminium, and magnesium have found some application, though a very limited one in the case of the last. Other metals still, like cæsium, cerium, etc., have been made for the purposes of chemical study or for cabinet curiosities.

The science of metallurgy includes the processes for obtaining all the metallic elements, but in practice the *art* of metallurgy is restricted to the production of the useful metals alone, the preparation of the others being the work of chemical manufactories. Those minerals which contain enough metallic base to make its extraction profitable are called *ores*, and as the question of profit is dependent upon local circumstances, a given mineral may be an ore in one country and not in another. It is rare to find an ore consisting entirely of the metal-bearing mineral, other non-metalliferous minerals being nearly always mixed mechanically with it. This useless rock is technically known as the "gangue," and it plays a very important part in metallurgy, frequently compelling the choice of operations that are not favorable to the complete extraction of the metal, or that are costly for some other reason. Two general kinds of gangue are distinguished: First, earthy gangue, which is either acid, from a preponderance of silica, or basic, when lime, magnesia, alumina, and iron most frequently occur. In this case two methods of removing the associated rock may be used. One is mechanical, the ore being crushed fine and passed through machines which cause a separation of the heavy ore from the lighter gangue by virtue of their different specific gravities; or by subjecting the crushed ore to some uniform force which affects the two minerals differently. This work, however, is usually allotted to mining operations, and the smelter receives the dressed product. The other mode of separating the gangue is by fusion with fluxes. A "flux" is any substance which will make the ore fusible and fluid at temperatures which are within our control. Practically, the operations of the metallurgist are confined to the treatment of compounds containing silica for the acid, and usually lime, magnesia, alumina, or iron for the base. Other acids and bases occur, but they play a very subordinate part, and are always accompanied by one or more of the above. The art of fluxing therefore simply consists in adding silica when the bases predominate in the ore, and one of the above bases when the contrary is the case. Its difficulties lie entirely in the fact that the proportions must be properly adapted to the metal under treatment and the temperature required. The second kind of gangue is one that consists of a metal-bearing mineral, with which is associated the mineral containing the object of the metallurgist's labors. A distinction has to be made between these two sorts of gangue—partly for the reason that the latter is always basic, and partly because it is often impossible to separate the two metalliferous minerals by mechanical means; and these ores therefore usually come into the metallurgist's hands just as they are received from the mines. Many type-processes of metallurgy have been invented to surmount the difficulties presented by such a metalliferous gangue. Among metals occurring in this manner the most frequent examples are tin, copper, lead, nickel, gold, silver, and others in pyrite (a bisulphide of iron). Most ores consist of both earthy and metalliferous minerals, and therefore require both mechanical and chemical processes for their treatment. While the ores present a great variety of combinations, three general classes may be recognized by the character of the negative element combined with the metal. They are — (1) Native metals, in which no acidifying element occurs, the metal itself being found uncombined in nature. These native metals are, however, never pure, but are always alloyed. They are gold, silver, copper, platinum, and bismuth. (2) Sulphides, or compounds of the metal with sulphur as the negative element; and in this class may be ranked the compounds in which arsenic and antimony occur, as they come under the same general mode of treatment. Copper, lead, silver, mercury, iron, antimony, nickel, and zinc form such compounds. (3) Oxides, which form by far the largest and most important class. Iron, copper, lead, tin, zinc, and all the rarer metals belong to it. Many metals occur in two or in all three of these classes, and the division here made refers only to their common occurrence and the mode of treating their ores. The general character of the processes by which a metal is extracted from its ore is not governed by the metal itself, but by the negative element with which it is combined. The metal may decide the adoption of a particular class of operations or apparatus, but the native metals may all be obtained by mechanical dressing or by simple fusion; the sulphides must all be melted with some substance that will combine with the sulphur and leave the metal free, or else they must be roasted and then treated like oxides; and the oxides of the useful metals are all reducible to metal by heating them with carbon. In carrying out these different processes a great variety of reactions are employed, but only those of a general character will be spoken of here. Two grand modes of producing these reactions are employed, the dry and the wet. In the former the fluidity necessary for the free action of the substances employed is obtained by heat; in the latter, by solution in a liquid. These two modes are frequently combined in the treatment of an ore. So far as is known, the dry method is the oldest, and the wet is at present the most progressive part of the art, having grown out of the establishment of chemical science. Its modes of operation simply repeat the reactions of the laboratory, and are therefore more under control and better understood than those of the dry method.

The metallurgy of the native metals consists usually in a combination of mechanical and chemical processes. When the ore occurs in a vein, as copper, and sometimes gold and silver, the vein-rock must be crushed fine; and the most common apparatus for this work is the stamp-mill. A stamp is a heavy pestle, of which the head is iron and the stem may be either iron or wood. It is supported between guides, and rests upon an iron seat or "die" placed in a mortar, and the crushing is performed by raising the stamp and allowing it to fall upon the ore, which is introduced upon the die, while a constant stream of water passes through the mortar. Stamp-mills form a very important part of the metallurgical apparatus used in the western part of the U. S., and their management includes many important questions of theory and practice. The side of the mortar contains a sieve of the proper degree of fineness, and as soon as the ore has been sufficiently crushed it is carried through the sieve by the water-current. It now consists of metallic grains mixed with, but no longer attached to, particles of rock. The succeeding operations are intended to effect the separation of the metallic grains, either by means of gravity or by taking up the metal (in the case of gold and silver) in mercury. Several modes of utilizing the force of gravity are employed. One of the most common is to run the stream of "slime" (the ore and water) over coarse blankets. The metal, being heavier than the rock, sinks to the bottom of the stream, and is caught in the meshes of the blankets, from which it is afterwards removed by washing them in a tank of water. A similar separation will be obtained if the slime runs over a flat, shallow trough without blankets, provided the force of the current is not sufficient to wash off the metal after it has once settled upon the trough. Many other mechanical methods of separation are employed. When mercury is used, as in the case of gold and silver ores, the operation is known as "amalgamation;" and it is not yet positively decided whether this is a mechanical or a chemical act, but it is probable that both of these forces are included. The mercury may be used either as a shallow bath, into which the gold sinks by virtue of its greater specific gravity, or it may be distributed in a thin layer over copper plates. The former method is most employed in Europe, and the latter in America. Agitation of the mercury and slime by a percussive movement of the vessel which contains them, or by causing ripples and low falls in the stream, is thought to increase the efficiency of the operation. A large part of the gold and all of the platinum obtained is found in sands and deposits of gravel. In this case the stamp-mill is not needed, the mining being so managed that the sand is conveyed in a current of water through the separating or amalgamating machinery. Platiniferous sands are first concentrated on blankets, as above described; the concentrated sand is carefully washed by hand; the gold removed by amalgamation; and the product, which contains about 75 per cent. of platinum, is sold to manufacturing chemists, who prepare the marketable metal. Of the metals so far considered, native copper and platinum are obtained only by washing, gold and silver by washing or amalgamation. Bismuth differs from the foregoing in having so low a fusing-point that it is more economical to melt the metal out of the ore by the operation called "liquation" than to crush and dress it. The ore is therefore placed in inclined iron tubes holding about 25 pounds, and heated to redness, when the metal flows out.

Next to these processes in point of simplicity is *the metallurgy of the oxides*. These ores include the most important metals known, such as iron, copper, lead, tin, and zinc. With the exception of iron, all of these are used pure in the arts, and the mode of treating the ores is to heat or fuse them in direct contact with the fuel. The affinity of carbon for oxygen is so strong at high temperatures that the elements in the ore are dissociated, the oxygen uniting with the fuel and passing off as a gas, leaving the metal to run out in a fluid state. This simple operation is one of the oldest in the art, and the time of its discovery is unknown. It is certain, however, that the oldest form of metallurgical apparatus is the shaft-furnace, which is especially adapted to satisfy the conditions of this operation. A shaft-furnace consists of four vertical walls containing within them a space which is usually much higher than it is wide or deep. Fire being made within it, the ore, fluxes, and fresh fuel are thrown in at the top, and combustion is maintained by driving a steady current of air in at the bottom. The especial characteristic of this apparatus is that the ore and fuel being in immediate contact, and the amount of air being limited, the carbon of the fuel must satisfy its affinity for oxygen by extracting and combining with that contained in the ore, producing the reaction known as "reduction." This affinity is so strong that most ores give up their oxygen at comparatively low temperatures, and reduction occurs while they are still in the upper part of the furnace. As the materials at the bottom are melted by the higher heat there and flow out, the reduced ore descends by its own weight until it is in turn melted and collected in the bottom of the furnace, from which it is removed by "tapping" or opening a small hole in the furnace-wall. Oxides of copper, lead, and tin may be smelted in one operation to metal in furnaces of this kind, which vary from 2 to 30 feet in height. Ores of iron, which are more "refractory" —that is, do not give up their oxygen with the same ease— require higher furnaces, technically called "blast furnaces," the extreme limits of which, in civilized countries, are 25 and 106 feet, while barbarous nations still employ very rude furnaces of 2 or 3 feet in height. Iron differs from almost all other metals in not being commonly produced in the pure state from its ores, though this is done in a few works by what is called the "direct process." The product of the blast furnace is always a carbide of iron, called pig iron. Iron ore being a compound of iron and oxygen, and pig iron being a compound of iron and carbon, it is evident that the work of the blast furnace consists in removing the oxygen from the ore and substituting a small amount of carbon in its place. It accomplishes this by means of two important chemical reactions. When a carbon-fuel is burned with a limited access of air, the product of the combustion contains 1 unit of carbon and 1 unit of oxygen in combination, and is called carbonic oxide. This product is not, however, a stable one, there being a higher oxide of carbon, which contains 2 units of oxygen to 1 of carbon. It is a law of chemistry that when an element enters into combination with another without completely satisfying its affinities, the new compound exerts the unsatisfied power of combination and therefore acts like the original substance. The combustion of fuel in the hearth of a blast furnace furnishes an example of this kind. The product CO has one of the affinities of carbon unsatisfied, since the carbon is capable of forming a higher oxide, CO_2. There are two methods by which the remaining affinity can by satisfied. One is to add a fresh supply of oxygen, and the other is to remove part of the carbon from the CO, leaving the remainder with both affinities satisfied. Both of these reactions take place in the blast furnace. The gas, rising through the materials in the furnace, extracts the oxygen from the ore, leaving it in the form of metal; and at the same time the ore exerts some power over the carbonic oxide, by which the latter is made to deposit part of its carbon. Thus, carbonic acid, in which all the affinities of carbon are satisfied, is produced in two ways. But only about half the carbon leaves the furnace in this state of combination, the other half being still the lower oxide, CO, and a condition of equilibrium seems to be established which depends upon the temperature, the rate of flow of the gas, and other circumstances. Experiments have proved that these operations go on nearly to completion in the upper half of the furnace. The lumps of ore there become porous masses of metallic iron, in the pores of which carbon is deposited in the form of soot. These descend to the bottom, are there raised to such a temperature that the iron and carbon combine, and the fusible alloy, pig iron, is formed, melts, and is tapped out. By thus forming an alloy the metallurgist is able to bring iron into fusion, though the temperature of the blast furnace is not high enough for the fusion of the pure metal.

Zinc differs from the other oxides in being volatilizable at high temperatures, and it is therefore obtained by "distillation." The ore is ground fine, mixed with a pure carbon-fuel, like charcoal or anthracite, and placed in a tube made of fire-clay. This is heated to whiteness, at which temperature the carbon attracts the oxygen of the ore, leaving the zinc to distil off as metal. In front of the tube are placed condensers of clay and sheet iron, in which the metal collects.

The metallurgy of the sulphides is more complicated than that of either of the above classes. The metals of this class are (1) volatilizable and (2) non-volatilizable. The former include mercury and zinc. The compound of mercury and sulphur, cinnabar, is not stable at high temperatures if sufficient air is present, the sulphur oxidizing and leaving the metal free. The ore is therefore heated to redness with access of air, when the mercuric sulphide distils off, and in doing so breaks up into mercury and sulphurous acid. The vapor is passed through large chambers, where the metal condenses and runs out. Sometimes the dissociation of the mercury and sulphur is aided by mixing iron or lime with the ore, as these have a stronger affinity for sulphur than the metal. The sulphide of zinc, called blende, is converted to oxide by "roasting," which consists in heating it in contact with the air. It is then treated like the oxide, as above described. In the treatment of the non-volatilizable metals three general processes are followed: (1) Roasting and reaction; (2) roasting and reduction; (3) precipitation. The first two depend upon the removal of the sulphur by roasting; and this operation, which is exactly the opposite of reduction, has a furnace especially adapted to its requirements which is in all respects the exact opposite of the shaft-furnace. It is called a "reverberatory furnace," and consists of a horizontal chamber with a low roof, having a fireplace on one side and a chimney on the other. The ore is placed in the chamber, which is called the "laboratory" or "hearth." The flames produced in the fireplace pass through this chamber, and are deflected by the low, arched roof upon the ore. Openings are made in the sides for the admission of air and for the purpose of working the charge. In this furnace the amount of air is in excess of that required by the fuel, so that the ore is subjected to oxidation. The oxide of sulphur, being a gas, passes off, leaving the remainder of the ore as a solid oxide. Various modes of utilizing this reaction are in use, depending upon the individual characteristics of the metals. When pure sulphide of silver is roasted, metallic silver, and not the oxide, remains; but in all other cases the residue is partly or wholly an oxide. Roasting and reaction is performed by interrupting the oxidation when only partially finished, thoroughly mixing the half-roasted ore, piling it up, closing the furnace doors to prevent the entrance of air, and heating the charge to such a temperature that the sulphur still remaining will combine with the oxygen absorbed by the ore. In this way both the sulphur and the oxygen are removed without giving the metal an opportunity to reoxidize, and metal is accordingly the result. Lead and copper ores are treated in this way. Roasting and reduction consists in allowing the oxidation of the ore to become complete, and then treating the product as above described for the oxide class. Lead, copper, antimony, nickel, and iron are obtained by this method. It should be remarked, however, that the sulphide of iron is never directly employed to produce the metal. It is used first as an ore of sulphur, and the oxidized residue is then treated as here described. Without the utilization of the sulphur as a source of sulphuric acid the sulphide of iron could not compete with the native oxide. Precipitation consists in melting the sulphide ore with some substance which has a stronger affinity for sulphur than the metal already combined with it. Lime, zinc, and iron are such substances, but the first requires too high a temperature for perfect action, and the second is too dear. Iron is the only reagent that is of universal application for this purpose. It may be used either as metal, oxide, or silicate, and the cinder made in ironworks is frequently employed. The unroasted ore is melted with the iron or cinder and the fluxes necessary to make the gangue fusible. A shaft-furnace is theoretically the best apparatus for the work, since no waste of iron by oxidation can take place in it. But the reverberatory is frequently used, because in it the sulphur can be partly removed by roasting at a low heat, and the operation finished by melting the residues with iron.

The outline of metallurgical practice here given relates only to the most general principles. It is rare that an ore can be smelted at once to metal of purity sufficient for its immediate use in the arts. A refining process is almost always applied to the metal; and very often the process of smelting is lengthened out by making each operation incomplete, and thus obtaining the metal by a gradual elimination of the elements combined with it. The reason for this is, that the impurities are always more volatilizable or more oxidizable, or their oxides are more reducible, than the metal itself, and by repeatedly subjecting the compound to operations which affect its constituents in different degrees a complete separation is effected. It is found to be much easier to eliminate these impurities from some compound of the metal than from the latter when fully reduced. For this reason the metal is often combined with some element that admits of perfect subsequent separation; and this compound is then passed through the purifying operations, in which there is a gradual concentration of the metallic base. The element employed for this purpose is sulphur. Oxides of copper are often turned into sulphides by adding some sulphide ore, like pyrite, to them, instead of reducing them at once to metal, which would not only cause serious loss in the slag, but also give an impure product in the case of impure ores. The popular belief that sulphur is the smelter's greatest enemy is therefore unfounded. It is often his chief dependence, and purposely added in his operations. A rich ore is usually smelted without concentration. Of poor ores there are two kinds. The ore may contain a rich mineral mixed with a great preponderance of gangue; and when mechanical concentration is not admissible, such ores are usually melted raw, with fluxes to make the gangue fusible. The product is the metalliferous mineral without the gangue, and the process can then proceed on this rich product with greater care. The other case is that of an ore which contains a great deal of metalliferous mineral, but of low grade. Such ores are usually subjected to some process like roasting, by which part of the mineral is obtained in a condition that will admit of its removal by the fluxes in the first fusion.

The products of the fusion of an ore are threefold: (1) That containing the metal. This may be either metallic or a "matte" when it contains sulphur, or "speise" when it contains much arsenic or antimony. (2) That containing the gangue and fluxes; it is the stony part of the ore melted to a glass, and is called "slag" when the bases are chiefly non-metallic, and "cinder" or "scoria" when the base is chiefly a metallic oxide. (3) The gaseous products, which, besides the products of combustion, contain the oxygen of the ore and such other constituents of it as are volatile.

Metallurgy is rapidly advancing as a science in consequence of the great aid given by the progress of chemistry. At the present day the most prominent question is the economical use of fuels. The best construction of furnaces, the use of gaseous fuel (which permits the employment of refuse carbonaceous materials), the heating of the blast to increase the effect of the fuel used, the utilization of the half-burned carbon which exists in furnace-smoke, and the direct production of metals from their ores in one or two operations, are all phases of this important problem; and these things are now chiefly occupying the attention of metallurgists. Great care is also taken in large works to make useful every element in the ore that has a market value. To this end, metallurgical establishments are now large manufactories of sulphuric acid, arsenic, iron and copper vitriol, such paints as zinc white, smalt, etc. The most noticeable instance of this economy is the manufacture of sulphuric acid from pyrite, which is a bisulphide of iron. No less than 800,000 tons of this ore are burnt for this purpose yearly in Europe, producing about two-thirds its weight of acid. Pyrite almost always contains at least a trace of silver, and in England about 200,000 tons of the burnt ore are treated for silver, of which it contains about three-fourths of an ounce per ton. After extracting the silver the residue is sold to the ironworks and made into iron. This is probably the most complete utilization of an ore known at the present day.

The *wet method* of treating ores consists in bringing the metal into solution, and then precipitating it by some agent. When the ore is an oxide or contains a native metal, the solution may be effected by treating it with an acid which will dissolve the metal; sulphides may also be treated in this way by first roasting them. Sulphuric and hydrochloric acids are those usually employed, but they are too dear in most localities, and the use of purchased acid is limited. Examples of such treatment are mostly confined to the metallurgy of gold, platinum, and bismuth, all high-priced metals. The acidification of the metal is sometimes accomplished by heating it with some substance containing the acid. Thus, silver is frequently chlorinated by heating the roasted ore with salt, which contains chlorine. The resulting chloride of silver may then be extracted by solution in strong brine, or it may be treated with iron, which reduces the chloride to metal, and mercury, which amalgamates the metal as fast as formed. The most usual mode of accomplishing solution is employed with the sulphides, which are carefully roasted in such a manner that the product is not an oxide, but a sulphate of the metal to be extracted. This is accomplished by regulating the temperature employed, and when the material operated on contains sulphides of several metals, a proper management of the operation will give a product containing oxides of the metals which are not desired, and a sulphate of the one which is to be extracted. The roasted material is then treated with water, which dissolves the sulphate, leaving the oxides; and the metal is then precipitated by some reagent. Copper precipitates silver, and iron precipitates copper. This operation is much employed in the metallurgy of silver when the ores are pure. But the ore itself is not treated directly in this way, the gangue being first removed by fusion, and the roasting applied to the resulting matte. Copper, silver, and nickel are the metals most frequently extracted by the wet way, but it is also applied to gold, platinum, and bismuth. For poor ores it is usually much cheaper than the dry method, but when the ore is rich, or if the gangue is a substance soluble in acid, the use of acid and labor may be so great as to make the dry method preferable. J. A. CHURCH.

Met′als [Gr. μέταλλον]. The elementary bodies known as the metals are especially characterized by their peculiar and generally high lustre, known as the metallic lustre; by very great opacity; and, with few exceptions, by their high specific gravity. The *opacity* of even the thinnest films is perfect, except in the case of gold, which is so malleable that it can be beaten into exceedingly thin films, through which a greenish light is found to pass. The *color* of the metals is generally white, although of various tints; zinc and lead having a bluish, bismuth a reddish, and calcium a yellowish tint. Gold is yellow, and copper red. The metals have generally a high *specific gravity*, but potassium, sodium, and lithium are lighter than water, while magnesium and aluminium have a specific gravity of 1.75 and 2.56 respectively. Of the others, the more important vary from arsenic at 5.88 to platinum at 21.5 in the form of fine wire. The specific gravity of malleable metals is decidedly increased by compression. *Malleability*, or the property of flattening more or less under pressure or blows, is possessed by a large number of the metals. Gold has been beaten into films only $\frac{1}{200000}$ of an inch thick; silver is also very malleable, and so are copper, tin, and platinum, although in an inferior degree. Iron, lead, nickel, cadmium, and mercury, when frozen, are more or less malleable; bismuth is very slightly malleable in small globules; while antimony, arsenic, cobalt, and manganese are brittle. Zinc is rather brittle at ordinary temperatures, but between 120° and 150° C. it can be rolled into sheets, which remain malleable when cold. At a higher temperature, 210°, it becomes very brittle again. Hammering and rolling render malleable metals more or less brittle, but their malleability can be restored by heating them strongly and slowly cooling them. This process is called *annealing*. Related to malleability is *ductility*, the property of being drawn into wire; but as this depends partly on the power of resisting a strain, or tenacity, the most malleable metals are not necessarily most ductile; the order being as follows, beginning with the most ductile: iron, copper, platinum, silver, gold, zinc, tin, lead. Metals are drawn into wire by pulling them through holes in steel plates. If they become brittle during this operation, they must be annealed. In *conductivity* the metals vary greatly. Silver is the best conductor of heat, and bismuth one of the poorest. Silver is likewise the best conductor of electricity.

Conductivity of Heat.—Silver, 1000; copper, 736; gold, 532; tin, 145; iron, 119; lead, 85; platinum, 84; bismuth, 18. The *linear expansion* of metal rods by heating from 0° to 100° C. is expressed by the following fractions: iron, $\frac{1}{819}$; gold, $\frac{1}{682}$; copper, $\frac{1}{584}$; silver, $\frac{1}{524}$; lead, $\frac{1}{351}$; zinc, $\frac{1}{333}$. Platinum expands only $\frac{1}{1167}$, and this being very nearly the rate of expansion of glass, it is found that platinum wires can be inserted into fused glass without any danger of cracking the glass on cooling. The fusibility of the metals covers a very wide range, mercury being liquid at ordinary temperatures, and platinum requiring the heat of the oxyhydrogen blowpipe for its liquefaction. Osmium is the most refractory of the metals, volatilizing without fusing at a temperature capable of volatilizing platinum.

Fusing-Points of Metals.

Mercury	39.44° C.	Antimony	—— C.
Tin	227.8	Silver	1023
Cadmium	228.	Copper	1091
Bismuth	258.	Gold	1102
Lead	325.	Cast iron	1530
Zinc	412.		

Nickel, cobalt, manganese, and palladium require the highest forge heat; molybdenum, tungsten, and chromium only agglomerate in the forge; titanium, iridium, rhodium, and platinum are infusible except at the temperature of the oxyhydrogen blowpipe. Wrought iron and platinum become soft before melting, and pieces of iron or steel can therefore be united together by pressure while in this pasty state, and porous platinum sponge can be made solid. This is called *welding*. *Volatility*, or the property of assuming the gaseous state, is known to be possessed by most of the metals, and is probably a property of them all. It is especially characteristic of certain of them, which volatilize at comparatively low temperatures. Thus, mercury yields a sensible amount of vapor at 20° C., and at 350° boils; zinc, cadmium, and magnesium volatilize rapidly at a red heat; and even gold and platinum may be vaporized before a properly arranged oxyhydrogen blast. Arsenic passes off in vapor without fusing. In *hardness* the metals vary at ordinary temperatures from the fluid mercury and soft, waxy potassium to the exceedingly hard chromium and manganese, capable of scratching glass and hardened steel. The *crystalline form* of some of the metals has been determined; some being found naturally crystallized, as gold, copper, and silver; others being deposited in crystals by the galvanic battery, as tin; by sublimation, as arsenic; or by fusion and gradual cooling, as bismuth. Zinc, arsenic, antimony, and bismuth crystallize in forms belonging to the hexagonal system; tin is tetragonal; gold, silver, platinum, mercury, copper, lead, and iron are isometric.

The metals are found both free and combined in nature. Gold and platinum almost invariably occur free, for it is a disputed question whether the gold so generally found in iron pyrites is combined with sulphur or not. Mercury occurs mainly as sulphide, and sometimes metallic. Silver is often found native, but more generally as sulphide, and with sulphides of antimony, arsenic, copper, and lead; also largely as chloride. Copper mainly as sulphide, generally with sulphide of iron, also very commonly as carbonate and oxide, and in a few localities large deposits of native copper are found. The iron ores are the oxides and carbonate; sulphide of iron furnishing sulphur, sulphuric acid, and green vitriol, but not being generally accounted an iron ore. Lead occurs mainly as sulphide, but the carbonate is also an important ore. Tin is found as oxide; the sulphide is a less esteemed ore, although abundant in the English mines. The most valuable zinc ores are the carbonate and sulphide; the oxide is less abundant. Nickel and cobalt occur chiefly as arsenides and sulphides; bismuth, antimony, and arsenic are found combined with sulphur, and also native, in sufficient quantities to be worked.

There are forty-nine of the elements universally considered as metals, tellurium, which is sometimes reckoned as the fiftieth, being generally classed among the *metalloids* with selenium, to which it bears close relations. Gold, silver, mercury, lead, copper, iron, and tin were known to the ancients. Potassium was discovered by Davy in 1807 while acting upon potash with a powerful galvanic battery, and this led to the discovery of sodium, lithium, and the metals of the alkaline earths. Rubidium, cæsium, thallium, and indium were discovered by the use of the spectroscope, indium being the last metal discovered. Gallium was discovered by M. Lecoq de Boisbaudran Aug. 27, 1875, during the spectroscopic examination of zinc-blende from the Pierrefitte mine, valley of Argeles, Pyrenees. It gives a violet line at 417, and a faint band about 404, and is a white, moderately hard metal, closely allied to zinc.

The metals have been variously classified, according to the purposes to be served by the grouping. To express their electrical relations they were arranged in succession, beginning with the most electro-positive metals, the alkali-metals, and ending with the most electro-negative, the noble metals; the noble metals being those whose oxides are reduced by heat alone—viz. gold, silver, mercury, and the metals of the platinum group. They are also classified according to the properties of their oxides, some forming powerful bases, as the oxides of metals of the alkalies and alkaline earths, with the lower oxides of most of the other metals; others form only acid oxides, as arsenic and antimony, and the higher oxides of chromium, manganese, and iron; while others, like sesquioxide of aluminium, may sometimes play the part of acids and sometimes of bases.

The classification of the metals according to their equivalence or combining power is the most accurate for the general purposes of modern chemistry. This method of classification assumes the atomic weight of hydrogen as the unit for the relative combining weights of the elements, which are then placed in groups whose members have equivalent combining proportions, and also possess certain properties in common.

1. *Monad Metals.*—The *alkali metals*, potassium, sodium, lithium, cæsium, and rubidium, which form only one chloride each. Silver, although differing widely from the alkali metals in general, is a monad, and yields an alum closely related to potash alum.

2. *Dyad Metals.*—Barium, strontium, and calcium, whose oxides are called the *alkaline earths*, form a group together. Glucinum, yttrium, erbium, lanthanum, and didymium, all rare metals, whose oxides are called earths, form a second group. Zinc and cadmium, with magnesium, which is analogous in many of its compounds to zinc, although it was formerly reckoned among the alkaline earths, form a third group. The elements of each of these groups form only one chloride. Mercury and copper constitute a fourth group, and form each two chlorides.

3. *Triad Metals.*—Indium, forming only a trichloride, and thallium and gold, forming each a mono and a trichloride, belong here. Thallium, however, has strong analogies to the alkali metals, and indium is capable of forming an alum with ammonium.

4. *Tetrad Metals.*—Platinum, palladium, iridium, rhodium, ruthenium, and osmium are classed together, and all form tetrachlorides, as well as dichlorides, excepting rhodium, which forms a dichloride and a trichloride, but is retained here from analogy. Tin and titanium form a second group of tetrads. Lead is considered quadrivalent, because it yields a plumbo-tetrethide with the hydrocarbon radical ethyl. Zirconium and thorinum form tetrachlorides. Iron, aluminium, manganese, cobalt, nickel, and cerium are also considered as tetrads, although their proper position is on some accounts doubtful.

5. *Pentad Metals.*—Arsenic and antimony form trioxides and pentoxides, and bismuth is grouped with them from its analogy to antimony. Vanadium is regarded as a pentad on account of its analogy to phosphorus in some of its combinations. Tantalum and niobium have been shown to form pentachlorides.

6. *Hexad Metals.*—Chromium forms a hexfluoride, and uranium is reckoned as a hexad from compounds similar to those of chromium. Tungsten forms a hexchloride, and molybdenum, being analogous to it, is considered hexadic.

Specific Gravities of Metals at 15.5° C.

Platinum (in thin wire)	21.50	Cobalt	8.54
Gold	19.50	Manganese	8.00
Uranium	18.40	Iron	7.79
Tungsten	17.60	Tin	7.29
Mercury	13.59	Zinc	6.86–7.1
Palladium	11.30–11.80	Antimony	6.80
Lead	11.45	Arsenic	5.88
Silver	10.50	Aluminium	2.56–2.67
Bismuth	9.90	Magnesium	1.75
Copper	8.96	Sodium	0.972
Nickel	8.80	Potassium	0.865
Cadmium	8.70	Lithium	0.593
Molybdenum	8.63		

H. B. CORNWALL.

Metam′erism in Chemistry [Gr. μετὰ, "after" or "beyond," and μέρος, "part" or "proportion"]. As intimated under the head ISOMERISM (which see), metamerism is a term sometimes used as a synonym of that term, oftener, however, as indicating special kinds of isomerism; but in the later literature of the science isomerism is often applied in a narrower sense, only to certain cases of identity of composition chiefly occurring among the immediate products of life—cases in which there is a minor degree of difference in physical properties; while metamerism is broadly applied, according to the prevailing fashions in nomenclature, to cases in which the same proportional numbers of equivalents are supposed to be arranged according to different hypotheses of molecular structure, and in which there are distinct, definite, and characteristic differences of physical properties. The distinction, however, between isomeres and metameres is ill defined, and apparently becoming more so. For the purposes of this article metamerism will be regarded as the broad term, and, as such, may be said to cover almost the whole ground of organic or zoic chemistry, so far as study and investigation are concerned; all the hypotheses which now prevail to explain the vast mass of facts of the science being shaped and bent with more or less reference to the continually expanding cases and classes of metameric correspondences between organic bodies, of which there would seem to be a capacity for an unlimited number and variety.

As we have yet made but little real progress in the unriddling of the true molecular structure of chemical compounds, all our hypotheses must be regarded as only possible, or at the best, if admitted to be *probable*, only partial views of the truth. They are none the less necessary, however, if only to enable us to classify facts and substances, the enormous accumulation of which would otherwise be far beyond the grasp of human memory and intellect. Caution must nevertheless be preserved to view these classifications as but provisional and founded on mere hypotheses, which some new expansion or development of exact science may at any time essentially modify.

There may be said to be three main hypotheses employed in the modes at present in vogue of explaining cases of metamerism: (1) The hypothesis of *compound radicals*, elementary groups which assume the function of elements, or *elementoids* as they may be most appropriately called. (2) The hypothesis of *types*, or that a certain small number of simple compounds constitute the typical structures—or probably we might say the molecular skeletons—upon or about which other elemental or compound elementoid molecules are attached. (3) The *replacement* hypothesis, according to which an equivalent of an element in any compound may be replaced by another element or elementoid—a process which may be extended to each and several of the elementary equivalents in the original typical compound, each being replaced by the same, or each by a different element or elementoid, thus leading to the production of a variety of substances almost beyond computation.

In the application of the above three primary hypotheses a number of subsidiary hypotheses are necessary. Thus, as an illustration, if the *existence* of elementoids or compound radicals be regarded as matter of fact, and not of hypothesis, there being at least two—*ammonium*, NH_4, and *cyanogen*, CN—whose elementoid functions admit of no doubt, yet there seems so far no *certain* basis for the settlement of the precise groups of equivalents which exist as elementoids in the huge class of organic carbon compounds. Many chemists deny altogether the existence of the series of radicals called ethyle, methyle, propyle, butyle, etc., or their existence in combination as elementoids; and it is true that while these radicals were invented especially to form the basis of a hypothetical constitution of the monatomic alcohols, few chemists now believe them to exist in these alcohols. There is no difficulty whatever in supposing for every progressive series of carbohydrogen compounds a genetic formula in which but one single hydrocarbon radical is common to all—namely, H_2C, similar in structure to water, H_2O; nor is there any difficulty whatever in citing an immense number of facts to support such a view; as, for example, if we call ethylene H_2CH_2C, alcohol becomes $H_2CH_2CH_2O$, and Berthelot's famous synthesis of alcohol by direct combination of ethylene and water is an illustration in point. As has been remarked in the article on HOMOLOGY, the old organic radicals themselves constitute one of the "progressive series" of Schiel, having the genetic or "homologenic" formula, $H + {}_nH_2C$.

With these brief preliminary observations to illustrate the uncertainty of the prevailing systems of explaining metamerism, one or two cases may be cited of classes of metameres to give a partial idea, at least, of some of these cases. We shall first quote, from Prof. Wauklyn, a tabulation of nine metameres having the same empirical composition, $C_{10}H_{20}O_2$, which are formulated on the common "organic radical" hypothesis:

Amylic valerate	$C_5H_{11}O,C_5H_9O$.
Hexylic butyrate	$C_6H_{13}O,C_4H_7O$.
Heptylic propionate	$C_7H_{15}O,C_3H_5O$.
Octylic acetate	$C_8H_{17}O,C_2H_3O$.
Nonylic formate	$C_9H_{19}O,CHO$.
Tetrylic caproate	$C_4H_9O,C_6H_{11}O$.
Tritylic œnanthate	$C_3H_7O,C_7H_{13}O$.
Ethylic caprylate	$C_2H_5O,C_8H_{15}O$.
Methylic pelargonate	$CH_3O,C_9H_{17}O$.
Rutic acid	$C_{10}H_{20}O_2$.

Another example may be given among bodies of the "ammonia type," in which the metamerism is believed to be explained by a replacement or substitution of one, two, or three of the hydrogen equivalents in ammonia, NHHH, by different hydrocarbon radicals. These bodies all have the same empirical formula, $C_6H_{15}N$:

Hexylamine	NHH,C_6H_{13}.
Amyle-methylamine	NH,CH_3,C_5H_{11}.
Tetryle-ethylamine	NH,C_2H_5,C_4H_9.
Tetryle-dimethylamine	N,CH_3,CH_3,C_4H_9.
Di-tritylamine	NH,C_3,H_7,C_3H_7.
Trityle-ethyle-methylamine	N,CH_3,C_2H_5,C_3H_7.
Tri-ethylamine	N,C_2H_5,C_2H_5, C_2H_5.

All such metameres are liable to vary in chemical and physical characters, such as boiling-points and densities (and therefore in equivalent volumes).

Another mode of representing metamerism hypothetically is by means of the so-called "graphic formulæ," by which it is sometimes supposed that the arrangement of the equivalents in certain ways *upon the same plane* can give us a correct idea of their true arrangement and relations in a compound molecule, which must *occupy space*, as it possesses *volume*. The best textbooks admit that these methods cannot represent the actual arrangement of the elements in a compound, and their continued employment must therefore be detrimental to science, by tending to imbue the mind of the student with wholly artificial views, which must be again eradicated therefrom as he attempts to follow the advancement of true inductive discovery. (See the article VOLUMES, MOLECULAR.)

HENRY WURTZ.

Metamo'ra, cap. of Woodford co., Ill. (see map of Illinois, ref. 4–E, for location of county), is situated on the Dwight branch of the Chicago and Alton R. R., 137 miles S. W. of the city of Chicago, and 7 miles N. by E. of Washington, has some manufactures. Pop. in 1870, 702; in 1880, 828.

Metamor'phism in Chemical Geology [Gr. μεταμορφόω, to "transform," to "change over"]. Broadly, this term applies to all those changes by which loose sedimentary matters are transformed into solid rock, but is generally confined, in the geological literature of the present day, to those changes by which *compact crystalline* rocks, including granites, gneisses, crystalline marbles, etc., have been formed from sediments *in situ*, excluding thus products of actual fusion, like true lavas and such so-called traps, basalts, etc. as are homogeneous or not bedded. Understood in this narrower sense, no rock will usually be admitted as metamorphic which does not retain unmistakable indications, in some part, of its original bedding or sedimentary deposition. The view being now widely accepted, as a highly probable generalization, that *all other* known rocks—except the truly igneous ones—are formed of materials originally abraded mechanically from these crystalline bedded metamorphic rocks, and that these constitute the universal substratum of the earth's crust, melted or fused masses (which themselves often include fragments of metamorphic rocks, having been formed by their fusion) being only local in their occurrence, it has been recognized of late years as one of the most important fundamental problems of geology to arrive at some consistent hypothesis which may serve as a provisional theory, at least, of the mode of transformation of ancient sediments into compact crystalline masses; in other words, to arrive at a theory of the nature and agents of metamorphism. The main facts are that (1) Metamorphic action, properly so called, has been *uniform*, or nearly so, over *enormous surfaces* of the earth and throughout *thick masses* of rocks. (2) Some *higher degree of temperature* than that normal in the present crust of the earth (so far as it is known) must have prevailed, though it is very generally maintained that this temperature was much below that of incandescence, and, some believe, not much above 300° or 400° F. (3) This elevation of temperature must often have been nearly uniform throughout vast extents of rock-mass, and thus could not have been due to conduction or convection of heat from one part or one level of the mass to other distant parts or levels. (4) Metamorphism is uniformly found to be concurrent with immense changes of the original internal position of the planes of bedding of the rock, so that from horizontal it has often become vertical. (5) The distortions of the lamination, the compacting of the rock into a mass devoid of visible pores, and the flattening of the beds into lenticular shapes combine to prove a condition of *plastic or pasty* consistence under a *pressure* vast almost beyond computation.

The origin and cause of the uniform internal *heat* of the rock-masses during metamorphism being one of the most important and (previously) incomprehensible questions connected therewith, a careful consideration of the above-stated conditions of the problem led the present writer to propose, to the American Association for the Advancement of Science, at Buffalo in 1866, the view that the *heat* of metamorphism was produced by the transformation of *work* into *heat*—that is, of molar motion into molecular motion—during the compression and plication of the mass. This theory is now adopted by many of the leaders of the science of geology. Dana, in the last edition of his *Manual of Geology* (1874, p. 729), says: "It is then true, as Wurtz was first to announce, that the heat of metamorphism was made, in the very rocks that were altered, by the movements to which they were subjected." The distinguished English geologist Robert Mallet tried in 1872 to extend this new dynamic theory of metamorphism to the explanation of *volcanic heat*, which is local and not general, but he is as yet followed in this by few geologists of authority.

The origin of the *pressure*, the second great essential element in metamorphism, is not yet beyond dispute among geologists, and as it does not strictly come under the head of chemical geology, it will be elsewhere treated of.

HENRY WURTZ.

Metamor'phosis, in botany, was the term introduced by Linnæus to signify the relation which the parts of a blossom bear to leaves. (For an exposition of the facts and the conceptions as now understood, see BOTANY—*Metamorphoses of Leaves and Stems*; also LEAF, and MORPHOLOGY, VEGETABLE.)

Met'aphor [Gr. μεταφορά, a "transference"], a rhetorical figure by which one idea, more concrete, more familiar, and consequently more impressive to the imagination, is placed in the stead of another more abstract, less familiar, and needing some reinforcement in order to strike the imagination. Webster calls it a simile in one word. The most common form of the metaphor is that by which the name of some sensible object is transferred to an object which does not fall under our senses. In this form the metaphor denotes not only a rhetorical figure, but a stage in the development of a language. (See FIGURE, GRAMMATICAL LANGUAGE, TROPE.)

Metaphys'ics, as the name of an independent science, originated incidentally. In the collection of the works of Aristotle a number of essays containing the highest generalizations to which he carried physical science were placed immediately after his physics, and received as their running title the name τὰ μετὰ τὰ φυσικά—literally, "that which follows after the physics." This title, which originally referred only to the place occupied by the essays as part of the collection, became in course of time, especially among the later Peripatetics, suggestive of the general character of the contents of these essays; and thus "metaphysics" became the name of the highest development of physical science—that science which treats of being in its nature, irrespective of its manifestations under individual forms.

No sharp line of distinction can be drawn between physics and metaphysics—as little as between physiology and psychology; only a general characterization of the difference can be given. As all those mental phenomena which can be demonstrated as resulting directly or indirectly from merely physical processes are generally and properly included in physiology, and only those phenomena are retained by psychology which cannot be demonstrated as products of some change taking place in the body, so all those cognitions which are derived from experience and can be proved by experiment are referred to physics, while metaphysics deals in such cognitions only for which no other evidence can be given than their logical necessity. But the transition from one of these groups of cognitions to the other is very vague. The two sciences are complementary and reciprocally dependent. When metaphysics loses its connection with, and applicability to, physics, it becomes empty and dreamy. The neo-Platonic school in the Greek philosophy, the later Schoolmen in the Middle Ages, numerous phases in modern German philosophy, are examples. On the other hand, when physics ceases to be penetrated with metaphysics, it becomes confused and stupid, as shown by the French philosophy of the eighteenth century and some phases of the latest English philosophy.

In the history of philosophy, metaphysics appears under different names, according to certain modifications which its general problem has undergone at different times or with different philosophers. When treating simply of being *per se*, and the logical correlations of the constituents of this idea, it is called ontology—by Hegel, objective logic. When it applies itself more especially to the relation between knowledge and being, consciousness and objective reality, it has been called critical philosophy, speculative psychology, etc. When it considers being under the view of the final cause from which all phenomena are derived, it forms cosmogony, natural theology, philosophy of nature, and philosophy of religion.

CLEMENS PETERSEN.

Metasta'sio (PIETRO ANTONIO DOMENICO BONAVENTURA), b. at Assisi Jan. 13, 1698, in humble circumstances. His true name was TRAPASSI, but having attracted the attention of the famous jurisconsult, Gravina, by his talent for rhyming and improvisation, he was adopted and educated by him, received the name of Metastasio, and inherited a large fortune, which enabled him to follow his passion for poetical production. In 1724 he published his *Didone Abandonata*, which was composed by Sardi and brought on the stage at Naples with immense success. Other lyrical dramas followed, alternating with cantatas, sonnets, and lyrical poems of different kinds; and he was already a man of great fame when in 1729 the emperor Charles VI. invited him to his court as *poeta laureatus*, with a pension of 4000 florins a year. At Vienna he continued his poetical activity with great success till his death, Apr. 12, 1782. Besides his lyrical poems and cantatas, he wrote 63 lyrical dramas, which, although their dramatic form is now antiquated, are still read in Italy with great pleasure on account of their noble ideas and natural and felicitous expressions. There are many editions of his works; one of the best is that in 20 volumes (Mantua, 1816–20). There is also a number of biographies—one by Charles Burney (London, 1797)—but the most interesting and striking sketch of his life is found in Vernon Lee, *Studies of the Eighteenth Century in Italy* (London, 1880).

Metas′tasis [Gr. *μετά*, "across," and *ἱστάναι*, to "place"], in pathology, the sudden removal of a disease to a distant part, as when the disease called mumps is transferred from the parotid to the mammary glands or to the testes. There are also metastatic abscesses, dependent upon septicæmia, pyæmia, or blood-clot. Besides these there are metastatic inflammations, whose transfer cannot be accounted for by any theory yet advanced.

Met′calf (Ralph), b. at Charlestown, N. H., Nov. 21, 1798; graduated at Dartmouth 1823; began the practice of law at Newport, N. H., 1826; was much in public life; several years secretary of state of New Hampshire; was governor 1855–56. D. at Claremont, N. H., Nov. 21, 1858.

Metcalf (Theron), LL.D., b. at Franklin, Mass., Oct. 16, 1784; graduated at Brown University 1805; became a reporter of the Massachusetts supreme court in 1839, and was one of its judges 1848–65; author of numerous volumes of legal reports, digests, etc., and editor of important legal works, especially *Digest of Cases in the Massachusetts Supreme Court* (1816–23) and Metcalf's *Reports, 1840–49* (13 vols., 1840–51). D. Nov. 13, 1875.

Metcalfe (Charles Theophilus), Baron, b. in Berkshire, England, Jan. 30, 1785; went to India in 1801; became heir to a baronetcy 1822; acting governor-general of India 1835–36; governor of Jamaica 1839–42; governor-general of Canada 1842–44; a baron 1844. D. at Basingstoke Sept. 5, 1846.

Metcalfe (Rev. Frederick), B. D., b. in England about 1817; graduated at St. John's College, Cambridge, in 1838; was elected fellow of Lincoln College, Oxford; became head-master of Brighton College in 1848; translated from the German A. Becker's *Gallus* (1844), and *Charicles* (1845), each accompanied with notes and excursuses; translated Vilmar's *History of German Literature* (1858), *The Oxonian in Norway* (1856), *The Oxonian in Thelemarken* (1858), and *The Oxonian in Iceland* (1861).

Metcalfe (Thomas), b. in Fauquier co., Va., Mar. 20, 1780; removed in early youth to Fayette co., Ky., where he was bred a stone-mason, a fact of which he was always proud; became a political orator in 1809; fought with great distinction at Fort Meigs in 1813, and was thenceforth much in public life; was in Congress 1819–29; governor of Kentucky 1828–32; became a State senator 1834; president of the board of internal improvement in 1840; U. S. Senator 1848–49. D. in Nicholas co., Ky., Aug. 18, 1855. He was a Clay Whig, and displayed great ability in public affairs.

Metel′lus, the name of a Roman family belonging to the plebeian gens Cæcilia, and distinguished as much for the virtue as for the talents of its members. It first became known in history during the First Punic war, when Lucius Cæcilius Metellus was elected consul in 251 B. C., and it seems to have become extinct at the beginning of our era. Its most conspicuous members, all of whom adhered firmly to the party of the optimates, were (1) Quintus Cæcilius Metellus Macedonicus, who defeated the Macedonians in 148 B. C. and the Achæans in 146 B. C., and who was carried to his funeral pile by his four sons, of whom three had been consuls, while the fourth was a candidate for the office.—(2) Quintus Cæcilius Metellus Numidicus, who fought successfully in 108 B. C. against Jugurtha, king of Numidia, but was superseded by Marius, at that time his legate.—(3) Quintus Cæcilius Metellus Celer, who was prætor in 63 B. C., when Cicero was consul, and contributed much to the suppression of the conspiracy of Catiline.

Metempsycho′sis [Gr. *μετά*, "after," and *ἐμψυχόω*, to "vivify," to "animate"], the transit of the soul from one stage of being or life to another; commonly called transmigration. As the belief that the soul after death appears again in animals or in men and women is spread all over the world, it would appear to be anthropologically innate, and to be the first form in which the idea of immortality occurs to man. The early Egyptians saw in it an explanation of the sufferings endured by many men on earth, which sufferings were otherwise inexplicable. Their entire religion was based on this doctrine, that man is a fallen angel, once an equal of the gods. He is to be judged after death, and if his life on earth has been evil he must renew his earthly existence, if not as a human being, as an animal, according to his crimes. But it was in India, where the problems of metaphysics and ethics as connected with ontology and the destiny of the soul were elaborated to the last degree on a theistic basis, that metempsychosis was most ingeniously and extensively developed. All the problems of fate, free-will, and human suffering were easily explained by the doctrine that the soul, an emanation from God, passed from life to life, and that the sins committed in one existence were expiated in another. It was even held that the account was kept so closely that a soul might pass thousands of years or *kalpas* (æons) in one or other of the heavens as a reward for good deeds or self-inflicted suffering, and yet be obliged to return to earth or hell to expiate as an animal, man, or demon certain sins. To the pure theism of the early Jews and Arabs, or of the Shemitic race, who simply held that God directly made and willed all things, the idea of metempsychosis was utterly opposed. According to the latter, the soul is guided by laws which lie far behind the highest conceivable idea of a God; according to the former, God distinctly makes all laws with full self-consciousness. Consequently, the Old Testament contains no trace of the transmigration of souls. But after the building of the second temple foreign speculation and superstition flowed in on them freely. The *Gilgul Neshamoth*, or theory of metempsychosis, forms an important doctrine in the Cabbala, and ere long a mass of wild and beautiful legends arose to illustrate it. The rabbis held that David had been Adam, and is to come again as the Messiah, and that Simeon had been Japheth. Many fanciful ideas sprung up in the Hebrew theory of transmigration—*e. g.* that when a woman had a soul which had been that of a man she could not bear children until God had breathed into her some part of a woman's soul. The Greeks derived the doctrine of metempsychosis from teachers who had taken it from Egypt or India. Thales had taught it at an early period, and it was subsequently greatly developed by Pherecides, Pythagoras, and Plato. The Greek mysteries were, in fact, not only a school in which metempsychosis was taught, but an indispensable grade or lodge through which all of the aspirants must pass before they could be purified and pass on to higher stages of existence. Pindar, setting forth the Orphic doctrines, teaches that the soul must thrice lead a pure life before it could be fully set free: and Plato, refining on all the theories of his predecessors, believed (or rather argued for) the principle that souls had pre-existed, and that on earth they assumed shapes corresponding to their character. What with purification, penance, and intervals of a mere ghost-existence apart from the body, Plato assumed that ten thousand years must pass before the soul would attain divinity. There is, in fact, every reason for believing that there were no religious or spiritual systems of antiquity which did not eventually include metempsychosis, strange as it appears to us at the present day. The Epicureans denied it, but it appears to have been generally inculcated as one of the deepest doctrines of the mysteries. The Neoplatonists, who believed in magic, as in all the wild deductions from a theory of a universal soul and life, of which man is a part, assumed the doctrine of metempsychosis as a natural inheritance. Gnostics and Manichæans welcomed it, and the more speculative or mystical of the Church Fathers found in it, as the Egyptians had before them, a ready explanation of the fall of man and the doctrine of evil spirits. All are "dreeing their weird," or undergoing penance for sins. This considerable step towards reconciling the existence of suffering with that of a merciful God was distinctly set forth by Porphyry and Origen, and passed from the East, with all the strange heresies of "illumination," in all probability, through such institutions as the Cairene House of Light and the Knights Templar, into the wild doctrines of the obscure sects of the Middle Ages in Europe. The Taborites, an extreme branch of the Hussites, are said to have believed in transmigration, and this view has been thoroughly set forth by Madame George Sand in *Consuelo*. The Druids taught it, and of late years poetical philosophers or true poets have found in its inexhaustible fitness for romantic pictures and incidents subjects for their pens. C. G. Leland.

Me′teorite, Meteor′olite, or **A′ërolite.** These are used synonymously to denote a solid body that has fallen from the heavens. Of the three, meteorolite is perhaps the most correct and expressive, being derived from the Greek μετέωρα, a "meteor," and λιθος, a "stone." It is not to be confounded with those small luminous bodies that flash across the sky every bright night, visiting us in large numbers at stated periods, and called *shooting stars;* for these last are doubtless composed of very attenuated matter, and never leave any solid residue behind them. A genuine meteorite may flash across the sky, become visible, and yet pass on without sending to the earth any evidence of its true character; but it is very doubtful if one of these bodies ever became entangled in our atmosphere without ultimately falling to the surface of the earth and constituting an addition to our globe. These bodies have been observed to fall in all ages of the world; and doubtless the earliest account we have of any one of them is to be found in the eleventh verse of the tenth chapter of Joshua; at any rate, the phenomenon referred to in that verse can be interpreted by reference to some of the more modern falls of meteoric stones. But one of the most remarkable falls recorded in ancient history is that of the Thracian stone mentioned by Pliny in the 58th chapter of his second book of natural history. It fell near Ægospotamos in Thrace 467 years before Christ. Pliny describes it as being as large as a cart (which, however, gives us a very indefinite idea of its size, the carts of those days being much smaller than those now in use); he describes it also as being of a burnt color. It was held in veneration by the inhabitants of the country, and the time of its fall served to fix the period of certain important events, as evidenced by the following statement to be found in the *Parian Chronicle:* "From the time when the stone fell at Ægospotamos, and the poet Simonides, who died at the age of ninety during the archonship of Theagenides at Athens, is 205 years." Another ancient and memorable meteorolite is now at Mecca; for the celebrated black stone, *Hajar el Aswad,* that forms an object of adoration of the pilgrims to the Kaaba at Mecca, is doubtless one of these bodies; and some think, with very good reason, that the image which fell down from Jupiter (referred to in the 35th verse of the 19th chapter of Acts), and was worshipped by the Ephesians, was also an aërolite.

As more careful observations and more accurate records were kept of natural phenomena, so the authentic accounts of the fall of these bodies, commencing with that of Ensesheim in 1492, have multiplied, until we have about 200 of these falls, represented by a large number of separate masses varying from the size of a pea to that of several hundred pounds' weight. The fall at L'Aigle, France, Apr. 26, 1803, is one of the most remarkable ones known; it occurred about 1 o'clock in the day-time, and it is estimated that from 2000 to 3000 stones fell, of which the largest found did not exceed 17½ pounds in weight.

To give an idea of the phenomena accompanying the fall of these bodies, we shall furnish a short statement of those connected with the fall at L'Aigle, and that in Guernsey co., O., in 1860. At the time of the fall of the L'Aigle meteorite the atmosphere was clear and calm, and many persons observed a brilliant fiery ball passing rapidly through the atmosphere; and a few moments after there was heard a violent explosion, or rather succession of explosions, lasting five or six minutes, the first two or three sounds resembling those of cannon, and subsequent ones that of musketry, then a rumbling noise like the beating of a drum; all these noises being produced by the original explosions and subsequent reverberations. The noise appeared to proceed from a small rectangular cloud, parts of which from time to time were thrown off by the successive explosions; the noises were heard in an area of over 100 miles, and the area over which the stones fell was about 6 miles long by 3 miles broad. Of the Guernsey fall we have no very definite account of the meteorite during its flight through the atmosphere. This occurred also in the day-time, a little after 1 o'clock, when three or four distinct explosions were heard, like the firing of heavy cannon, with the interval of a second or two after each report. This was followed by sounds like the firing of musketry in quick succession, which ended with a rumbling noise like distant thunder; and this continued two or three minutes. The first reports were so heavy as to produce a tremulous motion like heavy thunder, causing the glass in the windows to rattle; the sound was so singular that it caused excitement and alarm, many supposing it an earthquake.* The stones as they fell near to observers produced a buzzing noise. When these falls occur during the night-time the body as it passes through the air emits a most brilliant light, accompanied frequently with emission of sparks and a long trail of light behind.

The general character of these bodies *of the stony variety* is (1) great variety in size, from that of a pea to many cubic feet; (2) irregularity of form, with rough and indented surfaces; (3) they are coated with a black crust or varnish, which doubtless arises from the fusion of the surface by the intense heat developed during the rapid passage through the atmosphere; (4) their specific gravity is between 3 and 4; (5) the minerals constituting the mass are principally of the class belonging to the pyroxenes and olivenes, always containing more or less metallic iron alloyed with nickel and cobalt. There are one or two meteorites supposed not to contain this metallic iron, but it is very doubtful if such be really the case. There are other minerals associated with them; the most interesting and constant are schreibersite (a phosphuret of iron and nickel) and triolite (a sulphuret of iron). A fragment of one of the Guernsey county meteorites gave for its composition—

	Per cent.
Olivene	56.884
Pyroxene	32.416
Nickeliferous iron	10.690
Schreibersite	.002
Triolite	.015

Iron Meteorites.—This class simply represents the metallic particles found in the stony meteorites, increased to several pounds and even tons in weight, as exemplified by the Cranborne iron in the British Museum or the Texas iron (of less weight) in the Yale College Museum. All of the irons that are known, except three or four, have been discovered some time after their fall, this not having been observed, their composition being the only guide as to their origin. There have, however, been three of them seen to fall, and these constitute the three most valuable specimens of this class. They are the following:

Agram	1751
Dickson co., Tenn	1835
Braunau	1847

The iron meteorites have the same irregular shape as the stony ones, with a specific gravity of 7 and 7.8, with a composition of which the three following irons are types:

	Tazewell, Tenn.	Oldham co., Ky.	San Gregorio, Mex.
Iron	84.10	91.61	95.01
Nickel	15.22	8.09	4.40
Cobalt	.43	.25	.51
Copper	.06	trace.	trace.
Phosphorus	.19	.05	.08

In the interior of these irons it is not uncommon to find nodules of sulphuret of iron, phosphuret of iron and nickel, and graphite. When polished the surface of the metal is very brilliant, and in some cases remains so; in others the surfaces are rapidly rusted from the effects of chlorine contained in some of them. If the polished surfaces of these irons are acted on by nitric acid, either alone or with a little hydrochloric acid, a number of angular figures, more or less delicately defined, are made apparent; and these are called Widmannstättian figures.

Origin of Meteorites.—Whence come these masses of stones and iron? It was at one time supposed that they originated in the atmosphere or were ejected from terrestrial volcanoes, but these crude notions have been long since exploded. Another theory, advanced by Terzago, and subsequently by La Place (adopted by Berzelius and others), and sustained in part by his mathematical calculations, is that they were projected from the moon. There are many points of plausibility connected with this theory, when modified by supposing that these bodies have not come directly to the earth from the moon, but may have been detached or projected from the moon many thousands of years before they became entangled in our atmosphere. The most formidable objection to the moon-theory is that the supposed velocity of some of them precludes the idea of their being satellitic fragments, their velocities being such as belong to planetary and even cometary bodies. About this question of velocity there is yet much that is obscure. The most commonly received theory is the one first promulgated by Chladni, who considered them as bodies, or fragments of bodies, revolving in space, that from time to time came near enough to the earth to be brought within its sphere of attraction. Some, adopting this theory, connect them intimately with comets. But whatever theory be adopted, it will be difficult as yet to reconcile any one of them to all the phenomena in connection with the physical character and chemical constitution of meteorites.

J. LAWRENCE SMITH.

Meteorological Instruments. See OBSERVATORY, METEOROLOGICAL.

Meteorol′ogy [Gr. μετεωρολογία], the science that treats of the earth's atmosphere and its relations to all the various features of the weather. A distinction is properly made between meteorology and climatology, in that the latter deals with the condition of the atmosphere at the surface of the dry land, in so far as it influences animal or vegetable life, while meteorology extends its scope to the whole atmosphere, over the ocean as well as over the land, at great as well as at small elevations, and deals with mechanical and physical problems that are foreign to climatology. It is true that only a generation ago our knowledge of meteorology was in fact but a knowledge of climatology, and most of our treatises on meteorology are necessarily chiefly occupied with climatology. There is, however, every prospect that a few years hence we shall be able to treat the phenomena of the atmosphere from a very comprehensive point of view, and, in fact, by a deductive rather than an inductive method.

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*The number of stones that fell must have exceeded 100; there were about 28 of them discovered, the largest weighing over 300 pounds.

In the excellent works of Kämtz (Halle and Leipsic, 1836), Schmid (Leipsic, 1860), Muhry (Leipsic and Heidelberg, 1856 and 1862), Blodgett (Philadelphia, 1860), Loomis (New York, 1868–74), Buchan (Edinburgh and London, 1868–75), Lorenz and Rothe (Vienna, 1874), and Mohn (Berlin, 1875), we find comprehensive reviews of the results of the great mass of observations that have been accumulating since the introduction of accurate methods and instruments. Referring to these works for the numerical details of these results, we shall in the present article briefly indicate the physical and mechanical explanations of the observed phenomena, and shall pursue, in fact, a semi-deductive mode of presentation of the subject.

Temperature and Moisture.—In dealing with the phenomena of the atmosphere deductively, we have to begin with the consideration of the density of the air, the inequalities of which are the direct cause of the general currents as well as of the local winds. Given the distribution of density, and the resulting currents of air should be deducible by the laws of mechanics. This density depends upon temperature, aqueous vapor, and pressure; of these, the first is the fundamental, and demands our first attention. The temperature may be regarded as regulated by, first, the radiation from the sun, subject to the absorption of such solar atmospheres or other envelopes as may exist; second, the absorption by the air of the heat radiated into it from the sun, either directly or after reflection from the earth or clouds; third, the radiation into space of the heat thus received from the sun; fourth, the mutual conversion of heat and molecular work. Taking these subjects up in this order, we note—first, that the amount of heat annually received from the sun is probably not constant, as has been indeed suspected since the time of Herschel. For the actual demonstration of its variability we are indebted to a number of physicists, of whom we need only mention especially Köppen, whose elaborate computations, based on the observations of temperature alone, are given in the *Journal of the Austrian Meteorological Society* for 1872. This author seems to have shown that the quantity of heat received increases and diminishes to a slight extent parallel with the increase and diminution of the solar spots. It follows, therefore, that there is a slight secular change, while other investigations, prominent among which may be mentioned those of Prof. S. P. Langley, show that there are also sensible hourly changes in the intensity of solar radiation. Neglecting these smaller changes, Sir William Thomson finds that the average quantity of heat received by the earth from the sun, as determined by Pouillet and Herschel, and converted by Joule's unit, is, for an area of one square foot exposed perpendicularly to the direction of the solar rays, 83 foot-pounds per second. This number relates to the heat received at the outer surface of our atmosphere. The quantity absorbed by the atmosphere will depend upon the chemical constitution or the mechanical purity of the atmosphere at that place, and upon the thickness of the stratum of air traversed by the solar rays; which thickness depends principally upon the latitude of the station and the apparent altitude of the sun above the horizon. For the latitude of Paris, from various measures made in different parts of the world (Pouillet and Desains in France, Leslie in England, Herschel in England and Southern Africa, Lambert and Erman in Germany), it may be concluded that on the driest clearest days 15, but on ordinary days 25 per cent. of the solar heat is absorbed by the atmosphere before the rays reach the earth, the sun being supposed in the zenith. A similar result has been reached with reference to the so-called visual rays (by Bouguer, Seidel, Zollner, Alvan Clark, and others), and also the chemical rays (by Vogel, Schall, Bunsen, Roscoe, and others). In accordance with modern ideas on this subject, it would be more proper to speak of the thermal, visual, and chemical effects of solar radiation than to speak of heat, visual, and actinic rays. The solar radiation, whether we consider its visual, thermal, or chemical effects, diminishes, as is known from experience and may be demonstrated by molecular mechanics, in a geometrical ratio as the thickness of the absorbent increases in an arithmetical ratio. It is therefore possible to express by a formula pretty approximately the law of diminution of the heat received from the sun with the increase of the zenith distance of that luminary. We give, therefore, in the second column of Table I. the numbers expressing the relative total radiation received by a unit of area of the surface of the earth at each ten degrees of latitude in the northern hemisphere on the average of an entire year, during which the sun has varied from a declination + 23° to one of — 23°, and back again, as calculated by Meech for the outer portion of the earth's atmosphere, and therefore unaffected by the absorption of the air. The numbers for the southern are very slightly greater than those for the northern hemisphere, but are not given by Meech:

TABLE I.

LATITUDE.	Total solar radiation received annually by a unit's surface of the earth; the atmosphere being—			Forbes's investigation.		
	Perfectly diathermanous.	At its maximum diathermicity.	At its average cloudiness.	Observed mean annual temperature.	Measured ratio of land to water.	Computed mean annual temperature.
— 40°	......	......	......	54.6°	0.040	55.5°
— 30	......	......	......	66.9	0.200	64.9
— 20	......	......	......	74.1	0.225	73.3
— 10	......	......	......	78.0	0.204	78.1
0	1.00	0.75	0.30	79.7	0.216	80.0
+ 10	0.99	0.74	0.29	79.9	0.234	79.6
20	0.94	0.71	0.28	77.5	0.308	76.6
30	0.88	0.64	0.26	69.8	0.434	69.4
40	0.79	0.55	0.22	56.5	0.445	58.0
50	0.68	0.49	0.20	42.5	0.563	43.0
60	0.57	0.37	0.15	29.8	0.568	27.5
70	0.47	0.26	0.10	16.4	0.483	16.5
80	0.43	0.16	0.06			
+ 90	0.42	0.08	0.03			

In the third column of the table we give the amounts of heat received at the corresponding latitudes upon the earth's surface as diminished by the absorption of the atmosphere, assuming the latter to have been throughout the year in a uniform state of maximum diathermancy. In the second column of the table Meech has taken complete account of the varying length of the day and altitude of the sun, as changing with the seasons; and the striking influence of the long summer days at the poles, in increasing the quantity of heat received there to a total comparable with that received at the polar circles, is quite apparent. By comparing the first and second columns it appears that of the total amount of heat received by the entire earth during the year from the sun, only about 0.66 reaches its surface, even on the assumption of a uniform cloudless sky. If, however, we consider that the average cloudiness of the entire globe is not far from six-tenths, it is evident that we must diminish the numbers given in the third column of our table to four-tenths of their present value, the result of which diminution is given in the fourth column, from which it appears that in the average condition of the atmosphere, so far as our observations have made it known to us, about $\frac{27}{100}$ths, or one-fourth of the solar radiation that is incident upon our atmosphere, actually reaches the surface of the ground. Of the work done by the $\frac{73}{100}$ths which is absorbed by the atmosphere, but little account has been taken, thus far, in meteorology. Doubtless, its most important function is the performance of molecular work—viz. the preservation in an invisible state of that aqueous vapor which, if allowed to condense into cloud, would cover the whole earth with a perpetual canopy of fog. Of the $\frac{27}{100}$ths that reach the earth's surface, we may consider that almost the whole of it penetrates the earth or water on which it falls, and is retained there for a greater or less period—some only for a fraction of a second, some for many days; in so doing we neglect the slight percentage that is specularly reflected from the land and from the water. Knowing as we do that the earth at the distance of a few feet below its surface maintains a uniform temperature, instead of becoming gradually warmer and warmer under the influence of the solar radiation, it becomes necessary to trace in general terms the process by which it is relieved of its continually increasing amount of heat; in this process the atmosphere acts as a carrier. A small portion of the heat received at the surface of the solid earth is, by conduction, conveyed toward the interior so long as the latter is cooler than the surface; the mathematical laws determining this conduction have been satisfactorily elucidated by Fourier and Poisson. The larger portion of the heat is, however, immediately (and the whole ultimately) given by radiation (as ultra red rays) back to the adjacent or lowest stratum of air, while a very sensible quantity is absorbed in various chemical and organic processes, of which those of principal importance to meteorology are the evaporation of water, ice, or snow and the development of vegetable growth. The radiative and conductive powers of the various components of the earth's surface are, however, not sufficient thus immediately to relieve the surface of *all* the heat received from the sun; the temperature of the soil consequently continues to increase, at least in clear weather, so long as the sun remains near the meridian. The surface of the earth therefore continues to warm up the lowest stratum of the atmosphere (aqueous vapor being, according to Tyndall, opaque to the ultra red rays) until a considerable time after the sun has passed the meridian, and until the combined amount of heat received at the surface, both from the sun and from the next lowest stratum in the earth, equals its own combined evaporative and radiative power. (The radiative power depends on the temperature of the adjacent air, and therefore on the mobility of the latter viewed as a convector.) The radiative and conductive powers of the components of the earth's surface are therefore a matter of great importance in deductive meteorology, and have been studied by numerous physicists, among whom we may mention Wells, Boussingault, Daniel, Poisson, Quetelet, Stone, Smyth, Schubler, Forbes, Helmersen, Pfaundler, etc. The general results of the investigations of Kämtz and Kupffer were graphically expressed by them in isogeotherms or lines of equal earth's surface temperature. Similar lines expressing the temperature of the surface of the ocean have been given by numerous authorities, especially the U. S. Coast Survey, the Netherlands Meteorological Institute, and the hydrographic bureaus of England, France, and the U. S.

The results of the processes of radiation which we have here sketched in general terms may be approximately said to be—(1) The land is warmed up more rapidly and cooled more rapidly than the ocean. (2) The air in contact with the land receives its heat more rapidly than that in contact with the ocean. (3) The air over the ocean or over fields of snow or over regions covered with heavy vegetation receives more moisture than that over the arid portions of the earth, other circumstances being the same. (4) Those portions of the lowest stratum of atmosphere which are specifically lighter, either from containing more moisture or more heat, are forced by the surrounding heavier gas to rise, in doing which they allow the neighboring air to flow in, producing winds or currents, while the rising lighter portions expand, thereby consuming a portion of their superabundant heat in molecular work, and losing a greater portion by radiation to the colder strata about them; which radiation goes on more rapidly in proportion as they ascend higher. (5) It is by the conductive process referred to in the last paragraph that it becomes possible for the heat received at the earth's surface to be dissipated into empty space; which dissipation is partially accomplished in one diurnal rotation of the earth, but more perfectly in one annual revolution, as is evident from the fact that the mean annual temperatures vary so slightly. (6) The total movement of the atmosphere as measured at the surface of the earth in units of force must, on the average of the year, be nearly equivalent to the mechanical equivalent of the total amount of heat received by the surface of the earth, or 45×10^{15} foot-pounds per second. (7) When over a given region the sun's direct heat is entirely or almost entirely withdrawn, and radiation from the earth's surface has continued to deplete its store of heat, until it is no longer able to heat up the lowest stratum of the superincumbent atmosphere to a temperature above that of neighboring regions, that layer of air ceases to have any buoyant power, and remains lying quietly on the earth's surface; which quiescence, however, does not hinder the transmission through it of radiations from the surface of the earth. This may continue to an indefinite extent, or at least until an equilibrium is established between the temperature of the ground and the temperature of the entire mass of air above it. Such an equilibrium is, however, scarcely attainable except at very low readings of the thermometer; and long before this point is reached it usually happens either that the sun rises or that either dew or hoar-frost forms on the surface of the ground, or else fog forms in the air immediately above, or, more frequently still, layers of strati or cirri cloud form in the higher atmosphere. In either of these latter cases the fog or cloud, acting as a covering to the earth's surface, neutralizes any further radiation therefrom; which radiation is then confined to the upper surface of the fog or cloud. (8) The capability of the earth and atmosphere at any season or any place to convey away the heat received by them is approximately shown by the interval elapsing after noon at which the maximum of the temperature takes place, and by the range between the maximum temperature of the afternoon and the minimum temperature in the morning; or, still better, by the interval of time elapsing between such maximum and minimum. (9) The study of local winds is thus seen to be a mechanical problem whose data are local topography, etc. Thus, for example, stations near the seashore or near mountains experience a diurnal change in the force of the wind, the strongest winds being experienced in the afternoon, with opposite winds in the early morning, and periods of calm between. In connection with local winds, local storms are to be classed, and indeed all the minor atmospheric peculiarities that constitute the climate of any locality. Local storms may be due either to topographical peculiarities, or to the intense uprising currents of midday, or to the rapid radiation at night-time, or to a combination of all these causes. The effects of rapidly uprising currents, the consequent cooling, the formation of cloud and hail, etc., have been happily developed by Espy, Hirn, Peslin, Reye, Thompson, Hann, etc. The laws according to which a mass of air cools as it ascends—so far, at least, as that cooling is due to the mechanical absorption of heat—have been developed by these writers from the principles established by Clausius and others, and are represented in Table II., as given by Hann:

Table II.—*Diminution of Temperature, in fractions of a degree Centigrade, experienced by a mass of Saturated Air in ascending through 100 mètres.*

Initial.		Initial temperatures.				
Pressure, milli-mètres.	Approx. altitude, mètres.	− 10° C.	0° C.	+ 10° C.	+ 20° C.	+ 30° C.
760	20	0.76°	0.63°	0.54°	0.45°	0.38°
700	680	.74	.62	.53	.44	.37
600	1,910	.71	.58	.49	.40	
500	3,360	.68	.55	.46	.38	
400	5,150	.63	.50	.42		
300	7,430	.57	.44			
200	10,670	.49	.38			

This, however, takes no account of the radiation of heat from this same mass of air. Some of the effects of the radiation of heat in the upper strata of the atmosphere have been forcibly set forth by Faye, who has shown that the air thus cooled by radiation need not, in its descent to the earth, necessarily become sensibly warmer, as most of the previous writers on this subject had supposed, but may retain its low degree of temperature under certain circumstances, thus giving rise to the streams of cold air that pour down the sides of mountains, and that generally also attend tornadoes and thunderstorms. (10) The study of the general currents of the atmosphere is a similar problem, whose data are the general orography of the earth and the general distribution of clouds, moisture, and temperature: in this connection also must be studied the general or extensive storms that sweep over the earth's surface. For the study of the general atmospheric currents the average distribution of the temperature in the lower stratum of the air is the fundamental desideratum: it may be approximately deduced from the considerations of the previous articles, and has been graphically given by the isothermal lines of Humboldt, Dove, Buchan, Hennessy,[*] and others, which represent graphically the results of actual observations with all possible minuteness. Others have, however, very approximately expressed some of these results in convenient mathematical formulæ. First, Brewster showed that the mean annual temperature of stations on any parallel was for the northern hemisphere pretty closely expressed by the formula $T = +81.5^\circ \cos L$. Sartorius has, with considerable critical skill, given us an approximate view of what the distribution of temperature probably would be in case the earth's surface were all water or all land; his memoir is known to me only through a review thereof. His methods of investigation seem to be similar to those of Forbes, who in an interesting memoir has shown that the annual average temperature of the lower stratum of air may be closely represented on Fahrenheit's scale by the formula $T = 12.5^\circ + 59.2^\circ \cos \frac{5}{4}L + 38.1^\circ \lambda \cos 2L$, where L represents the latitude, and λ the ratio of land to water as measured around the entire globe on the respective parallels of latitude. The remarkable agreement of this formula with observation is shown in Table I., where we have given the observed temperatures and measured land ratio, together with the results of Forbes's computations. By the aid of such considerations and such formulæ as these we should be able by means of the laws of dynamics to deduce the general movements of the atmosphere; which subject we will now take up.

The Movements of the Air.—Were the earth or air perfectly quiescent, meteorological phenomena would be reduced to the most absolute uniformity; the variations introduced by the movements of the air, as primarily due to the varying densities of its various parts, and as affected by the rotation of the earth, constitute the most prominent phenomena of the weather. The influence of the rotation of the earth has, since the enunciation by Hadley (1735) of his theory of the trade-winds, been more or less imperfectly taken into account by numerous writers; more recently the memoirs of Poisson, and the discussions that took place at the Paris Academy of Science subsequent to the exhibition of Foucault's pendulum experiment (see Paris *Comptes Rendus*, 1859–61) and the publications of Prof. James Thomson (1857), Peslin (1868), Colding (1868), Everett (1871), have more fully elucidated the subject. But both in respect to priority and in fulness of detail, as well as in the comprehensiveness of their scope, the works of Prof. William Ferrel of Washington are pre-eminent, and especially worthy of our attention, as they have served to establish on a firm foundation the dynamics of meteorology. According to this mathematician (*Nashville Journal of Medicine and Surgery*, vol. i. p. 291, Nashville, 1856), "There are four principal forces which must be taken into account in a correct theory of the winds. The first arises from the greater specific gravity of the atmosphere in some places than others, on account of its condition as to temperature and the dew-point; for when it becomes heated in any place or charged with vapor to a greater degree than at others, it becomes specifically lighter; hence the equilibrium is destroyed; there is a flowing together there of the heavier air on all sides, which displaces the lighter air, and causes it to rise up and to flow out in a contrary direction. This is the *primum mobile* of the winds, and all the other forces concerned are dependent upon it for their efficiency. A second force arises from the tendency which the atmosphere has, under the influence of gravity, when from any cause it has risen above the general level, to flow to places of a lower level. These two preceding forces generally produce counter-currents. Again, when from any cause a particle of air has been put in motion toward the N. or S., the combination of this motion with the rotatory motion of the earth produces a third force, which causes a deflection of the motion to the E. when this motion is toward the N., and a deflection to the W. when it is toward the S. This is the same as one of the forces contained in La Place's general equations of the tides, the analytical expression of which is $2\sin l\cos l n u r$; l being the latitude, n the motion of the earth at the equator, u the velocity of the particle N. or S., and r the radius of the earth. The fourth and last force arises from the combination of a relative E. or W. motion of the atmosphere with the rotatory motion of the earth. In consequence of the atmosphere's revolving on a common axis with that of the earth, each particle is impressed with a centrifugal force, which, being resolved into a vertical and a horizontal force, the latter causes it to assume a spheroidal form conforming to the figure of the earth. But if the rotatory motion of any part of the atmosphere is greater than that of the surface of the earth—or, in other words, if any part of the atmosphere has a relative easterly motion with regard to the earth's surface—this force is increased, and if it has a relative westerly motion, it is diminished; and this difference gives rise to a disturbing force which prevents the atmosphere's being in a state of equilibrium with a figure conforming to that of the earth's surface, but causes an accumulation of the atmosphere at certain latitudes, and a depression at others; and the consequent difference in the pressures of the atmosphere at these latitudes very materially influence its motions. This force is also expressed by one of the terms of La Place's equations, the analytical expression of which is $2\sin l n v r$; v being the relative eastern or western velocity of the atmosphere."

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[*] Prof. Hennessy's synthermal lines are in *Trans. R. Irish Acad.*, vol. xxiv.

The third and fourth forces enumerated in this extract from Mr. Ferrel's first publication on the subject admit of being compounded together, so as to be represented by one expression, which is defined as follows (Ferrel's *Motion of Fluids and Solids relative to the Earth's Surface*, in Runkle's *Mathematical Monthly*, 1859–60): "Whatever direction a body moves on the surface of the earth, there is a force arising from the earth's rotation which deflects it to the right in the northern hemisphere, but to the left in the southern. This deflecting force is represented by the expression $2nv\cos\theta$." The influence of this deflecting force, although imperfectly understood by Hadley, was rightly applied by La Place, Poisson, Poncelet, Foucault, and others to the problems treated by them; but on account of its importance in meteorology, and its fruitful applications by Ferrel, it has, with some propriety, been called "Ferrel's law." By careful deductive treatment of his general mechanical formulæ in the memoir last referred to, Ferrel shows that if there were absolutely no friction between the earth and the wind, or between the particles of the air itself, it would follow that the atmosphere, "however deep it may be at the equator, cannot exist at the poles; and the exterior surface of the atmosphere would be slightly depressed at the equator, and have its maximum height about the parallel of 35°, and meet the surface of the earth near the poles. At the latitude of maximum height the atmosphere would have no motion E. or W.; between the parallels of 35° and the poles the motion would be eastward, but between those parallels and the equator it would be toward the W." If, now, we suppose a uniform coefficient of friction, we have to consider that, as there can be no resistance until there is motion, "the atmosphere must have a tendency to assume in some measure the same motions and figures as in the case of no resistances. Hence, toward the poles the general motion of the atmosphere must be toward the E., and in the torrid zone toward the W. There must also be a comparatively small depression at the poles and at the equator. There must be a region of calms about the poles, and a belt of calms at the equator. The belt of calms which, in the case of no friction, would exist at the parallels of 35°, would be moved toward the equator N. of the parallel of 30°. The less friction of air moving over air than over the earth causes an additional accumulation of atmosphere at the tropical belts, the outflow of which, combined with the westerly and easterly motions of the atmosphere, gives rise to the fresh N. E. trade-winds of the northern hemisphere, and to the S. W. surface-currents of the temperate zone." This assumption of a uniform frictional resistance over the entire earth is, however, but a very rough approximation to the actual condition of the surface of the globe, on which we find a greater quantity of land, and consequently greater resistances to motion of the air, in the northern than in the southern hemisphere. Consequently, "the eastward motion of the air upon which the deflecting force depends is in the northern hemisphere much less, and therefore the more rapid motions of the southern hemisphere cause a greater depression there, and a greater part of the atmosphere to be thrown into the northern hemisphere." This also accounts for the mean position of the equatorial calm-belt being in general a little N. of the equator. But in the Pacific Ocean, where there is nearly as much water N. of the equator as S., the position of the calm-belt nearly coincides with the equator. For the same reason, the tropical calm-belt of the northern hemisphere is farther from the equator than that of the southern hemisphere; and, on account of the irregular distribution of the land and water of the two hemispheres in different longitudes, this belt does not coincide throughout its whole extent with any parallel of latitude. In the longitude of Asia, where there is all land in the northern hemisphere and the Indian Ocean in the southern, this belt, which is also the dividing-line which separates the winds which blow E. from those which blow W., is farther from the equator than at any other place, as shown by Prof. Coffin's charts of the winds.

"In winter the difference of temperature between the equator and the poles upon which the disturbance of the atmosphere depends is much greater than in summer; this causes the eastward motion of the atmosphere in either hemisphere during its winter to be greater, while in the other hemisphere it is less. Hence, a portion of the volume of the atmosphere in winter is thrown into the other hemisphere; but although the volume or height of the atmosphere is then less, yet, being more dense, the barometric pressure remains nearly the same. The difference at Paris, and in the middle latitudes generally, between winter and summer, is only about one-tenth of an inch. On account of this alternate change with the seasons of the velocity of the eastward motion of the atmosphere in the two hemispheres, the equatorial and tropical calm-belts change their positions a little, moving N. during our spring, and S. in the fall." (*American Journal of Science*, 1861, vol. xxxi. p. 31.)

The subdivision of each hemisphere into continental and oceanic areas introduces further complications into the systems of winds and pressures; thus, for instance, over the N. Atlantic and N. Pacific oceans the regions of maximum pressure and of calms lie to the southward of the corresponding regions over the continents. Moreover, the belts of maximum pressure are most clearly perceived when the movements of the air meet with the least resistance. They are, therefore, in both hemispheres, pushed over to the eastern sides of the oceans. The general movements of the air, as thus deduced by Mr. Ferrel from the laws of mechanics, are in singularly close accordance with the general results of observations, as may be seen by a study of the maps published by Coffin, Buchan, the British admiralty, etc. In respect to the historical development of our knowledge upon this subject, as based upon observations, we note that the diminution of pressure in the equatorial regions, and the excess near the tropics, were first clearly brought to light by Capt. Wilkes, and almost simultaneously by Schouw, who first gave a very complete table of average barometric pressure at some forty stations in the northern and southern hemispheres. The existence of a slight easterly movement of the atmosphere in the polar regions of the earth was first established by Coffin in his *Winds of the Northern Hemisphere* (Washington, 1853), where he states that "between the parallels of latitude 60° and 66° in the northern hemispheres there appears to be a belt of easterly and north-easterly winds, while farther N. the mean direction of the wind in the arctic regions of North America is about nearly N. W."

Equally successful has been the application by Mr. Ferrel of his analytical formulæ to the study of storms. Since all moving bodies deflect to the $\left\{\begin{matrix}\text{right}\\ \text{left}\end{matrix}\right\}$ in the $\left\{\begin{matrix}\text{northern}\\ \text{southern}\end{matrix}\right\}$ hemisphere, it follows that all extensive storms will exhibit a rotation around a central region in the $\left\{\begin{matrix}\text{negative}\\ \text{positive}\end{matrix}\right\}$ direction. The additional centrifugal force thus introduced produces a diminution of pressure in the central regions of the storm, which is quite satisfactorily given by a remarkable relation between the wind and the barometric gradient first published by Ferrel in June, 1874. (See *American Journal Science*, 1875.)

It is not possible in this brief introduction to deductive meteorology to detail the laws partly belonging to mechanics and partly to molecular physics that lead to the minor phenomena of diurnal barometric variations, formation of rain and snow, etc. Equally difficult would it be to give here any satisfactory account of the methods, partly philosophical, but principally empirical, by means of which the information given daily on the synoptic weather-maps of Europe and America is made available for the prediction of the weather twelve or twenty-four hours in advance.

CLEVELAND ABBE.

Me'teors. The word *meteor*, from the Greek μετέωρος, means a "thing in the air" or "above the ground." It has been used to denote many different objects and phenomena, generally of short duration, that have their place in the atmosphere. Thus, there are *aërial meteors*, as winds, tornadoes, etc.; *aqueous meteors*, as fogs, rain, snow, hail, etc.; *luminous meteors*, or those due to the action on light of elements in the air, as rainbows, halos, parhelias, mirages, etc.; *electrical meteors*, as lightnings, auroras, etc.; and *igneous meteors*, as shooting or falling stars, star-showers, bolides or fireballs, aërolites or meteorites, etc. In present usage the term *meteor* is generally limited to the last group, or to the igneous meteors.

Upon any clear night a person looking upward will from time to time see a bright starlike point of light appear in the sky, move rapidly several degrees in a right line across the heavens, and as suddenly disappear, the whole flight lasting usually only a fraction of a second. This is a *shooting* or *falling star*. On certain nights these shooting stars have been seen in immense numbers. Thus, on the morning of Nov. 13, 1833, they came so thickly as to be described as a fiery snowstorm. On Nov. 12, 1799, Nov. 13, 1832, Nov. 14, 1866, Nov. 14, 1867, Nov. 14, 1868, Apr. 4, 1095, Oct. 24, 1366, Nov. 27, 1872, and on many other nights that could be named, they came by thousands. On the night of Aug. 10–11 of every year three or four times the usual number are to be seen. The brighter of these displays are called *star-showers*.

Varieties of Meteors.—The shooting stars are of all degrees of brightness. Some are so faint that one looking at them cannot be certain that he sees anything, and some are visible only in a telescope. Others may be brighter than the planets, or even than the moon. These are called *bolides* or *fireballs*, or by older writers *flying dragons*. Sometimes they are seen in full daylight. The larger fireballs often explode into fragments, the parts chasing one another across the sky or scattering in different directions. In some cases terrific explosions, as of distant and numerous cannon, are heard over all the region a few minutes after the disappearance of the body. These are called *detonating meteors*. At times from these detonating meteors come down stony fragments, scattering themselves over a region miles in extent, and usually striking the ground with enough force to bury themselves in soft earth one or two feet. These fragments are called *aërolites* or *meteorites*. All these igneous meteors have, it is believed, a similar origin and character, though they differ in size, in color, in brightness, in chemical composition, etc.

Height.—By observers near each other the track of a shooting star is seen in the same part of the heavens. But when two observers see the same track from two stations 50 or 100 miles apart, it appears in different parts of the sky. Hence the actual altitude can be determined. It is found that they are not seen higher than about 100 miles from the earth, and they rarely come lower than 30 miles unless they send down fragments. While they are thus very far above the region of clouds, they are still more distinct in place from all other astronomical phenomena, excepting, perhaps, the auroras and twilight.

Numbers.—Shooting stars are seen on any clear, moonless night. One person would on the average see not less than eight per hour, but the number increases through the night, so that about three times as many can be seen just before dawn as in the evening hours. A large group watching together can see five or six times as many as one person, or an average, at midnight, of 40 or 50 per hour.

Trains.—Many of the shooting stars leave behind them a bright cloud of phosphorescent light. Often this disappears in a fraction of a second or in two or three seconds. Not unfrequently, however, a bright one leaves in its path a narrow bar of light several degrees long. This contracts in length and broadens, sometimes changing into a small round cloud, which slowly floats away. But usually it retains its elongated form, and after a fraction of a minute is seen to lose its straightness. If it lasts several minutes, the cloud gets twisted forms, the result, no doubt, of winds in the upper air and of currents produced by the meteor itself. One such train the writer saw during 45 minutes, and they have been reported as lasting more than an hour.

Color.—The meteors and their trains have various colors —white, green, blue, yellow, scarlet, etc. Those which are seen on Nov. 13 of various years leave a bluish train. The body and train of a large meteor may give in its various parts all these colors.

Duration of Flight.—The duration of the flight is generally less than a second of time, but the brighter ones may last several seconds. The fireball of July 20, 1860, was in sight over half a minute, which was, however, an extreme instance, for its path was very long. It was first seen over the State of Michigan, and last seen when it was 200 or 300 miles E. of New York City.

Velocity.—Some meteors move through the air as slow as 8 or 10 miles, and some as fast as 40 or more miles, a second. The mean velocity is about 30 miles a second, more than 100 times that of a cannon-ball.

Density.—The stony meteorites are solid. The same is true, also, of all the smaller meteors; for some of them are seen to split into fragments; some are seen to describe curved lines, or to glance in the air like stones on water, or on hitting a hard body. Small agglomerations of gas, moreover, could not retain their integrity during their travels so as to enter the air like shooting stars.

Shape.—The stony meteorites have in general the shape of broken fragments of stone. The outside is usually covered with a thin black crust, which is evidently due to a melting of the surface in the atmosphere. The stones have often a peculiar shape, as though a broken surface had been melted to a small depth. The occasional glancing of the shooting stars implies that the same irregular shape sometimes, if not always, belongs to the small meteors.

Meteoric Irons.—There have been found at various times and places loose iron masses that are assumed to be of meteoric origin, because their peculiar form, their peculiar chemical composition, and their peculiar crystalline structure are like those of the iron masses that have been seen in several instances to come down from meteors.

Actual Size.—There was a fall of meteorites in Iowa on Feb. 12, 1875, from which many fragments, in all not less than 500 pounds in weight, were secured. Iron masses assumed to be of meteoric origin are known to exist which weigh many tons, and it may be readily believed that the larger detonating and stone-producing meteors are, when they enter the air, as large as these irons. On the other hand, the smallest shooting stars, especially the telescopic ones, are probably not greater than small pebbles or grains of coarse sand. The apparent size of all meteors is magnified by the surrounding flame and by irradiation, and does not therefore indicate the real size of the meteoric body.

Fracture in the Air.—The meteorites coming from a single meteor must before entering the air have been in close company, and were probably coherent. The resistance of the air, and the consequent sudden heating of the body, whose temperature must equal that of space, are sufficient causes for breaking the body into fragments. At the close of the flight these fragments are usually distributed over areas miles in extent. Upon them we often find evidences of successive fractures. One surface may show by its smooth form continued melting. On an adjacent surface may be an accumulation of melted matter, with clear evidence on its margin of its having come from the other side. Another surface may show a mere accumulation of melted matter, while its own material is not changed. Another surface may be more or less browned as with smoke, with some or all of its margins exhibiting a delicate rounding of the black crust of the adjacent surfaces, showing the fracture to have taken place while the crust was soft. Still other surfaces are so slightly discolored that it is impossible to decide whether the fracture may not even have been subsequent to the fall, while numerous cracks extending into the stony mass show that the disintegration was still in progress. All these peculiarities are shown in some Iowa meteorites that fell Feb. 12, 1875, and which are now before me. This breaking is shown peculiarly by the fragments of a meteor that fell in India in 1861, which were picked up at places three or four miles apart, and which fit to one another. Moreover, some of the fitting surfaces had the usual black crust, while others were unaltered. A large meteor seen through a telescope by Schmidt at Athens in 1863 was made up of a large number of smaller meteors, which, however, to the naked eye seemed to be a single fireball.

Structure of the Meteorites.—The meteorites contain no elements, so far as we know, which have not been found on the earth. But these elements are compounded differently from any terrestrial minerals. Iron is always present, usually in metallic form and combined with nickel. The stones from different meteors differ much in their structure, though they may be grouped in a few well-marked classes. In general, the meteorites resemble the igneous more than the other rocks of the earth's crust. The iron masses have a crystalline structure, which is revealed by polishing a surface and etching it with acid. The lines developed by the acid are called the *Widmannstätten figures.*

Gases in the Meteorites.—If fine chips of meteoric iron, or powdered fragments of the stony meteorites, be placed in a vacuum and then heated moderately, they yield up gases consisting of oxygen, carbon, hydrogen, and nitrogen. These gases seem to have been absorbed at some former time by the meteor, probably by the iron of the meteor. The spectrum of these gases corresponds to the spectrum of the light of a comet's coma and tail.

Chemical Constitution.—For the chemical components and the minerals in meteorites and meteoric irons, see METEORITES.

The Meteors are Astronomical Phenomena.—It is now universally admitted by astronomers that igneous meteors are caused by small bodies which have been travelling about the sun in their orbits, but now come into the earth's atmosphere, and, in general, burn up. These bodies before they come into the air are called *meteoroids.*

Star-shower of Nov. 13.—On the morning of Nov. 13, 1833, from about 3 o'clock till daylight, large numbers of shooting stars were seen throughout the western hemisphere. The very important fact was noticed that wherever the observer might be, the paths of the meteors across the sky were always directed from a point in the constellation Leo, and that this point kept its place among the stars notwithstanding the earth's rotation. This fact could be explained only by assuming that the paths of the meteors through the air were parallel to each other, and were directed from the constellation Leo; also that the meteors were of cosmical not of terrestrial origin. Further research established that there had been star-showers on the following earlier dates:

Nov. 13, 1832;
" 12, 1799;
" 9, 1698;
Oct. 28, 1602 (O. S.);
" 25, 1533 "
" 23, 1366 "

Oct. 19, 1202 (O. S.);
" 17, 1101 "
" 15, 1002 "
" 14, 934 "
" 15, 931 "
" 13, 902 "

These dates show a cycle of about 33 years, with a change of date of about three days in a century, the apparent change of twelve days in the seventeenth century being due in the main to the difference between old and new style. The cycle, the change of date, and the radiation all implied that the meteors belonged to a group of bodies revolving about the sun in similar elliptic orbits. It was also found that only five possible orbits could explain the cycle and the radiation, and that one, and only one, of these explains the change of date. This is an orbit whose period is $33\frac{1}{4}$ years, inclination 17° 45′, eccentricity about $\frac{9}{10}$, and motion retrograde. According to expectation, the meteors appeared again in thousands on the morning of Nov. 14 in 1866, 1867, and 1868.

Comet 1866^1.—A comet passed its perihelion in Jan., 1866, which has an orbit very nearly identical with the common orbit of the meteors as thus determined. In fact, the comet is travelling with the group, and near the head of it.

Comets 1366.—A star-shower occurred in Oct., 1366. Two or three days afterward a comet appeared in the northern heavens, and travelled along the track of the meteors. A week later a second comet followed along the same path. Probably both were members of the group.

Dimensions of the Leonid Meteor Stream.—These meteors, because of their radiation from the constellation Leo, are called *Leonids.* The denser part of the stream of meteors is traversed by the earth in from one to three hours, which implies an actual thickness of 20,000 to 50,000 miles. It takes three or four years for the stream to pass the node, which implies a length of many hundreds of millions of miles. The breadth in its own plane is unknown. The numbers seen per minute in the middle of the brighter of these star-showers imply that the meteoroids have in the centre of the stream, as they travel through space, a mean distance from their near neighbors of from 25 to 50 miles.

The August Meteors and Comet 1862^3.—There are shooting stars every year on Aug. 9–12, numbering on the morning of the 10th or 11th 200 or 300 per hour for four observers with a clear moonless sky. They radiate from the constellation Perseus, and are hence called *Perseids.* The comet 1862^3 has an orbit that very nearly cuts the earth's orbit at the point where the earth is on the 10th of August. If a stream of meteoroids were moving with this comet, as the Leonids move with comet 1866^1, they would appear like the Perseids, the radiant being in the same place in Perseus. Hence, it is reasonable to assume that the Perseids and comet 1862^3 have like orbits.

The Biela Comets and the Andromedes.—A comet of short period, making three circuits in 20 years, was discovered in 1772, and observed in 1805, 1826, 1832, 1845, and 1852. In 1845 it was seen to be separated into two parts, about 150,000 miles from each other. In 1852 the two comets were about 1,200,000 miles from each other. Since that time they have never been seen. The earth's orbit came very close to the comet's orbit, the earth crossing the comet's path at first early in December, but afterward, owing to the action of Jupiter on the comet, late in November. Shooting stars were seen in considerable numbers Dec. 7, 1798, and Dec. 8, 1838, and at the latter time were observed to radiate from Andromeda; they are hence called *Andromedes.* From this same point in the sky any meteoroids travelling along the orbit of the Biela comets, and coming into the air, would be seen to radiate. On Nov. 24 and 27, 1872, large numbers of Andromedes were seen in Europe and America, forming on the latter date a star-shower of the most brilliant character. Immediately after the shower a comet was seen in the part of the heavens directly opposite to Andromeda, apparently moving away from the earth. This comet, though it was not one of the two main fragments of the Biela comet, nor yet was what the earth had just passed through, is supposed to be travelling with the Andromeda meteoroids along the orbit of Biela's comet. The whole forms a stream, more or less intermittent, hundreds of millions of miles in length.

The April Meteors and Comet 1861^1.—Shooting stars in large numbers have been observed in certain years on the 20th of April, radiating from a point in the constellation Lyra. They are hence called *Lyriads.* They seem to be connected with the comet 1861^1, in the same way as the star-showers with the comets already described. Brilliant displays of shooting stars were seen in China on this day B. C. 687 and B. C. 15, and in Europe A. D. 1095 and A. D. 1122, which probably were Lyriad meteors.

Other Meteor-streams and Sporadic Meteors.—Shooting stars are seen every clear night. An attempt has been made to separate these sporadic meteors into meteor-streams other than the three named above. About 200 radiants have been named by observers as more or less probable. Some of these will no doubt be found to be connected with comets, while some are probably not real.

Numbers of Sporadic Meteors.—By considering the number of meteors visible each hour, their distribution over the sky, and the average relative velocity of the meteoroids in space—all of which can be determined with a certain degree of accuracy—we find that there are in the region through which the earth is travelling 10,000 or 15,000 meteoroids in each volume of the size of earth. In other words, each meteoroid that would, in coming into the air, under favorable circumstances, furnish a meteor-track visible to the naked eye, occupies an average space equal to a cube whose edge is 200 or 300 miles. The number of the meteoroids that enter the atmosphere daily is not less than 10,000,000. If we include those smaller meteors which are seen only in the telescope, that number may be multiplied twenty or forty fold.

Theory of the Meteors.—We may then regard the meteoroid as a small solid body describing its long elliptic orbit about the sun, like any comet. The number of such small bodies is so great that every day many millions of them come within 4000 miles of the earth's centre, the number being but little increased by the earth's attraction. They are entirely invisible until, at a height of less than 100 miles from the ground, they enter air dense enough to resist their motion and create light. The air being compressible, an intense heat is developed directly in front of the body. The anterior surface is in consequence melted away, the melted matter being wiped off by the air. This streams back, forming in part the apparent flame and the train of the meteor. Its own firmer constitution prevents the meteorite from like condensation and internal heating, and it therefore proceeds many miles before it is entirely destroyed. Under favorable circumstances of velocity, chemical and mechanical constitution, and size the meteoroid is not entirely scattered, but, breaking up into fragments, comes to the ground in a shower of stones. These stones often show traces of the flow of melted matter, also evidences of successive fractures, and even the partially-developed cracks which with further action would have become fractures. But for this action of the air in arresting and destroying the meteoroids, we should be intolerably pelted with them. The meteorites are all evidently fragments, not separate formations. They are in the heavens, to some extent at least, grouped in streams along the orbits of known comets, and hence have some common origin with them. The continuity of these streams, the double and multiple character of Biela's and other comets, and the steady diminution of comets in brilliancy at successive returns, seem to argue a continuous breaking up of the comet into fragments by some cause—probably by the sun's heat. This view is strengthened by the fact that the meteoric irons and stones bring with them carbonic acid, which is known to form so prominent a part of the comet's tail. The meteoroids, however, are not constituents of either the comet's coma or its tail.

Literature.—The literature of this subject is quite extensive. I would specially refer to the various articles in the *American Journal of Science*, in the *Astronomische Nachrichten*, in the *Monthly Notices* of the Royal Astronomical Society, and to the annual reports of the Luminous Meteor committee of the British Association for the Advancement of Science; also, to the following separate works: Schiaperelli, *Note e Riflessioni sulla Teoria astronomica delle Stelle cadenti* (Florence, 1867), or its German translation by Boguslawski (Stettin, 1871), Kirkwood, *Meteoric Astronomy* (Philadelphia, 1867), and *Comets and Meteors* (Philadelphia, 1873). H. A. NEWTON.

Meter, Gas. See GAS-LIGHTING.

Meter, Water. See WATER METER.

Meteyard (ELIZA), better known as "Silverpen," b. in Liverpool, England, June 21, 1822; became well known as a contributor to the magazines edited by Hood, Eliza Cook, and Douglas Jerrold, in which she wrote principally upon social and sanitary reforms and upon antiquarian subjects. Her most elaborate and valuable work is the *Life of Josiah Wedgwood* (2 vols., 1865–66), which was supplemented by *Records of the Younger Wedgwoods and their Friends, embracing the History of the Discovery of Photography and a Fac-simile of the First Photograph* (1871). D. Apr. 7, 1879.

Meth'odism. The title "Methodists" was applied to Wesley and some of his Oxford associates not in derision, but as expressive of the regularity of their religious habits, especially their punctual devotion to the ritualistic services of the Church, for the Oxford "Holy Club," as they were otherwise called, were not only extremely "High Church," but exceedingly "ritualistic." They were distinctively the "ritualistic party" of their day, notwithstanding the very simple practical character and comparative disregard for ritualism which the Methodistic movement subsequently assumed. The little society, begun in 1729, grew slowly, and consisted in its sixth year of only fourteen members, the most memorable of them being John and Charles Wesley and George Whitefield. (See WESLEY.) The departure of the Wesleys to America terminated the history of the "Oxford Methodists" and the existence of the "Holy Club." The return of the two brothers to England, however, revived the denominational epithet, for by the next year (1739) they and Whitefield had spread a religious sensation over much of the United Kingdom. They were excluded from the pulpits of the national Church, and had to preach in the open air, and in many places they and their adherents were denied the Eucharist at the church altars. They were therefore compelled to unite their followers in "societies," to give them the sacraments, and provide for them places of assembling and worship. The year 1739 is considered the true epoch of Methodism. In that year Wesley began the erection of his first chapel at Bristol, opened his famous "Old Foundry" in London, and formed in the latter city his first "society," which he says (in the introduction to his *General Rules*) was the "rise of the UNITED SOCIETY"—that is to say, of organized Methodism. In the same year "bands" were formed, for the first time, in the city of Bristol, and it is the date of the first publication by the brothers of their *Hymns and Sacred Poems*, the beginning of that Methodistic psalmody which has spread over most of the Protestant world, and which has been the chief liturgy of the denomination.

Thus had the "great Methodistic movement" commenced. It soon extended over Great Britain and into Ireland. Additional "societies" were continually formed; *General Rules* were prepared for them by John and Charles Wesley jointly. These "Rules" are the recognized "terms of membership" throughout the Methodist communion, and they expressly declare that no other "condition" than such as they define "is previously required of those who desire admission to these societies." They are singularly liberal, being "remarkable," says a Methodist writer, "as containing not a single dogmatic condition of communion." They are thoroughly practical, requiring as the "only condition" "a desire to flee the wrath to come and be saved from sin," and the exemplification of this desire, first, by the avoidance of certain specified vices; secondly, "the doing good of every possible sort, and as far as possible, to all men," especially in certain specified respects. Wesley, though at first, as he acknowledges, a "High Churchman," and as strict a "ritualist" as the Anglican Church possessed in his day, had now become one of the most charitable of men. Throughout the remainder of his life he refers often to the liberality of the terms of membership in his societies, and demands of all good men the sacrifice of sectarian bigotry and co-operation in practical religion. Though he now formed "societies," not churches technically or strictly considered, yet when, many years later, he prepared a form of organization for the Methodist Episcopal Church in the U. S., he still retained the *General Rules* as presenting the only condition of membership, and inserted in a separate part of the book the Anglican Articles, not as an obligatory symbol to be virtually subscribed, but as a merely indicative standard of the best theological opinions. Members of the Church were to be amenable not so much for their individual opinions as for making strife and trouble in the denomination by them. It cannot be questioned that John Wesley was not only immeasurably in advance of his own age, but also far in advance of ours in "evangelical liberality."

The societies rapidly increased. Wesley and his few clerical coadjutors flew, it may be said, over the realm, preaching daily. They were soon compelled to organize more thoroughly their converts if they would not labor in vain. The societies were therefore divided into "classes" of about twelve persons each, and placed under the inspection of select "leaders." They met weekly, sang, prayed, and related their Christian experience. The "class meeting" has since been the germ of almost every Methodist church in the world. Each member contributed a penny a week and a shilling a quarter for the support of the cause, and thence arose the whole financial system of Methodism. The clerical laborers could not supply the increasing local societies; laymen of natural talents were therefore recognized, first as "exhorters," and then as "local preachers," to conduct their public services in the absence of their clerical guides. Wesley soon called out some of his ablest "local preachers" into the general field, to travel and preach continually, like himself, his brother, and Whitefield; and thence arose the lay *itinerant ministry*—one of the greatest facts in the history of the Methodist movement throughout the world. To give regularity to the labors of these lay evangelists, they were assigned to different sections of the country; thence came the famous Methodist "circuit"—of incalculable service, especially in the early frontier settlements of the New World, for it sometimes put under the regular ministrations of one or two "itinerants" parishes 500 miles in extent. Over a given number of these circuit preachers presided a select itinerant, and thence arose the "district," with its "presiding elder" in America, its "chairman" in England. This officer assembled the preachers and other "official members" of each circuit four times a year, for the better regulation of their work; thence arose the "quarterly conference;" a similar gathering from all the circuits of a district constituted the "district conference;" the yearly gathering of all the preachers of all the districts, for the revision of their entire work and its redistribution for the ensuing year, made the "annual conference." The latter, however, preceded, chronologically, the other forms of "conference," Wesley having held the first session in 1747. In America the great territorial range of the denomination has rendered necessary a quadrennial session called the "general conference," composed of delegates from all the annual conferences.

Besides these peculiarities, Methodism has some minor functions or distinctions which have contributed much to its popular effectiveness. Its "love-feast" was borrowed, through its early Moravian associates (see WESLEYS), from the agapæ of the primitive Church. Bread and water are distributed among the assembly at the opening of its service, and the rest of the time is spent in the narration of Christian experience. The "band meeting" was also copied from the Moravians. Each sex met in its own bands; the "class meeting" has generally superseded this institution. The "watch-night" is usually celebrated on New Year's Eve, its services closing with silent prayer at midnight. It originated with the early Methodist converts among the Kingswood colliers. It had been their custom to close the old and hail in the new year with drunken orgies. Methodism reclaimed hosts of these poor people, who changed to this new and devout form their observance of

New Year's Eve, and gave it to the denomination throughout the world. The lay "prayer meeting" is universal among Methodists, and has been claimed as original with them, at least in the modern Church. (Smith's *Hist. of Meth.*, vol. i.) It is characterized by great freedom and fervor, and especially by its popular psalmody. Both sexes have equal liberty of prayer and exhortation in it.

The *theology of Methodism* may be said to be substantially that of the Church of England, though it eliminates the alleged Calvinistic teachings of the Thirty-nine Articles. Wesley was thoroughly Arminian, and his followers are universally such. The "minutes" of his early conferences record many discussions with his assembled preachers on theological subjects. Certain compilations from these documents, together with his sermons and his notes on the New Testament, are recognized as the theological standards of the English or Wesleyan Methodists. In the U. S. his abridgment of the Anglican Articles is the only authoritative Methodistic standard. It does not include his views of the "witness of the Spirit" and of "sanctification," which, though subjects of much interest to American Methodists, are left quite freely to individual opinion and discretion. These two doctrines have usually been considered, by outside critics of Methodism, as peculiar to its theology. Neither Wesley nor any subsequent authority of the denomination would admit them to be so. They consider them to be not only biblical, but generally admitted truths in Greek and Latin Christendom. Wesley did not even go as far in his teachings regarding the "witness of the Spirit" as many of the older Protestant theologians went in the doctrine of "assurance." According to him, the Spirit, not by any marvellous demonstration, outward or inward—"not by an inward voice, though He may do this sometimes"—gives the peaceful impression to the justified man that his sins are forgiven. To use his own words, "the Spirit so works upon the soul by His immediate influence, and by a strong though inexplicable operation, that the stormy wind and troubled waves subside, and there is a sweet calm; the heart resting as in the arms of Jesus, and the sinner being clearly satisfied that all his 'iniquities are forgiven and his sins covered.'" In his teachings on sanctification—or "perfection," a word which he used because the Scriptures use it—he taught not absolute moral perfection. "We are no more to expect any man to be infallible," he says, "than to be omniscient." A Methodist writer affirms that "perfection, as defined by Wesley, is not perfection according to the absolute moral law; it is what he calls it, *Christian perfection*—perfection according to the new moral economy introduced by the atonement, in which the heart, being sanctified, fulfils the law by love (Rom. xiii. 8, 10), and its involuntary imperfections are provided for by that economy without the imputation of guilt, as in the case of infancy and all irresponsible persons."

Though in the foregoing remarks historical references have been made chiefly to Wesleyan or English Methodism, the subject has nevertheless been treated with a studied generality in order to economize room. Nearly all that has been thus far said is applicable to the many divisions of the denomination, and will not therefore need to be repeated in their respective treatment. For one of the most noteworthy facts of Methodism is its essential unity. Whatever distinctive prefixes or affixes its numerous bodies may have adopted, they all hold to what they justly consider substantive Methodism. Their theology is universally the same, except among the Welsh Calvinistic Methodists. They have very generally the same practical system and interior regimen, and aim at the same type of spiritual life. They nearly all have fraternal relations. Though there are now, according to one of their most cautious authorities, more than 12,000,000 "persons receiving Methodist instruction, and from week to week meeting together in Methodist buildings for the purpose of worshipping Almighty God" (Tyerman's *Life and Times of Wesley*, i. 9), and though these are scattered over most of the outlines of the globe, yet are they essentially one people.

We may now proceed more particularly, yet briefly, to record their various branches.

Wesleyan Methodists is the title of the British parent body. The outlines of its early development have already been given. During Wesley's life it was chiefly controlled by his patriarchal authority. He left, however, a "Deed of Declaration," recognized in 1794 by the high court of chancery, providing for the government of the "connection" after his decease. By this deed the annual conference is composed of 100 travelling preachers, with power to fill vacancies in their number. They are the "legal conference," but the other travelling ministers attend their sessions and share in their debates, without the right of voting. The president of the conference is elected for one year, and has during this term the general supervision of the denomination. The proceedings of the "district" and "quarterly conferences" (above noted) are subject to revision and amendment in the annual conference. Committees appointed by these minor bodies to prepare the principal business of the annual session meet about a week before the latter, and their measures are generally, if not invariably, adopted by the "legal hundred." As these committees consist largely of laymen, the rigor of Wesley's "Deed of Declaration" is much relieved by this concessive policy of the conference. Wesleyan Methodism cannot, under that deed, have "lay representation," but it has nearly its equivalent in the preliminary committees. One of these committees makes a draft of the "appointments" of all the travelling preachers for the ensuing year; this document is submitted to the attention of the societies, which have the right of appeal to the conference for changes. Its final determination is with the conference. No preacher, however, can be appointed to the same place more than three successive years. The Wesleyans now report about 3200 travelling preachers and 560,000 church members. Their foreign missions dot much of the globe. A Wesleyan authority (Tyerman) says: "The parent conference employs in Great Britain and Ireland 1782 regular ministers. Besides these, there were in 1864, in England only, 11,804 lay preachers, preaching 8754 sermons every Sabbath day. In the same year the number of preaching-places in England only was 6718, and the number of sermons preached weekly by ministers and lay preachers combined was 13,852. To these must be added the lay preachers, preaching-places, etc. in Wales, Scotland, Ireland, Shetland, and the Channel Islands. The number of church members in Great Britain and Ireland is 365,285, with 21,223 on trial; and, calculating that the hearers are three times as numerous as the church members, there are considerably more than 1,000,000 persons in the United Kingdom who are attendants upon the religious services of the *parent* conference of 'the people called Methodists.' Some idea of their chapel and school property may be formed from the fact that during the last seven years there has been expended in Great Britain only, in new erections and in reducing debts on existing buildings, £1,672,541; and towards that amount of expenditure there has been actually raised and paid (exclusive of all connectional collections, loans, and drafts) the sum of £1,284,498. During the ten years from 1859 to 1868, inclusive, there was raised for the support of the foreign missions of the connection £1,408,235; and if to this there be added the amount of the Jubilee Fund, we find more than a million and a half sterling contributed during the decade for the sustenance and extension of the Methodist work in foreign lands. The missions now referred to are carried on in Ireland, France, Switzerland, Germany, Italy, Gibraltar, India, Ceylon, China, South and West Africa, the West Indies, Canada, Eastern British America, Australia, and Polynesia. In these distant places the committee having the management of the missions employ 3798 paid agents, including 994 who are regularly ordained and are wholly engaged in the work of the Christian ministry. Besides these, there are about 20,000 agents of the society (as lay preachers, etc.) who are rendering important service gratuitously, while the number of church members is 154,187, and the number of attendants upon the religious services more than half a million. Space prevents a reference to the other institutions and funds of British Methodism, except to add that, besides 174,721 children in the mission schools, the parent connection has in Great Britain 698 day schools, efficiently conducted by 1532 certificated, assistant, and pupil teachers, and containing 119,070 scholars; also 5328 Sunday schools, containing 601,801 scholars, taught by 103,441 persons, who render their services gratuitously; and that the total number of publications printed and issued by the English Book Committee only, during the year ending June, 1866, was 4,122,800, of which nearly 2,000,000 were periodicals, and more than 250,000 were hymn-books." The Wesleyans have conferences, affiliated and subordinate to that of England, in Ireland, Australia, Canada, Eastern British America, and France. Besides a quarterly review and monthly magazine, they have 12 weekly journals and several missionary and Sunday-school periodicals. Some of these are published in their foreign fields; most of them are "official," others are "independent." They have 4 collegiate institutions, 2 theological schools, an important normal seminary, and numerous academies or boarding schools.

The *Calvinistic Methodists* arose from a difference between Whitefield and Wesley respecting the Calvinistic doctrines. Wesley, as we have seen, was thoroughly Arminian, Whitefield as thoroughly Calvinistic. After Wesley's celebrated sermon on "free grace" they pursued separate though parallel lines of public labor. Personally, they became cordial friends again, but their followers were never reunited. The Calvinistic Methodists were finally organized in three denominations. The first was called *Lady Huntingdon's Connection*. Her ladyship was their liberal patron and their chief director. She purchased or built for them numerous chapels. Their pastors were settled, they used the liturgy of the national Church, but their system of government was essentially congregational. They early established a theological school, which still exists under the title of Cheshunt College. They have not shared the prosperity of the other Methodist bodies. The British religious census for 1851 reported their number of chapels at 109, with accommodations for about 39,000 hearers. They have now less than 100 preachers and less than 70 chapels.

The second body of Calvinistic Methodists, the *Whitefield Methodists*, no longer exists as a "connection" or denomination, but some of their early churches survive among the independent congregations of England.

The third and greatest result of Calvinistic Methodism bears the title of the *Welsh Calvinistic Methodists*. Welsh Methodism was independent of English, both in origin and organization. Its first "societies" were formed in 1735. The chief founders were Howell Harris, Griffith Jones, Daniel Rowlands, and Thomas Charles, the last named surviving long enough to shape the later history of the denomination. Its first "association" was held in 1742, two and a half years prior to the English Methodist Conference, under Wesley, at London. In 1811 it was more thoroughly organized, and in 1864 the organization was completed by the constitution of the General Assembly. The Church is Presbyterian in doctrine and polity, and is a member of the Presbyterian Alliance. The statistics for 1884 are: In Wales, synods, 2; presbyteries, 21; communicants, 124,505; in the U. S., synods, 5; presbyteries, 18; communicants, 11,500.

The *Wesleyan Methodist New Connection* is the title of an organization originally composed of about 5000 seceders from the parent connection, who for certain alleged grievances withdrew in 1797, under the leadership of Alexander Kilham, an able preacher who had been expelled the preceding year for his zealous advocacy of liberal changes in the system of government which Wesley had established. The New Connection adopted equal lay and ministerial representation in its conference. It extended into Ireland, and for a considerable time was the refuge of members of the elder body who were dissatisfied with their restricted liberties. There are some 10,000 New Connection Methodists in Canada. The New Connection in Canada has recently united with the Wesleyans. The ministry of this denomination now comprises about 260 travelling preachers, and its membership about 35,000 communicants.

The *Primitive Methodists* are distinguished by their zeal and success, and form one of the most important branches of the great Methodist family. Lorenzo Dow, an eccentric American Methodist, introduced the American camp-meeting into England about 1807. William Clows, a Wesleyan local preacher, approved and labored in these "open-air" assemblies. Hugh Bourne, a layman, but an influential chapel trustee, saw in them an important means of reaching multitudes of the common people who could not otherwise be brought under religious influence. He defended them in a pamphlet; counter-publications were issued by the preachers of Burslem and Macclesfield circuits. No small agitation ensued, and in 1807 the conference denounced camp-meetings and "disclaimed connection with them." In 1808, Bourne was expelled from the connection; two years later Clows was also expelled. They continued, however, their "out-door meetings," organized their converts in classes, and in 1810 established the Primitive Methodist Connection. It retained the doctrines and internal discipline of Wesleyan Methodism, and attempted to restore the primitive simplicity of the latter in dress, manners, and living. It revived Wesley's custom of "out-door preaching," and licensed women to preach. Its church government is notably liberal towards the laity, two-thirds of its annual conference being laymen. The Primitive Methodists have done much good among the neglected classes of England; they have also established several foreign missions. In the U. S. they have about 2000 members. Their aggregate membership is more than 161,000, and their ministers about 1000.

The *Primitive Wesleyans of Ireland* must not be confounded with those of England, above noticed. The Irish body was distinguished by its partiality to the Established Church in Ireland, and originated in that partiality. As early as 1795 the British conference allowed its preachers to administer the sacraments to their people, under specified restrictions. The Irish conference (a branch of the former) voted in the next year that it was not expedient for the preachers within its territory to avail themselves of this concession. About twenty years later (1816), in compliance with an extensive demand of the people, the concession of the parent conference was adopted. In a vote of 88 members there was a minority of 26 which sturdily insisted that their people should still resort to the Established Church for the sacraments. This, it was argued, was Wesley's design down to his death regarding all his societies, except those of America, where the Anglican establishment had ceased to exist. Adam Averell, one of the most commanding members of the Irish conference, withdrew from the connection, leading with him the minority and about 10,000 members. Wesleyan Methodism lost by this schism at least one-third of its numerical strength in Ireland. The Irish Primitives have not had remarkable success; for some years they have been declining. Their latest statistics which have reached us show about 14,000 members and 85 preachers.

Besides the above, there are minor sects of Methodists in England, among which may be mentioned—(*a*) The *Band-room Methodists*, so called from a "band-room" in Manchester where they were accustomed to assemble as a Wesleyan "class," but where they violated the rules of the connection by admitting persons who were not members of the society, and by rejecting the authority of the "leaders' meeting," which intervened against their irregularities. They seceded in 1806. They have annual conferences, but no salaried ministry. They have had no remarkable success, and have changed their name to the *United Free Gospel Churches*. (*b*) The *Protestant Methodists*, chiefly seceders from the Wesleyan societies of Leeds, who became disaffected in 1828 because the societies placed an organ in one of their chapels. More than 1000 communicants, including 56 class-leaders and 28 local preachers, combined in the schism. (*c*) The *Wesleyan Methodist Association*, originated in 1835 by a secession chiefly under the direction of Rev. Dr. Samuel Warren, who with his followers opposed the introduction of theological schools among the Wesleyans. Though Wesley himself had proposed such means of ministerial education, it was assumed by the seceders that they were incompatible with the genius of Methodism, and would be adverse to its prosperity. The *Protestant Methodists* of Leeds united with these Association Methodists in 1828. (*d*) The *Reformed Methodists* originated in an extraordinary proceeding of the parent Wesleyan conference in 1849, when six of its members, some of them eminent men, were arraigned before that body and half of them reproved, the other half expelled, under an accusation of disguised hostility to the conference and of secret co-operation with the Wesleyan Methodist Association. It was alleged by the accused and their many friends that the action of the conference was precipitate, and violated the legal formalities in such cases required. It excited profound agitation throughout the connection, and no less than 100,000 Wesleyans seceded. These last-mentioned three bodies have been consolidated under the title of the *United Methodist Free Churches*. They have adopted a "liberal" system of church government, admitting laymen to their annual conference or assembly, and giving independent jurisdiction to the circuits over their interior or local affairs. They report about 312 ministers and 68,000 members.

Besides these branches, others of less significance have existed for more or less time in England or Ireland, such as the *Wesleyan Reform Union*, a remnant of the schism of 1849 (who were unwilling to be merged in the *United Methodist Free Church*), the *Independent Methodists*, the *Tent Methodists*, etc. It will be observed that secession has played a conspicuous part in the history of English Methodism. The frequency of this evil is attributable largely to the ardent popular elements which it has been the task of the denomination to gather and improve, but still more, perhaps, to the restricted and rigid ecclesiastical system which Wesley's "Deed of Declaration" has entailed upon the parent body. Every schism in the history of Methodism has been occasioned by ecclesiastical or economical provocations; no theological defection or controversy has ever seriously disturbed the denomination in any part of the world.

We can now pass to Methodism in the New World, where it has had its chief mission, and where by its peculiar practical system, especially by its ministerial "itinerancy," it has spread the provisions of religion coextensively with the ever-extending emigration, until it has become numerically the predominant denomination of the republic.

The *Methodist Episcopal Church* is the title of the earliest Methodist organization in the U. S. Philip Embury, with other Wesleyan immigrants from Ireland, began to hold meetings for preaching and prayer in New York City as early as 1766. In the next year Capt. Thomas Webb, a British officer who like Embury had been a Wesleyan local preacher in England, visited the little flock, and preached to them in his regimentals, exciting much popular interest. The captain also preached on Long Island, in New Jersey, Philadelphia, Delaware, and Maryland, and is honored as one of the chief founders of American Methodism. Embury's congregation increased rapidly in New York. In 1767 they worshipped in a rigging-loft, which was thronged, and in 1768 they built the famous old "John street chapel," supposed to be the first Methodist church erected in the Western hemisphere, though about the same time Robert Strawbridge (another Irish Wesleyan) began to preach, formed societies, and built a small chapel on Sam's Creek, Frederick co., Md. Some Methodist authorities still consider it doubtful which had priority, Embury or Strawbridge; the Church generally, however, recognizes the date of Embury's labors (1766) in New York as the epoch of American Methodism. In 1769, Wesley sent over two of his itinerants, Pillmoor and Boardman, who labored successfully in and about New York and Philadelphia. They were followed in 1771 by Wright and Asbury. The latter became the representative character and most effective bishop of the denomination, and did more for its outspread and permanence than any other man in its history. In 1773, Wesley sent over two more itinerants, Rankin and Shadford; and this year is also memorable for the session of the first American Methodist conference. It was held in Philadelphia, and reported 1160 members of society and 10 preachers—the same number of the latter as constituted Wesley's first conference in England twenty-nine years before. Notwithstanding the disturbed condition of the country during the ensuing American Revolution, the cause prospered, and in 1784 enrolled 15,000 communicants. There were now 84 preachers, travelling 46 "circuits," for by this time a considerable native ministry had been raised up. Hitherto, the Methodists had been dependent on the colonial English Church for the sacraments, none of their own preachers having yet been ordained; but in this year Wesley ordained two of his English itinerants to the function of presbyters, and consecrated Rev. Dr. Thomas Coke as a bishop, and sent them to America with authority to organize the scattered societies as a distinct Church, under the title of "The Methodist Episcopal Church in the U. S. of America." He sent with them a printed liturgy and formulæ for ordinations, the sacraments, marriage, burial of the dead, etc., abridged from the Book of Common Prayer, and substantially the same as those still in force in the Methodist Book of Discipline. Coke and his two presbyters assembled a general conference about Christmas at Baltimore, where the plan appointed by Wesley was adopted, and Asbury (at Wesley's suggestion) was ordained successively deacon, presbyter, and bishop. Wesley was led to these extraordinary measures by the abolition of the authority of the English Church establishment in the colonies, by the urgent demand of his American people for the sacraments, and by his repeated failure to obtain relief for them in the ordination of some of his preachers by the bishop of London.

American Methodism had now become a consolidated and distinct Church. It retained the ecclesiastical system of English Methodism, as well as its theology, except that its chief administration was placed in the hands of bishops. As it rapidly extended over the continent its annual conferences were multiplied, until in 1792 regular "general conferences" were created, meeting quadrennially, and comprising all the travelling preachers who could attend. It was found necessary at last, by the growth of the ministry, to make the general conference a *delegated* body. It assembled as such, for the first time, in 1812, at the Old John street church, New York. The ratio of delegates to the number of travelling preachers has been necessarily changed from time to time. In 1872, the popular demand for lay representation having prevailed, the delegates consisted of one minister for forty-five of the preachers, and two laymen for every annual conference. The ministry itself had been zealous in the promotion of lay representation.

The quadrennial general conference is the supreme assembly of the Church—legislative, judicial, executive. It elects the bishops, who are, in fact, but its executive agents; it makes all laws except minor local regulations, which are left to the annual conferences; it tries judicial appeals from the annual conferences; it is itself under constitutional restraints, called "Restrictive Rules," which can be suspended or changed only by the concurrence of specified majorities in the general conference and in all the annual conferences. American Methodism has now a quarterly conference for each circuit; a district conference for all the circuits which are under the care of each presiding elder; annual conferences for larger sections of the country, embracing often considerable portions of one or more States; and a general conference, comprehending all the annual conferences. The work of the denomination is thus under periodical supervision in a series of sessions extending from a quarter of a year to four years. The preachers are appointed at the annual conferences for one year, but they can be assigned for three successive years to the same appointment. The bishops make these appointments, aided by the presiding elders; the latter can be continued four years on the same district. The bishops are required by an organic law of the Church to travel at large. The whole nation is their common diocese. The denomination has a powerful publishing institution called the "Book Concern," with above $1,000,000 capital. It has two large establishments—one in New York, the other in Cincinnati—with depositories in other cities from Boston to San Francisco. It issues a quarterly review, two monthly magazines (one in German), a monthly Sunday-school paper, several weekly Sunday-school and tract journals in different languages, and nine or ten weekly religious newspapers. There are also several unofficial or independent religious journals issued in various parts of the Church. Its theology and ecclesiastical economy have been sufficiently indicated in the preliminary remarks of this article. Though the denomination maintains episcopacy and the two ministerial orders of deacons and presbyters, it does not claim for them divine right or scriptural obligation. It regards them only as expedient for its own peculiar working system. Episcopacy it esteems merely as an office, not as an "order." The English Methodists have neither bishops nor deacons, but the American Methodists recognize the Wesleyans as a genuine Church. Wesley did not believe that any particular system of church polity is *enjoined* in the Holy Scriptures, and the claim of any denomination to validity *as* a Christian Church does not rest, in the estimation of Methodists, on its form of organization, but on theological and moral grounds.

One of the most momentous events in the history of the Methodist Episcopal Church was its division, by the separation from it of all the conferences (save one) in the slaveholding States, and their organization as the "Methodist Episcopal Church, South;" by which measure were severed from the parent Church 1474 travelling preachers, 2550 local preachers, 330,710 white members, 124,811 colored members, and 2978 Indian mission converts, making an aggregate of 462,428. At the general conference of 1844 the anti-slavery controversy, which had long agitated the denomination, culminated in measures which led the Southern delegates to declare that it would be impossible any longer to maintain Southern Methodism in connection with the Northern portion of the denomination. The conference thereupon made provision for a separate organization of the South, contingent on the necessity of any such division. This necessity was subsequently asserted by Southern conferences, quarterly and annual, and a convention was held at Louisville, Ky., in 1845, at which the new Church was definitively organized. (See METHODIST EPISCOPAL CHURCH, SOUTH.) It would be impossible here to enter into the arguments, pro and con., of this great ecclesiastical controversy, nor is it desirable. Later national events have extinguished the chief cause of the strife, and fraternal and conciliatory measures may now well befit both parties, even should reunion be out of the question. Both churches have since the civil war had signal success.

There are now in the Methodist Episcopal Church 80 annual conferences, 10,854 travelling preachers, 12,581 local preachers, ——— members, 1,363,876 Sunday-school pupils, 200,492 Sunday-school teachers, and property in churches and parsonages amounting to $78,893,045. It has 27 universities and colleges, 5 theological schools, and 69 academies or boarding schools. The Methodist Episcopal Church has foreign missions in Mexico, South America, Sweden, Norway, Denmark, Germany, Switzerland, Italy, Bulgaria, Africa, India, Japan, and China. In Africa (Liberia) it has a conference, a colored bishop, a weekly journal, and schools. In Germany it has a conference, a theological seminary, and a "book concern," with one quarterly, two semi-monthly, and two monthly periodicals. It has also a conference in India. Its home missions are numerous and notably successful, especially among our German and Scandinavian population. Its German work includes 8 conferences, with 161 travelling preachers, 346 local preachers, 35,000 communicants, 500 churches or chapels, 2 colleges, 2 orphan asylums, a weekly journal, a Sunday-school periodical, and a monthly magazine. From this prosperous home German work its missions in Germany and Switzerland sprang. The Scandinavian domestic missions have 50 travelling preachers, 52 local preachers, 50 churches, about 5000 members, and a monthly journal.

The *Methodist Protestant Church* arose from a controversy in the Methodist Episcopal Church against the alleged exclusively clerical government of the denomination. The seceders opposed episcopacy and demanded lay representation. They organized at a convention held in Baltimore, Md., in 1830, which in a session of about twenty days formed a constitution, retaining the doctrines and essential discipline of the elder Church, but excluding episcopacy and establishing equal lay and clerical representation in the government of the Church. Its annual conferences have presidents elected by ballot. It has a delegated general conference, composed of laymen and preachers sent from its annual conferences. As the Protestant Methodists demanded not only lay representation, but the abolition of episcopacy, the concession of the former by the parent Church has not succeeded in bringing them back again to its fold. They have themselves been divided by the controversy on slavery into the Methodist Protestant Church of the North-western States and the Methodist Protestants of the Southern States; latterly, the Northern branch has assumed the title of the *Methodist Church*, proposing to combine under this name the various Methodist sects which have rejected episcopacy. This body reports about 75,000 members and 625 preachers. The *Methodist Protestants, South,* report about 60,000 members and 423 preachers. The two branches have taken steps for unification under the title *Methodist Protestant Church.*

The *Wesleyan Methodist Church* originated chiefly in the anti-slavery controversy; the question of lay representation, however, became one of the motives of its organization. Some of the most zealous anti-slavery preachers in the Methodist Episcopal Church called a convention at Utica, N. Y., in 1843, where the new Church was formed on a basis identical in theology and internal discipline with that of the elder body, but excluding episcopacy and presiding elders, and providing lay representation. They have annually elected presidents of conferences and stationed chairmen of districts. Their preachers are appointed by a committee, the conference having authoritative revision of the appointments. Local preachers as well as laymen have representation in the annual and general conferences. At the time of the organization of this body it reported 6000 members, with 300 preachers, travelling and local. It now reports about 20,000 members and 250 preachers.

The *African Methodist Episcopal Church,* whose members are sometimes called *Allenites,* was organized at Philadelphia in 1816, under the guidance of Richard Allen, afterwards Bishop Allen. They considered themselves disparaged and oppressed in the Methodist Episcopal Church, and finding no redress, formed themselves into an independent body, consecrated Allen as their first bishop, and adopted a system of government substantially the same as that of the parent Church. They have spread considerably in the Middle and Southern States, and have extended into Canada. They report 200,000 members and 600 preachers, including 7 bishops.

The *Zion African Methodist Episcopal Church* originated in a secession of colored people from the Methodist Episcopal churches of New York City in 1819. They retain all the distinctive features of the parent Church, but elect their bishops annually. These officers are not consecrated by formal ordination. They report 164,000 members and about 500 preachers.

The *Colored Methodist Episcopal Church in America* consists mostly of former African members of the Methodist Episcopal Church, South. After the civil war the colored members of the Methodist Episcopal Church, South, desired a separate organization; this desire was acceded to, and the new Church was accordingly formed on Dec. 16, 1870. W. H. Miles and R. H. Vanderhorst, colored men, were consecrated bishops. It consists of some 75,000 members. No white person is admitted to its membership. It has a weekly journal (*The Christian Index,* published at Louisville, Ky.). In its theology and polity it is a copy of the Methodist Episcopal Church, South, and the latter extends to it parental care, without trenching on its independence. It includes but a fragment of the former numerous African membership of the Methodist Episcopal Church, South; some of these remain in the latter, some have joined the Methodist Episcopal Church, and thousands have been absorbed in the two African Episcopal churches above mentioned.

The *United Brethren in Christ,* though bearing the same name as the Unitas Fratrum, or Moravians, have no relations with the latter, but are Methodists, and are often called *German Methodists.* In theology and polity they are nearly identical with the Methodist Episcopal Church, having bishops, a general conference, and annual conferences. They date from 1800, the year of their first conference, and have numerous societies in the Middle and Western States.

The *Evangelical Association* is also an organization of German Methodists, sometimes called *Albrights,* from the name of their principal founder. They have bishops, a general conference, and annual conferences, about 635 preachers, and 80,000 members.

The *Free Methodist Church* was formed in 1860, chiefly by friends of two preachers of the Methodist Episcopal Church who were expelled from the Genesee conference. They disclaim episcopacy, but have an elective *superintendent,* whose term of service is four years, and insist on congregational singing, excluding instrumental music; on free seats in the congregation; on extempore preaching; on plainness of dress and living; and especially on the doctrine of Christian perfection. They have about 100 preachers and 6000 members.

The *Canada Wesleyan Methodists* were organized in 1828. Before that date the Methodist societies of both Upper and Lower Canada were under the jurisdiction of the Methodist Episcopal Church, but the political differences of the two countries rendered an independent organization of Canadian Methodism expedient; and the general conference in the U. S. readily acceded to the wishes of its Canadian communicants. The latter in their new organization did not adopt episcopacy, but mostly copied the polity of the English Wesleyans and affiliated with the latter. They have a book concern, periodicals, a university, Indian missions, and 70,000 members.

The *Eastern British American Wesleyan Methodists,* a branch of the great English Wesleyan family, are now united with the *Canada Wesleyan Methodists* in the *Canada Methodist Church.*

The *Methodist Episcopal Church of Canada* was founded in 1828 by Canadian Methodists who were dissatisfied with the action of the majority of their brethren, who in their reorganization after the separation from the Church in the U. S. declined to continue the episcopal government under which they had hitherto existed and prospered. The minority organized separately on the model of the parent Church. It has bishops, a publishing-house, with a weekly and other periodicals, more than 20,000 communicants, and 230 preachers.

The following table, presented at the Ecumenical Methodist Conference held in London in 1881, will supplement the statistics of Methodism given in the preceding brief account:

BRANCHES.	Local preachers.	Travelling ministers.	Members.
I. *British Wesleyan Methodism.*			
England	24,400	2,571	501,300
Ireland	1,800	250	24,237
Australia	3,800	476	69,147
France	......	29	1,844
II. *Other British Methodists.*			
Primitive	15,600	1,150	185,316
Welsh Calvinistic	562	18	120,000
United Free	3,403	432	79,756
New Connection	1,205	183	31,652
Bible Christian	1,874	302	31,542
Reform Union	562	18	7,745
III. *U. S. and Canada—Episcopal.*			
Methodist Episcopal	12,555	12,096	1,743,000
Methodist Episcopal, South	5,832	4,004	840,000
African M. E.	3,168	1,498	215,000
African M. E. Zion	2,500	1,500	191,000
United Brethren	. ....	2,200	158,000
Colored M. E.	683	640	112,300
Evangelical Association	600	893	112,200
M. E. Canada	300	282	28,000
Union American M. E.	22	110	2,600
British M. E	20	45	2,200
IV. *U. S. and Canada—Non-Epis.*			
Methodist Church, Canada	3,540	1,200	123,013
Methodist Protestant	925	1,314	113,405
American Wesleyan Association	200	250	25,000
Independent Methodists	......	24	12,550
Free Methodists	233	313	12,600
Primitive (Canada)	270	97	8,307
Bible Christians	197	81	8,000
Primitive (U. S.)	162	196	3,210
Summary—I	30,000	3,326	596,528
II	23,206	2,103	456,031
III	25,680	23,268	3,404,300
IV	5,527	3,476	306,085
	84,413	32,172	4,762,944
Add ministers			32,172
Total			4,795,116

It has been usual, in calculating the Methodist *population,* to add three non-communicant members of the congregation for each recorded member of the Church, including thus the children of communicants and the other numerous adherents of the denomination, who, while habitually attending its services, do not formally join its societies. At this rate, the Methodist population throughout the world must be about 16,000,000. ABEL STEVENS.

Methodist Episcopal Church, South. The Methodist Church in America having become too unwieldy for one General Conference jurisdiction, this, together with the question of slavery, which had agitated the Church from the beginning, rendered a division necessary. At the General Conference held in New York in 1844 the subject was discussed with painful interest, and measures were adopted in the interest of peace for a separation of the Church into two distinct organizations. This is concisely set forth in an account of the organization of the M. E. Church, South, inserted in the *Discipline* of 1846 as follows: "In the judgment of the delegates of the several annual conferences in the slave-holding States, the continued agitation of the subject of slavery and abolition in a portion of the Church, the frequent action on that subject in the General Conference, and especially the proceedings of the General Conference of the Methodist Episcopal Church of 1844 in the case of the Rev. James O. Andrew, D. D., one of the bishops, who had become connected with slavery by marriage, produced a state of things in the South which rendered a continuance of the jurisdiction of that General Conference over the conferences aforesaid inconsistent with the success of the ministry in their proper calling. This conviction they declared in solemn form to the General Conference, accompanied with a protest against the action referred to, assured that public opinion in the slaveholding States would demand, and that a due regard to the vital interests of Christ's kingdom would justify, a separate and independent organization. The developments of a few months vindicated their anticipations. The Church in the South and South-west, in her primary assemblies, her quarterly and annual conferences, with a unanimity unparalleled in ecclesiastical history, approved the course of the delegates, and declared her conviction that a separate jurisdiction was necessary to her existence and prosperity. The General Conference of 1844 having adopted a 'Plan of Separation' and provided for the erection of the annual conferences in the slaveholding States into a separate ecclesiastical connection, under the jurisdiction of a Southern General Conference, the delegates of the aforementioned conferences in a published address recommended that a convention of delegates from the said conferences, duly instructed as to the wishes of the ministry and laity, should assemble at Louisville, Ky., on the first day of May, 1845. The convention met, delegates having been formally appointed in pursuance of this recommendation, and after a full and minute representation of all the facts in the premises, acting under the provisional 'Plan of Separation,' declared by solemn resolution the jurisdiction hitherto exercised by the General Conference of the Methodist Episcopal Church over the conferences in the slaveholding States *entirely dissolved*, and erected the said annual conferences into a separate ecclesiastical connection, under the style and title of *The Methodist Episcopal Church, South*, the first General Conference of which was held in the town of Petersburg, Va., on the first day of May, 1846." The "Plan of Separation" was conceived in the most fraternal spirit, and its acceptance by the South was urged by such distinguished Northern men as Drs. Olin, Elliott, and others, who believed that the Church in the South would be ruined if Bishop Andrew were deposed from the episcopate (as virtually proposed in the pending resolution), and in the North if he exercised his episcopal functions in the Northern conferences. The "Plan" is as follows: "The select committee of nine to consider and report on the declaration of the delegates from the conferences of the slaveholding States beg leave to submit the following report: Whereas, a Declaration has been presented to this General Conference, with the signatures of *fifty-one* delegates of the body from thirteen annual conferences in the slaveholding States, representing that, for various reasons enumerated, the objects and purposes of the Christian ministry and church organization cannot be successfully accomplished by them under the jurisdiction of this General Conference as now constituted; and whereas, in the event of a separation, a contingency to which the Declaration asks attention as not improbable, we esteem it the duty of this General Conference to meet the emergency with Christian kindness and the strictest equity; therefore, *Resolved*, by the delegates of the several annual conferences in General Conference assembled—1st, That should the conferences in the slaveholding States find it necessary to unite in a distinct ecclesiastical connection, the following rule shall be observed with regard to the northern boundary of such connection: All the societies, stations, and conferences adhering to the Church in the South by a vote of a majority of the members of said societies, stations, and conferences shall remain under the unmolested pastoral care of the Southern Church; and the ministers of the Methodist Episcopal Church shall in no wise attempt to organize churches or societies within the limits of the Church, South, nor shall they attempt to exercise any pastoral oversight therein, it being understood that the ministry of the South reciprocally observe the same rule in relation to stations, societies, and conferences adhering, by vote of a majority, to the Methodist Episcopal Church; provided also, that this rule shall apply only to societies, stations, and conferences bordering on the line of division, and not to interior charges, which shall in all cases be left to the care of that Church within whose territory they are situated. 2d, That ministers, local and travelling, of every grade and office in the Methodist Episcopal Church, may, as they prefer, remain in that Church or without blame attach themselves to the Church, South. 3d, *Resolved*, by the delegates of all the annual conferences in General Conference assembled, That we recommend to all the annual conferences, at their first approaching sessions, to authorize a change of the sixth restrictive article, so that the first clause shall read thus: 'They shall not appropriate the produce of the Book Concern nor of the Chartered Fund to any purpose other than for the benefit of the travelling, supernumerary, superannuated, and worn-out preachers, their wives, widows, and children, and to such other purposes as may be determined upon by the votes of two-thirds of the members of the General Conference.' 4th, That whenever the annual conferences, by a vote of three-fourths of all their members voting on the third resolution, shall have concurred in the recommendation to alter the sixth restrictive article, the agents at New York and Cincinnati shall, and they are hereby authorized and directed to, deliver over to any authorized agent or appointee of the Church, South, should one be authorized, all notes and book-accounts against the ministers, church-members, or citizens within its boundaries, with authority to collect the same for the sole use of the Southern Church; and that said agents also convey to the aforesaid agent or appointee of the South all the real estate, and assign to him all the property, including presses, stock, and all right and interest connected with the printing establishments at Charleston, Richmond, and Nashville, which now belong to the Methodist Episcopal Church. 5th, That when the annual conferences shall have approved the aforesaid change in the sixth restrictive article there shall be transferred to the above agent of the Southern Church so much of the capital and produce of the Methodist Book Concern as will, with the notes, book-accounts, presses, etc. mentioned in the last resolution, bear the same proportion to the whole property of said Concern that the travelling ministers in the Southern Church shall bear to all the travelling ministers of the Methodist Episcopal Church; the division to be made on the basis of the number of travelling preachers in the forthcoming *Minutes*. 6th, That the above transfer shall be in the form of annual payments of $2500 per annum, and specifically in stock of the Book Concern and in Southern notes and accounts due the establishment, and accruing after the first transfer mentioned above; and until all the payments are made the Southern Church shall share in all the net profits of the Book Concern in the proportion that the amount due them or in arrears bears to all the property of the Concern. 7th, That Nathan Bangs, George Peck, and James B. Finley be and they are hereby appointed commissioners to act in concert with the same number of commissioners appointed by the Southern organization (should one be formed) to estimate the amount which will fall due to the South by the preceding rule, and to have full power to carry into effect the whole arrangements proposed with regard to the division of property, should the separation take place. And if by any means a vacancy occurs in this board of commissioners, the Book Committee at New York shall fill said vacancy. 8th, That whenever any agents of the Southern Church are clothed with legal authority or corporate power to act in the premises, the agents at New York are hereby authorized and directed to act in concert with said Southern agents so as to give the provisions of these resolutions a legally binding force. 9th, That all the property of the Methodist Episcopal Church in meeting-houses, parsonages, colleges, schools, conference-funds, cemeteries, and of every kind within the limits of the Southern organization, shall be for ever free from any claim set up on the part of the Methodist Episcopal Church, so far as this resolution can be of force in the premises. 10th, That the Church so formed in the South shall have a common property in all the copyrights in possession of the Book Concern at New York and Cincinnati at the time of the settlement by the commissioners. 11th, *Resolved*, That the bishops be respectfully requested to lay that part of this report requiring the action of the annual conferences before them as soon as possible, beginning with the New York conference. 12th, *Resolved*, That the Book Agents at New York be directed to make such compensation to the conferences South for their dividend from the Chartered Fund as the commissioners to be provided for shall agree upon. ROBERT PAINE, Chairman.

"New York, June 7, 1844."

The Southern conferences organized according to the provisions of the foregoing Plan, and at the first general conference (in 1846) Joshua Soule, senior bishop of the M. E. Church, and Bishop Andrew adhered South, and were recognized in their episcopal character; and William

Capers, D. D., and Robert Paine, D. D., were elected and consecrated as their colleagues. Lovick Pierce, D. D., was appointed to bear the fraternal regards of the conference to the General Conference of the M. E. Church, which met in Pittsburg in 1848, but that conference declined to receive him in his official character, and repudiated the "Plan of Separation" as null and void. A refusal to divide the Church property with the Southern Church led to litigation, which was finally terminated by a decision of the Supreme Court of the U. S., which recognized the validity of the Plan agreeably to the claim of the M. E. Church, South. The court affirmed that according to its provisions "the religious association known as the Methodist Episcopal Church in the U. S. of America, as then existing, was divided into two associations or distinct Methodist Episcopal churches, as in the bill of complaint is alleged." At first, the bishops of the M. E. Church (North) declined to exercise their functions in the South; but during the war (1862–65) and since, in obedience to the instructions of their General Conference, they have organized annual conferences in all parts of the South, as have also the "African" and "African Zion" connections, thus taking from the M. E. Church, South, a large part of its colored members, of whom it numbered nearly 200,000 in 1860. At the General Conference of the M. E. Church in 1872, messengers were appointed to bear fraternal greetings to the General Conference of the M. E. Church, South, which met in Louisville in 1874. The manner in which these messengers fulfilled their mission and were received by the conference was highly creditable to both parties. The conference responded fraternally to their communications, and authorized the bishops to appoint commissioners to bear fraternal greetings to the General Conference of the M. E. Church, which met in 1876, and to adjust existing difficulties between the two connections. The late venerable Dr. Lovick Pierce, who d. in 1879 in the ninety-fifth year of his age, and who served on a similar errand in 1848, was appointed (in connection with Dr. James A. Duncan, president of Randolph-Macon College, and Chancellor Garland of Vanderbilt University) to lead this fraternal commission, but was too feeble to attend. Since this Conference perfect fraternity has existed between the two churches. The adjustment of all existing difficulties in the way of fraternity was referred to a joint commission of ten members (five from each Church), which met at Cape May, N. J., in Aug., 1876. The action of this commission was endorsed by the next succeeding General Conferences of both churches. Few of either connection desire organic union, as the representation in one general conference would be little more than nominal, the annual conferences being so numerous and the membership so large. It would be better to subdivide both connections, so as to have several distinct jurisdictions, all of which might be represented in an œcumenical conference, with no legislative or judicial powers. Though all the Arminian Methodists in the world agree in the great essentials of Methodism, yet there is considerable difference in matters of polity, which preclude organic union, but need not interfere with fraternal intercourse. The "two Methodisms," *e. g.*, differ as to the relative powers of the bishops and the general conference—the M. E. Church, South, holding that the bishops are a co-ordinate branch of the government, and cannot be *deposed* by a *delegated* general conference, except as they may be excommunicated by regular process of trial; which was the vexed question that divided the Church in 1844. The M. E. Church has made an addition to the terms of membership not sanctioned by the M. E. Church, South, and altered the general rule on slavery, which the M. E. Church, South, has cancelled as not being in the "General Rules" as drawn up by John Wesley. There also are differences in the organization and powers of district and quarterly conferences, and other points which are not very important, but which, with the foregoing, render an organic union undesirable, if not impossible.

As the great theatre of the late war covered the region occupied by the M. E. Church, South, it suffered greatly thereby. Churches, parsonages, seminary buildings, etc. were destroyed or alienated from the Church in many places; thousands of its members perished; and after the surrender the greater part of its colored membership was taken into other folds. But the Church has rallied its fortunes with wonderful energy. The *General Minutes* for 1883 report 3863 effective travelling ministers, of whom 8 are bishops; 313 superannuated ministers; 5892 local preachers; 888,094 white communicants, 1255 colored, 4783 Indians; total, ministers and members, 904,248, being a net increase in 1883 of 26,949. Sunday-schools, 9875; teachers, 65,574; scholars, 509,934. Over $227,000 was contributed in 1883 for missions. At the General Conference of 1882, 75 universities, colleges, and other institutions of learning were reported as under the care of the Church, and the number is constantly increasing. The Publishing-house, located in Nashville, is a magnificent institution; it is supervised by a Book Committee appointed by the General Conference, and managed by a Book Agent. It employs an editor of books and of the *Christian Advocate*, a weekly sheet, the organ of the General Conference; and also a Sunday-school secretary, who edits a Sunday-school magazine, the *Sunday-school Visitor*, and other publications in that department. There are many other weekly papers issued in various parts of the connection. A theological and literary *Quarterly Review* is published at Macon, Ga. The board of missions has its bureau in the Publishing-house; it employs two secretaries, and superintends the missions in China, Mexico, Brazil, and among the Indians. The domestic missions are managed by the several annual conferences within whose bounds they are located. The property formerly held by the Church for the colored people has been legally transferred (as also the members for the most part) to the Colored Methodist Episcopal Church in America, which connection, aided by the M. E. Church, South, is now (1884) building at Augusta, Ga., a seminary (Paine Institute) for the training of its ministers and the education of its youth. The Vanderbilt University (located at Nashville, Tenn.), the largest and best-endowed institution of learning in the South, is wielding a powerful influence in the Church. The Church Extension Society is doing vast good in supplying destitute places with comfortable houses of worship. (See *Disciplines*, *General Minutes*, and *Journals* of the General Conferences of the Methodist Episcopal Church and Methodist Episcopal Church, South; Redford's *Organization of the Methodist Episcopal Church, South*; Myers's *Disruption of the Methodist Episcopal Church*; Howard's *Reports of the Supreme Court*; and the foregoing article on METHODISM, by Dr. Abel Stevens; McTyeire's *Manual of the Discipline* and *History of Methodism*; Summers's *Commentary on the Ritual of the M. E. Church, South*; Peterson's *Hand-Book of Southern Methodism*.)

T. O. SUMMERS. REVISED BY WILBUR F. TILLETT.

Metho'dius, one of the two apostles to the Slavonians, archbishop of Moravia; cited to appear before the pope on two occasions—once for the use of the vulgar tongue in the church services. D. Apr. 9, 885. (See CYRIL.)

Methomania [from the Gr. μέθη, "drunkenness," and μανία, "mania"], also called **Dipsomania,** is an irresistible desire or morbid craving for intoxicating substances, and originates from the depression of the nervous system and general weakness of all the vital processes which follow after inebriation. In order to bring the organism back to its former vigor new stimulants are used, and thus grows up a habit of intoxication which is now not considered simply as a moral blemish, to be corrected by moral means, but is treated as a disease, and in this way often cured.

Meth'uen, Essex co., Mass. (see map of Massachusetts, ref. 1–I, for location of county), on the Manchester and Lawrence R. R., bounded N. by the New Hampshire line, and S. in part by the Merrimack River, has good water-power, furnished by the Spicket River, manufactures of cottons, woollens, shoes, jute, and hats, a high school, and a public library. Pop. of tp. in 1880, 4392; in 1885, 4507.

Meth'yl [Gr. μετά, "with," and ὕλη, "wood"], ($Me = CH_3$; in the free state, $Me_2 = C_2H_6$), the first member of the series of alcohol radicals C_nH_{2n+1}, bearing the same relation to methylic alcohol that ethyl (C_2H_5) bears to common alcohol. Methyl may be prepared (1) by decomposing cyanide of ethyl with potassium; (2) by the electrolysis of acetic acid; (3) by the action of zinc on methyl iodide. It is a colorless and odorless gas, which burns with a bluish flame. It is isomeric, and probably identical with the hydride of ethyl, $C_2H_5H = C_2H_6$. Methyl enters into the composition of a great variety of interesting compounds—methylic or wood-ether $(CH_3)_2O$, methylic alcohol, CH_3OH, compound ethers, as CH_3Cl, $CH_3C_2H_3O_2$, amines, etc.

C. F. CHANDLER.

Methyl Alcohol, Methyl Hydrate, Carbinol, Pyroxylic Spirit, or **Wood-Naphtha** ($CH_4O = CH_3\text{-}OH$). It is found associated with acetic acid in the watery product from the distillation of wood, and may also be formed (1) by distilling methyl-chloride with potassic hydrate; (2) by distilling oil of wintergreen, which is chiefly methyl-salicylate, with potassic hydrate; (3) from hydrocyanic acid, by first converting it into methylamine, and then applying argentic nitrate according to the method of Mendius. (*Ann. Chem. Pharm.*, cxlv. 42.)

Preparation of Commercial Wood-Spirit.—The crude watery liquid (*pyroligneous acid*) obtained by the distillation of wood is redistilled; the first tenth which passes over is rectified over slaked lime, whereupon considerable ammonia is given off; sulphuric acid is then added, which fixes the remaining ammonia and precipitates some tarry matter: the liquid is redistilled and rectified several times over quicklime. Oak-wood yields about two gallons crude wood-spirit to the cord. The crude product has a strong aromatic odor, and turns brown on keeping. It contains considerable quantities of acetone, methyl-acetate, ethyl-acetate, and lignone or xylite, which is the dimethyl-acetate of ethylene.

The Purification of Crude Wood-Spirit is effected by saturating it with fused calcic chloride, with which the methyl alcohol forms a compound which is not decomposed by a temperature of 100° C. It is then heated over a water-bath as long as anything volatile is given off. It is then distilled with water, and the product is rectified over quicklime. A purer product is obtained when the crude product is distilled with strong potash or soda ley previous to the treatment with calcic chloride. To obtain perfectly pure methyl alcohol an ether of methyl, as the oxalate, must be first prepared from the wood-spirit.

Properties.—Methyl alcohol is a colorless, mobile liquid, having a purely spirituous odor, like that of common alcohol. Sp. gr. = 0.8142 at 0° C. It boils at 60°–66.5°, according to the nature of the vessel, and bumps strongly while boiling. It burns with a pale flame, and is used as a substitute for alcohol in spirit-lamps. It mixes with water, alcohol, and ether, and dissolves fixed and volatile oils and most resins. It unites directly with some substances, forming compounds like the alcoholates, in which it takes the place of water of crystallization; with calcic chloride it forms $CaCl_2.2CH_4O$; with anhydrous baryta, $BaO.2CH_4O$; with potassium and sodium, KCH_3O and $NaCH_3O$. By oxidation it is converted into formic acid, $CH_4O + O = HCHO_2 + H_2O$. Calcic hypochlorite (bleaching-powder) converts it into chloroform.

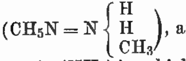
The following table exhibits the strength of pure methyl alcohol diluted with water, as determined by Ure (*Phil. Mag.*, [3], xix. 51):

Percentage of Anhydrous Methylic Alcohol (sp. gr. 0.8136, at 15°) in Wood-Spirit.

Sp. gr.	Per cent.	Sp. gr.	Per cent.	Sp. gr.	Per cent.	Sp. gr.	Per cent.
0.8136	100.00	0.8674	82.00	0.9008	69.44	0.9344	53.70
0.8216	98.11	0.8712	80.64	0.9032	68.50	0.9386	51.54
0.8256	96.11	0.8742	79.36	0.9060	67.57	0.9414	50.00
0.8320	94.34	0.8784	78.13	0.9070	66.66	0.9448	47.62
0.8384	92.22	0.8822	77.00	0.9116	65.00	0.9484	46.00
0.8418	90.90	0.8842	75.76	0.9154	63.30	0.9518	43.48
0.8470	88.30	0.8876	74.63	0.9184	61.73	0.9540	41.66
0.8514	87.72	0.8918	73.53	0.9218	60.24	0.9564	40.00
0.8564	86.20	0.8930	72.46	0.9242	58.82	0.9584	38.46
0.8596	84.75	0.8950	71.43	0.9266	57.73	0.9600	37.11
0.8642	83.33	0.8984	70.42	0.9296	56.18	0.9620	35.71

G. Krell (*Deut. Chem. Ges. Ber.*, vi. 1310) has given a method for estimating the proportion of pure methyl alcohol by means of phosphorus di-iodide. Methyl alcohol does not give Lieben's iodoform reaction with iodine and potash; hence this reaction may be employed to test it for ethyl alcohol, acetone, and other compounds which yield iodoform when thus treated. There is said to be a considerable demand for methyl alcohol for the preparation of methylene chloride, to be used as a substitute for ammonia in ice-machines. C. F. CHANDLER.

Methyl'amine, Methylammonia, or **Methylia**



$$(CH_5N = N\left\{\begin{matrix}H\\H\\CH_3\end{matrix}\right)$$

, an organic base which consists of ammonia (NH_3) in which one atom of hydrogen has been replaced by methyl (CH_3). (See AMINES.) Methylamine is prepared by the action of potassic hydrate on cyanurate of methyl, or of nascent hydrogen on hydrocyanic acid. It is a colorless gas, having a strong ammoniacal odor. It turns reddened litmus-paper blue, fumes with hydrochloric acid, burns readily, is more soluble in water than any other known gas. The aqueous solution is very caustic; is like aqua ammonia in its properties. C. F. CHANDLER.

Meth'ylene (CH_2). This compound, the first and simplest of the olefines, is not known with certainty in the free state. It is a diatomic radical, forming ethers analogous to those of ETHYLENE (which see). C. F. CHANDLER.

Meth'ylene Bichlor'ide, or **Chloromethyl,** a clear, very volatile, inflammable liquid of an agreeable chloroform-like odor, boiling at 88° F. Its formula is CH_2Cl_2. It was introduced into medicine as an anæsthetic in 1867 by Dr. B. W. Richardson of London. As such it surpasses even chloroform in speed of action and absence of disagreeable after-effects, but, unfortunately, like chloroform, it is not entirely safe. It is administered by inhalation through a special apparatus. EDWARD CURTIS.

Methylene Blue, Methyl Green, and **Methyl Violet.** See ANILINE COLORS.

Metonic Cycle. See CYCLE.

Meton'ymy [Gr. μετωνυμία, "change of name"], a trope or figure of speech by which the name of one idea is substituted for that of another to which it stands in some relation, such as that of cause to effect, substance to quality, precedent to sequence, etc. As the connection between the two ideas must be real, and not a mere combination accomplished by the imagination, this trope has been defined by Dr. Krauth as a grammatical and not a rhetorical figure. (See FIGURE, GRAMMATICAL and RHETORICAL.)

Mètre [Gr. μέτρον, "measure"], the linear base of the metric system of weights, measures, and moneys. Theoretically, it is the $\frac{1}{10000000}$th part of the quadrant of a terrestrial meridian; actually, it is the length of a bar of platinum designed to represent that dimension (3.280899 feet = 39.37079 inches), now deposited in the Palace of the Archives of France in Paris. (See METRIC SYSTEM.)

F. A. P. BARNARD.

Me'tre [μέτρον, "measure"], the arrangement of rhythmic feet into groups constituting lines or stanzas. In English verse a *foot* is a binary or triple group of syllables which admit of being distributed into rhythmic periods by means of the presence or absence of accent, or the distribution of strong or weak effects. Feet are the measures of verse, the form of which depends on their number, kind, and succession; and when the groups of feet are too long to be readily seized by the listener, they fall into rhythmic prose, as in much of Macpherson's *Ossian:*

> The maids of the song came into our presence, and the mildly blushing Everallin. Her dark hair spread on her neck of snow, her eye rolled in secret on Ossian; she touched the harp of music, and we blessed the daughter of Branno.—*Lathmon.*

Whether the following Ossianic example contains three or four feet depends upon the accent of the last word:

Once' we | wres'tled on | Mal'mor; . . .
Once' we | wres'tled | on' Mal | mor';

the latter form being the correct one. In case "on' Mal'" are both accented, we get part of a second line—

Once' we | wres'tled | on' 𝄾 |
Mal'mor | . . . ,

where the first line is *catalectic*, or incomplete at the end; but should a line end in a weak syllable, as in

The ves' | per hymn' | is steal' | ing,

the overplus syllable makes it *hypermetric*. A perfect line commonly bears the inconvenient negative name of acatalectic, instead of which we apply the term *holometric* (ὅλος, "entire") to forms like

Hark', the | ves'per | hymn' is | steal'ing |;

and *amphimetric* when the time of a foot is made up of an initial *anacrusis* (or preliminary fragment of a line or a strain) and a final *catalexis*—a common phase in music and in lyric verse:

Be | hold' the | chief' who | now' com | mands'.

In the stanza following the first three lines are *independent* in metre, each being complete in itself, but the third and fourth are *dependent*, because they have the foot "light with" in common—

Common | Sense one | night, 𝄾‖ Catalectic line.
Though not | used to | gambols, ‖ Holometric "
Went out | by moon | light,- Catalectic "
With ‖ Genius, | on his | rambles. ‖ Anacrusic "
Th. Moore.

In the next dependent lines (Campbell, 1801) it will be observed that a dissyllabic ending requires a monosyllabic initial in the next line, as "-saken, In," while a monosyllabic ending requires a dissyllabic continuation, as "shore; but a-":

Erin, my | country! though | sad and for | saken,-
In | dreams I re | visit thy | seabeaten | shore;-
But, a | las! in a | fair foreign | land I a | waken,-
And | sigh for the | friends who can | meet me no | more!

But this important metric point is neglected in other lines, such as—

Never a | gain in the | green sunny | bowers,-
Where my | forefathers | lived, shall I | spend the sweet | hours,

where the rhythm is injured by a foot of four syllables. These lines belong to a poem commencing with the amphimetric line—

There | came to the | beach a poor | exile of | Erin;

and, judged by its metre, the absence of the anacrusis in a correlative catalectic line like

𝄾 | Erin, my | country! though | sad and for | saken,

makes it *acephalous* or headless.

In the following lines of Collins we may mark the first as oxytonic (see under PROSODY), and the second as paroxytonic:

But thou', | O Hope'! | with eyes' | so fair', ‖
What' was | thy' de | light'ed | meas'ure? |

But as this changes the rhythm and brings two accents ("fair′," "what′") together, the better scansion is—

But | thou′, O | Hope′! with | eyes′ so | fair′,
¬ | What′ was | thy′ de | light′ed | meas′ure? |

Gray's paroxytones—

Thee, the | voice, the | dance o | bey, ¬ |
Temper'd | to thy | warbled | lay, ¬— |

are better than the oxytonic scansion—

| ¬ Thee, | the voice, | the dance | obey, ‖
Temper'd | to thy | warbled | lay. ¬ |

The latter scansion is inconsistent with our musical notation, which places the accented note and syllable at the beginning of the measure, and as a consequence most verse, however written, is recited with the initial accent.

As in the Latin hexameter, there are neutral feet in English verse, but here, instead of being rhythmic, they are monotonous bits of prose inserted to fill out the metre. This defect is indicated by italics in the following lines, which are mere prose:

Let the mad poets say whate'er they please
Of the sweet fairies, peris, goddesses,
There is not such a treat among them all,
Haunters of cavern, lake, and waterfall,
As a real woman, lineal indeed.—Keats.

Dryden makes efficient use of neutral feet composed of weak syllables to paint rapidity of action, as in

Swift as a shaft′, or wīngĕd wīnd′, she flies′,
And dart′ing to the port′, obtains′ the prize′.

Metre is *symmetric* when the number of syllables in the line is a multiple of the accent-places; in other cases it is *unsymmetric*. The mixed metre line,

Calls′ a | loud′ to the | chase′,

is symmetric, because the third syllable of the second foot supplies the deficiency of the third, and allows of a scansion in pure binary rhythm and compound metre:

Calls′ a | loud′ to ‖ the chase′.

Metre is *simple*, whether in binary, triple, or mixed rhythm, when the strong and weak syllables follow in a certain degree of regularity; it is *compound* when different parts of the line or stanza admit of a different scansion, as in Dr. Guthrie's line—

Wait′ing | till′ the | Mas′ter ‖ shall bid′ | me rise′ | and come.′ |

The most common English metre is the *heroic* line of ten syllables, a pentapody in which the second, fourth, sixth, eighth, and tenth occupy the points of accent. This metre is often varied by a hexapody or Alexandrine, as in the last line of the Spenserian stanza—

What booteth then the good and righteous deed,
If goodnesse fiud no grace, nor righteousnesse no meed?

A monosyllable *per se* cannot form a foot, but with the aid of a rest it may occupy the time of one, as in the two first feet of Tennyson's—

Break, | break, | break,—
At the | foot of thy | crags, ‖ O Sea! |

or—

At the | foot of ‖ thy crags, | O Sea! |

A detached single foot is not metric, but it may fill out the metre of other feet, or become metric by repetition. The examples of monopody which follow fall respectively into four and three metric lines. The side letters indicate the rhymes:

Let′ us *a*
Nightly *b*
Get a *a*
Sprightly *b*
Cup or *c*
Supper *c*
In—or *d*
Dinner. *d*

When damp′, *a*
With lamp *a*
I tramp, *a*
My cup *b*
To sup, *b*
And dip *c*
My lip *c*
In flip. *c*

The next form is a paroxytonic (′ °) holometric tetrapody, in binary rhythm:

Senseless trees, they cannot hear thee;
Ruthless bears, they will not cheer thee.—*Shakspeare.*

This is the metre of *Hiawatha*, of the Finnish *Kalevala*, and it is known to Oriental and Slavonic verse. The shortness of the lines leaves little room for variety, and it has been but sparingly used in English, where a form is preferred with the alternate lines shortened, and which is sometimes written in long lines—

Leapt the troutling idly darting from some root-encircled spot,
Bent the bulrush, blushed the mallows, smiled the blue forget-me-not.— *All the Year Round*, July, 1870.

Cease, rude Boreas, blustering railer!
List, ye landsmen, all to me;
Messmates, hear a brother sailor
Sing the dangers of the sea.—*G. A. Stevens.*

Akin to this, we have lines like these of Hemans:

There's beauty all around our paths, if but our watchful eyes
Can trace it 'midst peculiar things, and through their lowly guise;

constituting the metre of Chapman's *Homer*, Phaer's *Virgil*, and Golding's *Ovid*. Such long lines require a wide page, and as a consequence they are commonly cut in two (at a point indicated by the commas in the preceding distich), when they are known as ballad metre, service metre, or common metre. Originally, when such lines were divided, the copyist did not always use additional capitals, and in fact there is no reason why printed verse should differ from prose in this respect, particularly in Greek and Latin:

Eche daye declareth by his course,
an other daye to come,
And by the night we knowe likewise
a nightly course to runne. *Sternholde*, 1551.

The additional syllable in triple rhythm yields somewhat more material for variety than binary rhythm affords, but most of the metres in one may be represented in the other. When feet of two and of three syllables are used together, they constitute an inferior kind of metre in *mixed rhythm*. (See the final paragraph at HEXAMETER.) As in music an appropriate *modulation* introduces a discord, so in mixed metre the addition or suppression of a syllable should be so managed as not to shock the rhythmic sense; the syllables in the binary feet should be rather long, those in the triple ones rather short.

The metres used in hymnology are given in treatises on rhetoric, grammar, and sacred music. The present article and others on collateral subjects are based upon a volume on English prosody prepared by the writer.

S. S. HALDEMAN.

Met′ric System, The, of Weights, Measures, and Moneys, a system designed to remove the confusion arising out of the excessive diversity of weights and measures prevailing in the world, by substituting in place of the arbitrary and inconsistent systems actually in use, a single one constructed on scientific principles and resting on a natural and invariable standard. The proposition for the creation of such a system originated in 1790 with Prince Talleyrand, then Bishop of Autun. He recommended the length of the pendulum beating seconds in latitude 45° as a suitable linear basis, and introduced into the National Assembly of France a decree embodying this proposition and providing for a scientific determination of the exact length of this pendulum by a commission to be composed in equal numbers of members of the French Academy of Sciences and of the Royal Society of London. This decree with some modification was adopted, and the king, Louis XVI., was requested to open a correspondence on the subject with the king of Great Britain, which he did; but owing to the temper and the public troubles of the times this overture met with no response. Similar applications to other nations were more successful, and in subsequent proceedings, Spain, Italy, the Netherlands, Switzerland, Denmark, and Sweden participated by sending delegates to an international commission. The system itself was however matured by the labors of a committee of the Academy of Sciences, embracing Borda, Lagrange, Laplace, Monge, and Condorcet, five of the ablest mathematicians of Europe. Their report, dated March 19, 1791, after considering the comparative fitness, as a standard of length, of the pendulum and of the earth itself in some one of its natural dimensions, decided in favor of the latter, and recommended as the standard unit of linear measure, one ten-millionth of the quadrant of a terrestrial meridian. The report was communicated to the Assembly and received its sanction. Committees of the Academy were then charged with the duty of making the necessary determinations of the standard units, including those of capacity and weight as well as that of length. An arc of the meridian passing through Paris and extending from Dunkirk to Barcelona was measured trigonometrically by Delambre and Méchain, an operation of immense labor which occupied seven years; the object being to ascertain with the greatest exactness the length of the linear base, called the METRE. It was resolved to make the unit of volume equal to the capacity of a cubical vessel measuring one-tenth of a metre on its edges; and the standard of weight, the actual weight of distilled water which should fill such a vessel at the temperature of maximum density. The weight of a given volume of water under these conditions was therefore made a subject of elaborate investigation by a committee of the Academy, and in conformity with the results obtained, the standard unit of weight, called the *gramme*, was fixed at one one-thousandth part of the standard weight above mentioned, which, being one thousand grammes in weight, is called the *kilogramme*.

On the 4th day of the month Messidor, in the seventh year of the Republic "one and indivisible," the international commission above referred to, after having carefully tested the accuracy of the standards prepared by the committees of the Academy, proceeded in a body to the Palace of the Archives in Paris, and there deposited the standard metre, a simple bar of platinum, which represents the linear base of the system, and the standard kilogramme, a simple cylinder, also of platinum, which represents the unit of metric weights. The value of these units had, however, been ascertained much earlier with an accuracy sufficient for all practical purposes; and by a law passed on the 1st of August, 1793, the metric system was established as the only legal system of weights and measures for France and the French colonial possessions. The system has since been successively adopted by Holland, Belgium, Spain, Portugal, Italy, the German Empire, Greece, Roumania, British India, Mexico, New Granada, Ecuador, Peru, Brazil, Uruguay, the Argentine Confederation, and Chili. Switzerland, without adopting the system in full, has given to all her standards metric values, and Denmark has done the same for her standard of weight. Austria has adopted the system for custom-house purposes, and Turkey has introduced a metric measure of length. In Great Britain the use of metric denominations in business transactions has been made legally permissible; but, by a singular inconsistency, the metric weights and measures themselves are not allowed to be kept in tradesmen's shops, and employed in actual commerce. In the United States, metric weights and measures were legalized by an act of Congress passed July 27, 1866, and at the same time the Bureau of Weights and Measures at Washington was directed to prepare and furnish to the executive authorities of the several States authenticated standards for the verification of metric weights and measures used in commercial affairs. The aggregate population of the countries in which the metric system has been established by law amounts to nearly 350,000,000; of those in which it has been partially introduced, to about 70,000,000; and of those where its use is legally permissible, to 70,000,000 more. It has thus been adopted by largely more than one-half the civilized and Christian world.

The question has been somewhat discussed whether the prototype metre of the Archives is really, with great severity of exactness, as it purports to be, one ten-millionth part of a terrestrial quadrant. This question complicates itself with the further question what is the true figure of the earth. There is no doubt at all of the accuracy of the measurement made by the French geodesists; but they measured only about ten degrees of the Paris meridian, and from this measurement deduced the length of the entire quadrant of ninety degrees, by calculation on the supposition that the earth is a regular spheroid having an ellipticity of $\frac{1}{309}$th. The investigations of Gen. T. F. De Schubert of the Russian army, and of Capt. A. R. Clarke of the British Ordnance Survey, have made it probable that the earth is an ellipsoid of three unequal axes, rather than a spheroid, and that the meridian passing through Paris is a trifle longer than the French computers supposed. If this is so—a thing, however, which must be yet regarded as doubtful—the prototype metre of the Archives is by a very minute fraction (hardly more than one two-hundredth of an inch) less than $\frac{1}{10000000}$th of the Paris meridian quadrant. On the other hand, it is, on the same supposition, with almost mathematical exactness, the $\frac{1}{10000000}$th part of the meridian quadrant passing through New York City.

These discussions, and the desirability of settling all doubts as to the stability of the system and the permanency of its unit-bases, as well as of providing authenticated copies of the prototype standards to be distributed to the governments of all metric nations, and of securing such standards against the danger of alteration in all coming time, led to the assembling at Paris, in the year 1870, of an international commission to consider and adjust all questions connected with this subject. In this commission, thirty independent powers were represented. The deliberations of the commission, interrupted by the war of that year between France and Germany, were subsequently resumed, and resulted at length in an international convention providing for the maintenance at Paris of an International Bureau of Weights and Measures, to be supported by *pro rata* contributions from all the signatory powers, and charged with the care of the prototype standards, and with the duty of constructing and verifying copies of those standards not only for the powers interested but for other governments or even for corporations and individuals who should apply for them and should be willing to pay the expense attending their construction and comparison. This convention was signed in March, 1874, the diplomatic representative of the United States, Mr. Washburne, being, by consent and direction of the President, one of the signers. It was resolved by this commission that the prototype metre and the prototype kilogramme of the Archives shall be recognized and perpetuated for ever as the true bases of the system, without regard to any doubtful questions which have been raised as to the exactness of their correspondence with their theoretic values.

The units of the Metric System are five—viz. 1. The Metre—the unit of length = 3.280899 feet = 39.37079 inches.

2. The Are—the unit of surface = the square of ten metres = 119.60332 square yards.

3. The Litre—the unit of capacity = the cube of one-tenth of a metre = 0.26418635 gals. = 1.0567454 qts. = 2.1134908 pints.

4. The Stere—the unit of solidity = one cubic metre = 35.336636 cu. feet = 1.308764 cu. yards. This unit has fallen into general disuse.

5. The Gramme—the unit of weight = 15.43234874 grains troy.

Each unit has its decimal multiples and submultiples; that is, weights and measures ten times larger or ten times smaller than the unit of the denomination preceding. These multiples and submultiples are indicated by prefixes placed before the names of the several fundamental units. The prefixes denoting multiples are derived from the Greek language, and are *deka*, ten; *hecto*, hundred; *kilo*, thousand; and *myria*, ten thousand. Those denoting submultiples are from the Latin, and are *deci*, tenth; *centi*, hundredth; and *milli*, thousandth.

The unit of itinerary measure is the Kilometre, which is equal to 0.62138 mile.

The unit of land measure is the Hectare, equal to 2.47114 acres.

The unit of commercial weight is the Kilogramme, equal to 2.20462125 pounds avoirdupois.

The system of French moneys is connected with that of metric weights by the creation of a coin of standard silver (nine parts pure silver and one of alloy) to represent the monetary unit, called the Franc, having the weight of exactly five grammes; the coins of higher and lower denominations being multiples and submultiples of this. As in the coinage system of France gold and silver are equally standard metals, it is necessary that their relative values, weight for weight, should be determined by an arbitrary ratio. This ratio is fixed by law at 15½ to 1; and accordingly the twenty-franc piece of gold, commonly (though not legally) called the napoleon, has the weight of twenty times five grammes divided by 15½, which is equal to 6.4516 grammes of standard gold. F. A. P. Barnard.

Met'ronome [Gr. μέτρον, "measure," and νόμος, "a division"], in music, an instrument for the measurement and regulation of time. As the directive terms usually prefixed to musical compositions, such as *adagio*, *lento*, *andante*, *allegro*, etc., can only give to the performer an approximate idea of the rate or velocity intended by the composer, various means have been employed to indicate the speed with more precision. The metronome, invented by John Maelzel, a mechanician in the service of the emperor of Austria, and brought into use in the early part of the present century, is a simple but ingenious contrivance by which any degree of slowness or rapidity can be marked, and practically shown with the greatest exactness. The instrument is small and portable, in form between that of the pyramid and the obelisk, and consists of an inverted steel pendulum (eight or nine inches long), on which is a sliding weight which may be moved up or down the pendulum, and thus brought opposite to any of the figures on a graduated scale in its rear. The pendulum is moved by simple wheelwork, and makes a loud tick for every vibration. It is evident that the sliding weight determines the rate at which the pendulum will vibrate. If it is near the point of suspension the motion will be rapid; and the rapidity decreases in proportion as the weight is moved towards the remote end, where the slowest point is reached. In practical use the object is to ascertain how many minims, crotchets, etc. of a given piece of music are to be performed in *one minute* of time. The numbers on the scale have therefore reference, as Mr. Maelzel remarks, "to a minute of time—*i. e.* when the weight is placed at 50, fifty beats or ticks will occur in each minute; when at 60, sixty beats (or seconds exactly) in a minute; when at 100, one hundred beats in a minute," etc. The rate at which any piece of music is to be played is thus easily found when the metronome mark is placed by the composer at the beginning. For example, 𝅗𝅥 = 50, means that when the sliding weight is placed at that figure on the graduated scale, the pendulum will vibrate *once for every minim* in the music, and that there will be fifty minims (or their value in other notes) in a minute of actual or clock-time. And when the rate indicated is ♩ = 75, and the weight is set accordingly, then the pendulum will vibrate and tick seventy-five times (or crotchets) in each minute. William Staunton.

Metrop'olis City, cap. of Massac co., Ill. (see map of Illinois, ref. 12–F, for location of county), 40 miles above the mouth of the Ohio River, has ship-yards, steam saw-mills, flouring-mills, and a steam-ferry. Pop. in 1870, 2490; in 1880, 2668.

Met'ternich (Clemens Wenzel Nepomuk Lothar), Prince, b. at Coblentz May 15, 1773; studied jurisprudence at Mentz and Strasburg; was appointed Austrian ambassador at the Hague in 1794, but returned to Vienna after the conquest of the Netherlands by the French; married in 1795 the granddaughter and sole heiress of Prince Kaunitz; was employed at the Congress of Rastadt (1797–99), and went in 1801 to Dresden as ambassador, in 1803 to Berlin, and in 1806 to Paris; on Oct. 8, 1809, was made minister of foreign affairs, and on May 25, 1821, chancellor of the empire, which positions he held till Mar. 13, 1848. With great shrewdness he kept Austria out of the great conflict of 1813 until she could make her own conditions for her participation, and at the Congress of Vienna (1814), of which he was unanimously chosen president, he procured for Austria a great extension of territory and a prominent position in Germany and Italy. For the next thirty years he actually stood at the head of the continental politics of Europe, and by the congresses of Aix-la-Chapelle (1818), Carlsbad (1819), Vienna (1820), Laybach (1821), Verona (1822), Münchengratz (1833), Töplitz (1835), etc., and by the aid of the Holy Alliance, he succeeded in suppressing almost every national or liberal movement in Europe. He most completely worked out his system within the boundaries of Austria, which by censure, police, etc. was almost hermetically shut out from the rest of Europe. Nevertheless, on Mar. 13, 1848, the revolution in Vienna compelled the prince to flee for his life. He resided in London till Nov., 1849, when he returned to Vienna, where he lived in retirement till his death, July 11, 1859. There are a collection of his writings (*Denkwürdigkeiten*) and an autobiography, the latter published in 1880.

Mettray', a v. of France, in the department of Indre-et-Loire, contains a celebrated institution for juvenile delinquents which has been in operation for several years with great success. Pop. in 1881, 1413.

Metz, a city and fortress in Alsace-Lorraine, on the Moselle, has 53,131 inhabitants (Dec. 1, 1881). The town is beautifully situated on both sides of the river, which divides into several arms, surrounded by mountains, and is one of the strongest fortresses in the world. Seven strong forts—Plappeville and St. Quentin to the W., St. Eloy to the N., St. Julien to the N. E., Les Battes to the E., Quenlen to the S. E., and St. Privat to the S.—crown the hills around it. It is the seat of the highest authorities of Lorraine, of a bishop, of a civil and commercial tribunal, etc., and has an academy, a college, 2 seminaries, a school of artillery, a museum with collections of Roman antiquities, coins, and pictures, a library containing 30,000 volumes, a botanical garden, and an arsenal. The most important public buildings are—the cathedral of St. Stephen, a Gothic structure, commenced in the thirteenth century, the nave finished in 1392, the choir in the sixteenth century, with a tower 118 mètres high and containing a bell weighing 260 cwts.; the church of St. Vincent, commenced in the thirteenth century; the church of St. Eucharius, from the twelfth century; and the palace of justice, from the eighteenth. Statues of Marshal Fabert and Marshal Ney adorn the city. The esplanade presents beautiful walks; opposite stand the magnificent barracks. Brushes, fur, felt, leather, paper, soap, silk, woollens, embroideries, drugs, etc. are manufactured, and a brisk trade is carried on in wine, timber, corn, and hides.

Metz, whose ancient name was *Divodurum* or *Mediomatrica*, was destroyed by Attila in the fifth century, then became the capital of Austrasia, fell on the division of the empire of Charlemagne to Germany, and was established as a free imperial city, governed by a count in the name of the emperor. In 1444 the French besieged the city without taking it, but in 1552 it fell into their hands. The Protestant princes of Germany, with the elector Maurice of Saxony at their head, asked King Henry II. of France to aid them against the German emperor. Henry entered Lorraine with 35,000 men, and, calling himself *vindex libertatis Germanicæ*, demanded free passage through the cities, also through Metz. But his troops, having entered the city under the constable of Montmorency, remained there. The emperor Charles V. besieged it in vain from Oct., 1552, to Jan., 1553; the French commander, Duke Francis of Guise, defended it successfully. Nevertheless, the French considered themselves as yet only the protectors of the city; Louis XIII. was the first who exercised the rights of a sovereign, and made it in 1633 the seat of a parliament. The German empire complained, but was too weak to retake the city, and by the Peace of Westphalia in 1648 the authority of France over Metz, as well as over Toul and Verdun, was acknowledged and guarantied. But by the war of 1870–71 the state of affairs was entirely changed. The fortress, which had been much strengthened by Napoleon III., formed the principal point of support for the imperial army drawn up along the German frontier, and after the first defeats at Weissenburg and Wörth it served as a retreat for the largest part of the army, numbering more than 180,000, under Marshal Bazaine. But before the marshal could lead this army out for operations in the open field he was shut up in the fortress by the manœuvres of the Germans. First he was attacked at Courcelles, Aug. 14, 1870, to the E. of the fortress, and thereby prevented from completing in proper time his march through, though he had already commenced it. Then, having left the fortress, he was attacked (Aug. 16) by Prince Frederick Charles on the opposite side, and thrown back within the walls of Metz by the battle of Vionville. At last, by the battle of Gravelotte (Aug. 18) he was compelled to shut himself up in Metz. Prince Frederick Charles enclosed Metz with an army of 200,000 men, and thus the memorable siege began which ended with the surrender both of army and fortress. Provided with a suitable garrison, Metz might have held out for a long time, but an army so large would necessarily consume the supplies very soon, and be compelled by hunger to surrender. The fortress, on the other hand, weakened the army, which, drawn up between the forts, could only form slowly under the eyes of the enemy and within reach of his guns. Thus it happened that these two powerful agencies of resistance neutralized each other because they were unduly combined. Nevertheless, in spite of this wretched situation and the greatest privations, the army held out for a long time and made several brilliant sallies. A severe contest took place between the besiegers and the besieged on Aug. 31 and Sept. 1. On these two days Bazaine endeavored with his whole force to break through to the N. E., in the direction of St. Barbe and Malroy-Charly, expecting that the army of Chalons would approach at the same time and support him. But this army did not come up; it was itself enclosed at Sedan by another German army, and the attempt at breaking through met with so stubborn a resistance in the battle of Noisseville that, after a contest of two days, in which there fell on the German side about 2000 men and on the French side still more, the French were compelled to return to the fortress. The situation of the French army became more and more wretched under the double influence of both moral and physical sufferings. The damp weather and the scanty and poor food caused much sickness. The German army also suffered much from its long inaction; it had more than 25 per cent. sick. At last, toward the end of October, Bazaine offered to capitulate, having lost, from Aug. 14 to Oct. 7, 25 generals, 2099 officers, and 40,339 men, wounded, dead, and missing, without counting the sick. On Oct. 27 the capitulation was concluded, according to which the fortress was to be occupied by the Germans, and the French army to go to Germany as prisoners of war. All war-materials and insignia of honor were to be given up to the Germans. The French army which surrendered, including the sick and the national guard, comprised 173,000 men, with 6000 officers and 3 marshals. The war-material, worth 80,000,000 francs, comprised 800 cannon, furniture for 85 batteries, 66 mitrailleuses, 300,000 muskets, an enormous number of sabres and cuirasses, 2000 wagons, etc.; 53 eagles and colors were taken. By the Peace of Frankfort (May 10, 1871) Metz was ceded to the German empire, and the German military administration has strengthened the fortress. (See Bazaine.) August Niemann.

Met'zu (Gabriel), b. at Leyden in 1615; resided in Amsterdam, and acquired a reputation as a genre painter equal to that of Terburg and Dow. His pictures are rare. D. at Leyden about 1667.

Meudon', town of France in the department of Seine-et-Oise, has a fine palace, extensive wine-culture, and manufactures of glass. Pop. 6080.

Meu'lebeké, a v. of Belgium, in the province of West Flanders, 20 miles S. W. of Ghent, on the Mandel, an affluent of the Lys, carries on flax-spinning and manufactures of lace. Pop. 8249.

Meung, or **Mehun, de** (Jean), b. at Meun, near Orleans, about 1279; lived at the court of Philippe le Bel, where he enjoyed a great reputation for his scholarship, his talent as a poet, and his biting sarcasm, and d. about 1320. His principal work is his continuation of the *Roman de la Rose*. This famous work was commenced, but left unfinished, by Guillaume de Lorris; more than one-half of the work was composed by Jean de Meung.

Meur'sius (Johannes), [Dutch, *De Meurs*], b. at Loosduinen, near the Hague, in 1579; studied philology; travelled much, and became professor of history at Leyden in 1610, afterwards of Greek, but left Holland, disturbed by the political broils in his country, and accepted a position at the Academy of Soröe in Denmark, where he d. Sept. 20, 1639. He was one of the most learned men of his age, and his *Glossarium Græco-barbarum* (1614) and *Athenæ*

Batavæ (1625), as well as his numerous critical monographs relating to the later Greek and Roman literature, are still of interest. He also wrote a history of Denmark in Latin. His works by Lamie (12 vols. fol., Florence, 1741–63).

Meurthe-et-Moselle, a department of North-eastern France, was formed after the Franco-Prussian war, on Sept. 11, 1871. It comprises an area of 2025 square miles with a population of 419,317. It consists of the four arrondissements, Briey, Lunéville, Nancy, and Toul, and contains some of the most beautiful scenery and some of the most fertile soil in France. Vine-culture is the chief occupation; half of the surface is occupied by vineyards. Cap. Nancy.

Meuse, department of North-eastern France, comprising an area of 2368 square miles, with a population of 289,861. It extends along both sides of the river Maas, which is enclosed between two ranges of low hills running parallel with it. The valley is very fertile and produces wheat and good wine; cattle, horses, swine, and bees are reared. The hills contain iron, limestone, and gypsum. Cap. Bar-le-Duc.

Meuse, a river of Europe which rises in France, in the S. of the department of Haute-Marne, and proceeding N. crosses the N. W. corner of the department of Vosges, and traverses the departments of Meuse and Ardennes, through the wild mountainous region of which latter, still known as the "Forest of Ardennes," it pours through a wild romantic gorge; on reaching Sedan it enters Belgium, and at Namur, where it receives on the left its largest tributary, the Sambre, almost doubling its volume, changes its course to N. E., and passes Liège, where it is augmented by the Ourthe; separates Dutch from Belgian Limburg, passing Maestricht and Roermond, at the latter of which it receives the Roer; at Bommel it draws so close to the Rhine as to be brought into communication with it; resumes its W. course, and finally turning N. W. joins the left bank of the Waal, one of the arms of the Rhine, and gives its name to the mighty accumulated flood of these streams, which proceeding W. is divided near Dordrecht into two great rivers, the one of which bends round to the N., and reaches Rotterdam; the other branch continues W.; and shortly after the two branches again unite and discharge themselves, amid shoals and quicksands, into the North Sea. Total length, 580 miles, of which 460 are navigable.

Mex'ia, Limestone co., Tex. (see map of Texas, ref. 3–I, for location of county), 231 miles N. W. of Galveston, on the Houston and Texas Central R. R., has a weekly newspaper, established in 1869, an academy, and a mill. Pop. in 1880, 1298.

Mexican Antiquities. See ARCHITECTURE OF THE AMERICAN ABORIGINES, by HON. L. H. MORGAN, LL.D.

Mexican Hieroglyphics. See INDIAN LANGUAGES OF AMERICA, by HON. J. HAMMOND TRUMBULL.

Mexican Languages. See INDIAN LANGUAGES.

Mex'ico [from Aztec, *Mexitli*, a name of the tutelary divinity], **United States of,** a federal republic of North America, and, next to the U. S., the most populous and wealthy country of the New World, occupies the whole breadth of the continent between the U. S. on the N. and Central America on the S. E., stretching from the Gulf of Mexico and the Caribbean Sea on the E. to the Pacific Ocean on the W. and S. In shape resembling a cornucopia, it has a length of 1950 miles along the axis of the continent, from the N. line of Sonora to Yucatan, a maximum breadth of 750 miles E. and W. in the latitude of Matamoras (excluding the peninsula of Lower California), an average breadth of about 400 miles in a line from N. E. to S. W. drawn through the capital, and a minimum breadth of 140 miles N. to S. at the Isthmus of Tehuantepec, with a coast-line of more than 6000 miles. The natural grand divisions of the country are those made by the tropic of Cancer and the Isthmus of Tehuantepec, which separate the original Mexico, central and tropical, from Northern and Eastern Mexico, which in colonial times were for the most part separately named and governed.

Area and Population.—The following table exhibits the areas of the 27 states, the territory of Lower California, and the federal district, according to the calculation made in 1882 by the Mexican government. No accurate census has ever been taken, but there can be no doubt that the population now (1884) exceeds 10,000,000. The population of the City of Mexico, given as 300,000, should properly include that of the whole federal district (461 square miles), or 439,769. Other large cities not capitals of states are Leon (Guanajuato), with a population estimated at 56,500, Celaya, San Miguel de Allende, Salvatierra, Orizaba, Zapotlan, Lagos, Tepic, Zamora, Matamoras, and Huajuapan, which range between 40,000 and 20,000. Emigration to Mexico is rapidly increasing; in 1882, 11,000 immigrants entered the port of Vera Cruz, mostly Italians and Spaniards. It has been stated, however, that a large proportion of the immigrants leave the country again.

States.	Area in square miles.	Population.	Capitals.	Pop. of capital.
Aguas Calientes...	2,895	140,430	Aguas Calientes	25,000
Campéche...........	25,832	90,413	Campéche.........	15,190
Chiapas	16,048	209,362	San Cristobal....	8,500
Chihuahua.........	83,746	225,941	Chihuahua........	12,116
Coahuila..............	50,890	130,026	Saltillo	20,000
Colima.................	3,743	65,827	Colima..............	23,572
Durango.......... ..	42,510	190,846	Durango...........	27,119
Federal Dist.........	461	439,769	Mexico.............	300,000
Guanajuato	11,411	834,849	Guanajuato	56,112
Guerrero	24,550	301,498	Chilpancingo.....	3,800
Hidalgo..............	8,163	427,390	Pachuca	22,000
Jalisco................	39,168	983,484	Guadalajara......	78,600
Lower California..	61,562	30,208	La Paz.............	2,396
Mexico........	7,838	710,579	Toluca..............	18,000
Michoacan..........	25,689	661,634	Morelia......	20,400
Morelos.............	1,776	159,160	Cuernavaca	16,320
Nuevo-Leon.........	23,635	203,284	Monterey..........	33,811
Oaxaca................	33,591	744,000	Oaxaca..............	26,228
Puebla................	12,021	784,466	Puebla..............	64,588
Querétaro...........	3,207	203,290	Querétaro.........	27,560
San Luis Potosi ...	27,500	516,486	San Luis Potosi	34,300
Sinaloa...............	36.198	186,491	Culiacan...........	7,878
Sonora	79,021	115,424	Ures	9,700
Tabasco..............	11,851	104,747	San Juan Bautista..............	6,800
Tamâulipas	30,225	140,137	C. Victoria.........	7,800
Tlaxcala..............	1,620	138,988	Tlaxcala	4,300
Vera Cruz...........	26,232	542,918	Jalapa....	14,200
Yucatan	29,567	302,319	Merida	32,000
Zacatecas............	22,998	422,906	Zacatecas..........	35,000
Total..............	743,948	10,046,872		

Physical Features.—Mexico proper consists of a vast table-land 6000 to 8000 feet above the sea, with narrow fringes of semi-tropical terrace-lands (*tierras templadas*) varying in elevation from 3000 to 5000 feet, and lowlands (*tierras calientes*) stretching from the sea-coasts to the bases of the mountains. The two latter regions sometimes penetrate far within the central mountain-system, along the courses of streams, expanding into broad fertile valleys, as in portions of Oaxaca, Puebla, Morelos, Mexico, Michoacan, and Jalisco. The mountain-system of Mexico is the northern prolongation of the Cordillera of the Andes (though the latter name is unknown in Mexico), divided into several branches. The *Sierra Madre*, or "mother-range," extends from the Isthmus of Tehuantepec to the northern frontier of the republic, skirting the Pacific at a considerable distance inland. A coast-range projects northward along the Gulf of Mexico, rising to the height of 17,879 feet in the celebrated peak of Orizaba; the central range, or *Cordillera de Anahuac*, which surrounds and separates the valleys of Mexico and Puebla, reaches, in the mighty cone of Popocatapetl, the height of 17,784 feet, while its twin volcano, Iztaccihuatl, attains 15,705 feet, and *Nevado de Toluca* (90 miles N. W.), 16,616 feet. Many other mountains vary from 10,000 to 12,000 feet, but the four so-called "volcanoes" above named are the only ones which are covered with perpetual snow. Popocatapetl alone occasionally sends up clouds of smoke, the most active volcanoes in modern times being the smaller ones of San Martin Tuxtla (Vera Cruz) and Jorullo (Michoacan). The central table-land of Mexico, broken by numerous transverse ranges into a series of great valleys, or rather basins, sometimes scores of miles in width, descends gradually northward, and Northern Mexico consists of a similar series of mountains and valleys at a less elevation. In Eastern Mexico the peninsula of Yucatan (including Campéche) is a vast plain which rises but slightly above the level of the sea, while the states of Chiapas and Tabasco belong geographically to the Central American mountain-system.

Climate.—There are in tropical Mexico but two seasons, the rainy and the dry, of irregular duration, usually extending from May to October, and from October to May, respectively, the heaviest rains occurring in September. The dry season is marked by frequent *nortes*, or gales of wind, sweeping southward across the Gulf of Mexico, rendering navigation somewhat perilous during their continuance. The mean annual temperature in the *tierras calientes* is from 75° to 85° F., in the *tierras templadas* from 65° to 70°, and in the *tierras frias* from 55° to 62°, rarely rising to 80° or sinking to 45°. At many points on the coast, however, especially at the ports of Vera Cruz, Acapulco, Mazatlan, and Guaymas, the summer heat ranges from 85° to 105°, usually accompanied by the terrible scourge of yellow fever. The temperate regions, or *tierras templadas*, enjoy a delicious climate, justly entitling them to the title of "paradise of Mexico" usually applied to the region of Jalapa and Huatusco. The table-land or "cold region" is cold only in a relative sense, the climate being as mild and equable as that of Naples, the chief discomfort to winter visitors arising from the rarefaction of the atmosphere. Moisture is irregularly distributed through the three regions, and largely affects their comparative healthiness, the dry climate, whether hot or cold, being reckoned the more salubrious; but this rule is not invariable, since the greatest annual rainfall (90 to 100 inches) is that of Huatusco, a healthful region of the terrace-lands.

Rivers.—From its physical configuration Mexico has few large or navigable rivers, being less favored in this important element of commercial prosperity than any other considerable country in the world except Arabia. The largest is the Rio Bravo or Rio Grande del Norte, forming the boundary with Texas, and navigable for vessels of light draught for a small portion of its lower course. The Panuco, Alvarado, Coatzacoalcos,. Grijalva, and Usumasinta, flowing into the Gulf of Mexico or the Bay of Campêche, are important streams, navigable through that portion of their course which traverses the lowlands. On the Pacific slope the largest river is the Lerma, called in its middle course Tololotlan, and in its lower course Rio Grande de Santiago, which rises in Lake Lerma in the central valley of Toluca, flows W. through Michoacan and Jalisco, traversing Lake Chapala, and forming numerous cataracts. It is wholly unnavigable, and the same may be said of the Mescala or Rio de las Balsas, which, rising in Puebla, flows W. 400 miles to the Pacific, and has been several times explored with a view to utilizing it for interoceanic communication.

Geology and Mines.—Mexico is eminently a country of mineral wealth, and its production of the precious metals was for more than three centuries subsequent to its discovery greater than that of any other country. Its geology has always been subordinated to its mineralogy, and is therefore very imperfectly known. Granite forms the foundation both of the central table-land and of the great mountain-system of Oaxaca, the mineral-bearing superstructure being chiefly porphyry. Caverns are numerous, one of them, Cacahuamilpa, being reputed the largest in the world. Much of the country has been the scene of volcanic action, of which the débris remain in immense fields of basaltic lava. Iron is found in immense masses in Coalcoman (Michoacan), Lagos (Jalisco), and in Durango, where the Cerro del Mercado is a solid mountain of magnetic iron ore. Copper, usually associated with gold, is found in considerable quantities in Chihuahua, Sonora, Guanajuato, Mexico, Guerrero, Jalisco, and Michoacan; tin in the two latter states; and lead occurs in connection with the ores of silver in many parts, but especially in Oaxaca. Quarries of marble, alabaster, gypsum, and rock-salt are numerous; sulphur is found in the craters of the volcanoes, and mineral springs occur in many localities. Cinnabar or red sulphuret of mercury has been found in small quantities in many states, and valuable mines have recently been developed in Morelos and Guerrero under the stimulus of the immense consumption and high price of quicksilver. The utility of this article for reducing silver ores was discovered in the sixteenth century by the Mexican miner Bartolomé Medina, a native of Pachuca. Bismuth occurs in several states; platinum has recently been discovered in Tlaxcala and Hidalgo, and coal has been found in small deposits in many quarters, but no mines are actually worked upon a profitable scale. Gold, being found in placers and easily worked, was the chief mineral treasure of the Aztecs, who made little use of silver from the difficulty of reducing the ores; hence, while Mexico was at first celebrated chiefly for its gold, that metal soon became subordinate to silver, and has ever since, in Mexico proper, afforded a very small proportion of the annual coinage. Of late years, however, gold-mines in the states of Mexico, Michoacan, and especially Guerrero, have been worked with profit, and, though the placers are nearly exhausted, the use of improved mining machinery will doubtless yield rich results. Silver early became, and will ever remain, the staple production of Mexico. The supply is practically illimitable. Though many thousands of mines have been abandoned as unprofitable, the introduction of improved processes of extraction and reduction and of cheap transportation through railway extension will augment the yield of silver to an indefinite extent, more especially if supplies of coal and quicksilver should in any way become cheap and abundant. In the first half of the sixteenth century the silver-mines of Tasco, Sultepec, Tlalpujahua, and Pachuca were developed by Cortés and his immediate successors. Subsequently, the great mining-districts of Guanajuato, San Luis Potosí, Zacatecas, and Durango were gradually discovered and worked, but it was not until the eighteenth century that they attained that high development which gave them a worldwide renown. At the close of that century the famous Veta Madre ("mother vein") of Guanajuato had, according to Humboldt, yielded one-fifth of the silver then current in the world, having far exceeded the famous mountain of Potosí in Upper Peru. The Veta Grande of Zacatecas during the last century frequently yielded $3,000,000 annually, and the mines of Catorce (San Luis Potosí) produced $150,000,000 in seventy-seven years. At the beginning of the nineteenth century the prosperity of Guanajuato and Pachuca attained its apogee; the proprietors of the Valenciana, Rayas, Regla, and other great *bonanzas* had become, virtually by purchase from the Spanish crown, counts or marquises under the titles of their mines, and had thus founded an aristocracy based on wealth. But the long war of independence (1810–20) ruined the mining interests of Mexico, causing the abandonment of all incipient or partially completed enterprises, and even of many prosperous mines, which soon filled with water, and have never since been worked. In 1825, on the establishment of the republican government, a fever for Mexican mines, largely traceable to the great work of Humboldt, pervaded the London money-market; the most reckless investments were made, and operations on a lavish scale of expenditure were carried out for years under the direction of so-called mining-engineers, whose inconceivable ignorance refused to learn anything from Mexican sources. Naturally, the English companies nearly all collapsed within a few years, to the great detriment of Mexico in European eyes, as the blame was, with but slight reason, ascribed either to revolutions or to the obstructiveness of Mexican governments. The mining resources of the country are now almost exclusively in the hands of Mexican capitalists, and are gradually recovering their prosperity. The Spanish "mining code," formed chiefly in Mexico, is still in use, and is the most elaborate in the world.

Mints and Coinage.—There are no less than 11 mints in the republic—namely, at Mexico (established 1538), Oaxaca, Guanajuato, San Luis Potosí, Zacatecas, Guadalajara, Durango, Chihuahua, Culiacan, Alamos, and Hermosillo. They coin on an average $20,000,000 per annum, of which less than $1,000,000 is in gold. The total production of Mexican mines up to 1880 is estimated at £622,000,000—namely, £432,000,000 for the period from 1537 to 1821, and £190,000,000 for 1821–80.

Vegetation and Agriculture.—Besides the European cereals, roots, and fruits, nearly all of which have found congenial homes in the uplands, Mexico produces a surprising variety of useful indigenous plants and trees. There are over 100 species of timber trees and cabinet woods, 17 oil-bearing plants and trees, 12 species of dyewoods, 8 of gum trees, and over 60 of medicinal plants. Indian corn is everywhere the staple food of the aboriginal population; wheat and barley grow to perfection in the central valleys, especially in the great *bajio* of Guanajuato; rice, sugar-cane, tobacco, cotton, coffee, cacao, and indigo thrive in the *tierras calientes* and *tierras templadas*, where oranges, lemons, olives, mangoes, bananas, pineapples, grapes, sweet potatoes, yuca, and scores of luscious wild fruits abound. The maguey of the *tierras frias* furnishes a palatable fruit, while its fermented juice, the famous *pulque*, constitutes the national beverage; and in Yucatan a plant of the same species affords the *heniquen*, a fibre which now constitutes the chief wealth of that peninsula. Many varieties of cactus are found, one of which is cultivated in Oaxaca as food for the cochineal insect. The mulberry thrives in Puebla, Michoacan, and Guanajuato, but the rearing of silkworms, once a considerable industry, has fallen into insignificance. The great cotton-producing regions are the northern states of Coahuila, Durango, and Sinaloa. The tobacco of Southern Vera Cruz and Tabasco, the cacao of Tabasco, Oaxaca, and Soconusco (Chiapas), the coffee of Michoacan and Colima, are reputed equal to any in the world. The market of Mexico is more abundantly and cheaply supplied with magnificent and varied flowers than that of any other city in the world.

Animal Kingdom.—All the European domestic animals are successfully reared, and the northern states are noted for their vast herds of cattle, droves of horses, and flocks of sheep. Among the wild animals are the puma, jaguar, ocelot, wolf, and coyote, with several species of bears, deer, and monkeys. Alligators abound in the lagoons and rivers of the lowlands; rattlesnakes and other venomous ophidians are common, as well as many kinds of noxious insects, especially scorpions and tarantulas. A great variety of brilliantly-colored parrots, humming-birds, and song-birds are found in the forests, as also many wild fowl and game birds. The coasts are well supplied with fish, and pearl-fishing is a valuable industry in the Gulf of California. Amber is found on the coasts of Yucatan.

Industry and Manufactures.—Agriculture is the occupation of the mass of the aboriginal population, whether in the tillage of their own small plots of ground or in the cultivation of the great plantations. Petty industries, such as the manufacture of earthenware, clay and rag figures, wooden toys, sweetmeats, artificial flowers, and other ornaments, are largely carried on in the cities, the goldsmiths especially excelling in filigree-work. Superior glassware and porcelain are made at Puebla, Texcoco, and other cities. In Leon, Celaya, Salvatierra, and other central cities the manufacture of *rebozos* or shawls, the weaving of cotton and woollen cloths by hand, and the manufacture of saddlery, all of fine quality, have acquired a great development. There are a few iron-foundries, paper, grist, and saw mills, but the latter are surprisingly rare. Cotton and woollen factories are as yet in their infancy, though a few are found in each of the principal cities, and they form a notable feature at Puebla, Querétaro, Guadalajara, Colima, and Saltillo. The manufacture of sugar is carried on upon a vast scale in Morelos.

Commerce.—The total value of exports from Mexico amounted in 1882 to £5,816,658—namely, precious metals, 3,412,753; textile fibres, 658,461; coffee, 482,908; hides and skins, 341,711; woods, 291,799; vanilla, 156,166; dye-stuffs, 68,572; sugar and molasses, 57,760; drugs, 16,494; tobacco, 70,250, etc. Of the exports, £2,752,172 went to the U. S., £2,056,875 to Great Britain, £437,334 to France, and the remainder chiefly to Germany, Spain, and Central America. The principal imports are cotton and linen manufactures, wrought iron, and machinery. The imports from the U. S. in 1882 were valued at £3,115,000—chiefly cotton, iron and steel, petroleum, wood, provisions, and refined sugar; those from France, at £1,864,899; those from Great Britain, at £1,685,541. The leading ports are Vera Cruz, Campêche, Progreso, Tampico, Tuxpam, and Matamoras on the Gulf of Mexico; Acapulco, Manzanillo, San Blas, Mazatlan, La Paz, and Guaymas on the Pacific. Of these, Acapulco is the only one having a good harbor. Nine-tenths of the foreign commerce of the republic passes through Vera Cruz, which is connected by lines of steamers with New Orleans, New York, Liverpool, Southampton, and St. Nazaire. Most of these lines touch at Progreso (Yucatan) and at Havana or St. Thomas. The American lines receive subsidies from the Mexican government. On the Pacific the steamers of the Pacific Mail Company touch twice a month at the principal ports, and also receive a subsidy. The commerce of the Pacific ports is largely in the hands of German mercantile houses. No accurate statistics are available, but the average number of vessels annually arriving in Mexican ports is not far from 5000, of which about one-fifth are national vessels.

Railways and Roads.—Until lately the only extended line of R. R. was from Vera Cruz to the City of Mexico (263 m.), with a branch from Apizaco to Puebla (29 m.). The main line was completed in Dec., 1872, having been constructed at intervals dating back to 1852. The ascent from the lowlands to the summit of the plateau (8000 feet) is a wonderful monument of engineering skill, and will compare favorably with the most noted constructions of the kind in Europe. A railway from Vera Cruz to Jalapa (about 60 miles) is now completed. Among the other lines now existing are the Mexican Central R. R., from the City of Mexico to El Paso (1224 miles); its Guanajuato branch, from Silao (14 miles); its Tampico division, from Tampico to San Luis Potosi (262 miles under construction, completed in 1884 to Valles, 70 miles); the Mexican National R. R., from Laredo to El Salado (323 miles); its Matamoras branch, to San Miguel (75 miles); its Southern general division, from the City of Mexico to San Miguel (178 miles); its Morelia division, from Acambaro to Morelia (57 miles); its Zacatecas division, from Guadalupe to Zacatecas (5 miles); its El Salto branch, to City of Mexico (50 miles); the lines from Vera Cruz to Medellin (11 miles), Mexico to Tlalpam (16 miles), and Mexico to Tlalnepantla (10 miles). In 1883 there were more than 3000 miles of railway open to traffic, with a direct connection between the City of Mexico and the City of New York. Railroads are being rapidly extended in all directions, and the frontier of the U. S. has been crossed by them at several places. A concession was granted many years since to an American company for a ship-canal across the Isthmus of Tehuantepec, and more recently for a railway. The former project is in abeyance; the latter may, it is hoped, be soon realized. The ordinary carriage-roads in Mexico are few in number, being limited to the highways between the principal cities. Mail and passenger communications are effected by means of 24 lines of diligences administered by a single company. The ordinary means of commercial transportation are by ox-carts and pack-mules. Telegraph lines have been rapidly extended since 1870. Every state capital is now in communication with the City of Mexico, and consequently with the U. S. and the whole world. The total length of telegraph-lines in 1883 was 16,938 miles, with 460 offices.

Administration.—The federal national government is administered according to the provisions of the liberal republican constitution of 1857, twice overthrown and restored (1858–60 and 1863–67), and considerably amended in 1873–74. The president is chosen by indirect popular suffrage every fourth year; the supreme judiciary and both houses of Congress are elected in the same manner, the former and the senate for terms of six years, the house of deputies for two years. The chief-justice is *ex-officio* vice-president. The senate existed for short periods under two former constitutions, but was abolished in 1853, and not restored until the constitutional amendments of 1874, by virtue of which the new senate was elected in 1875. The states have local constitutions, with elective governors and legislatures. The powers of the various branches of the national government closely resemble those of the U. S. The revenues are largely derived from export and import duties, and amounted in 1884 to $34,660,000. The expenditure during the same fiscal year was $30,730,998. The national debt, chiefly held in England, amounted in 1861 to about $60,000,000, but since the restoration of the republic, in 1867, diplomatic relations with England, as well as with France, were for a time in abeyance, and the Mexican government not only repudiates all the loans contracted by Maximilian, but holds that the former English debt was vitiated by the conduct of the British government. At the same time, it professes a willingness to make an equitable adjustment whenever the proper preliminary steps shall be taken by the British government. The total debt, with arrears of interest, amounted in 1882 to about $144,000,000. The Mexican army consists of 1741 officers and 18,894 men, who are maintained on an efficient footing at an annual expense of about $7,000,000. The navy is little more than nominal.

Religion.—During the colonial period Roman Catholicism was the only creed tolerated, and was the religion of the state under the earlier republican codes. By the constitution of 1857 all religions are equally protected, but none officially recognized by the state. The Catholic hierarchy possesses 3 archbishoprics, Mexico, Michoacan, and Guadalajara, and 12 bishoprics, Puebla, Vera Cruz, Oaxaca, Chiapas, Yucatan, San Luis Potosí, Tamaulipas, Nuevo Leon, Zacatecas, Durango, Sonora, and Lower California. The Catholic Church formerly owned nearly one-third of the soil, throughout Mexico, but by the "laws of reform" of 1856 and 1859 their landed property was nationalized, the convents abolished, and all superfluous church buildings sold or converted to public uses. American Protestant missions, chiefly of the Methodist Church, have been very successful in Mexico 1870–85, and the "Church of Jesus," a Mexican undenominational Protestant organization, possesses several large church edifices and has more than a score of congregations within the Valley of Mexico.

Education.—The University of Mexico, an ecclesiastical institution dating from the sixteenth century, was abolished in 1856. In its place special schools of law, medicine, music, agriculture, engineering, mines, commerce, fine arts, the sciences and literature, and a military college, are now maintained by the federal government, besides various grades of lower schools for both sexes, amounting in the City of Mexico to above 200, besides 100 private schools. The state governments support common schools at all the centres of population, and institutes for higher education at the capitals. The total number of public schools throughout the republic amounts to nearly 4000, and is rapidly being extended. There are also schools for deaf mutes, for the blind, and for juvenile delinquents, besides many creditable institutions supported by private beneficence. (For notices of the libraries, museums, and various other national institutions having an educational character see article Mexico, City of.)

History.—The chief interest of Mexican history prior to the present century is concentrated in the remarkable circumstances of its conquest (for which see Cortés, Hernando). The shadowy and uncertain events prior to Spanish discovery have been given with sufficient fulness under the heads Aztecs and Migrations of the American Aborigines, and the annals of three centuries of Spanish rule are almost a blank in the usual staples of history, there having been no foreign wars and no important internal revolutions. The modern Mexican people was being formed through those three centuries of race-fusion, the several Indian nations supplying the foundation upon which the Castilian superstructure was reared. The Mexicans at the beginning of the nineteenth century were a composite people, but the Indian element was so largely in the ascendant that persons of pure Castilian blood, though settled for generations in the country, were regarded by the mass of the nation as foreigners. Unfortunately, it was precisely this class which monopolized the posts of honor and influence, as well as the great landed estates and the commercial wealth of the country. The revolution of eleven years' duration which resulted in the independence of Mexico in 1821 was directed not so much against the abstract right of the Spanish crown as against odious caste-distinctions and the scandalous oppressions exercised by the *gachupines*, or men of pure Spanish birth. The native element not only obtained the ascendency, but ruined the colossal fortunes of the colonial aristocracy, and even expelled all natives of Spain from Mexico (1829). The earliest independent government of Mexico, that presided over by the liberator Iturbide (1821–23), was from the first intended not as a change of system, but merely a change of *personnel*, and it was only when the royal house of Spain had refused to permit one of its princes to assume the crown of Mexico that Iturbide himself was proclaimed emperor. The "republic" proclaimed by Santa Anna at Vera Cruz Dec., 1822, had originally little but the name in common with other republics, but the constitution adopted in 1824 made liberal drafts upon that of the U. S. The change of system thus attempted to be introduced was too radical to be permanently carried out, and the reformers, who in 1833 passed laws abolishing convents, suppressing the compulsory payment of tithes, and otherwise curtailing the power of the clergy, precipitated the downfall of the constitution. The numerous "plans," "organic bases," or "constitutions" that prevailed in Mexico under military leadership for the ensuing twenty years were for the most part mere pretexts for dictatorship, and Mexico never obtained a thoroughly republican form of government until the triumph of the "plan of Ayutla" overthrew the fifth dictatorship of Santa Anna (Aug., 1855) and prepared the way for the constituent convention of 1856. That body promulgated (Feb. 5, 1857) a constitution which, with some later amendments, is still the organic law of Mexico. It represents in many respects the most advanced principles of modern republicanism, and could not triumph over the privileged classes—*i. e.* the corrupt national Church, the army, and the conservative aristocracy—without two desperate struggles, known in Mexican history as the "war of reform" (1857–60) and the "French intervention" (1861–67), to which latter period belongs the ephemeral "empire" presided over by the Austrian archduke Ferdinand Maximilian (1864–67). In both these struggles the master-spirit, the genuine representative of republican Mexico, was the Indian statesman Benito Juarez, president of Mexico from Dec., 1857, till his death, July 18, 1872. (See MAXIMILIAN, MIRAMON, MEJIA, and MARQUEZ.) His chief assistant in the maintenance of national dignity and independence was the minister of foreign affairs, Sebastian Lerdo de Tejada, who succeeded to the presidency. The present president is Porfirio Diaz, formally proclaimed by the Mexican Congress as duly elected, Sept. 26, 1884. (See histories of Mexico by Prescott and Brantz Mayer, and upon the Mexican war and its consequences consult the articles SCOTT (WINFIELD), TAYLOR (ZACHARY), SANTA ANNA (A. L.), CALIFORNIA, TEXAS, and names of battles. Also see T. V. Brocklehurst, *Mexico To-Day*, London, 1882.)

PORTER C. BLISS.

Mexico, a state of the republic of the same name, bounded N. by the state of Hidalgo, E. by Tlaxcala and Puebla, S. by Morelos and Guerrero, and W. by Michoacan, with an area of 7838 square miles, exclusive of the Federal District embraced by it. Two mountain-ranges and elevated valleys, with numerous picturesque lakes, constitute the peculiar physical features of the state. The main valley, that of Mexico, separated on the W. by a mountain-chain from the more elevated valley of Toluca, is oval in form, and has a circumference of 200 miles along the crest of the mountains which environ it on all sides. It is broken into three basins of different levels—that of Chalco, in which lie Lakes Chalco and Xochimilco; the central basin of Lake Texcoco; and in the N. that of Teotihuacan, containing Lakes San Cristobal, Tonanillo, and Zumpango. The length of the whole valley is about 55 miles, and its width 37, with an area of 155.6 square leagues or 1710 square miles, about 170 of which are covered by lakes. The soil is a recent alluvion and detritus, with calcareous beds or deposits covered with vegetable mould in the arable lands, and occasionally also by an efflorescence of salt or alkaline matter. From the centre of the valley of Toluca, which has a level of 8210 feet, rises the peak of Nevado de Toluca, 15,770 feet above the sea. The southern valleys of the state are within the *tierras calientes* of the Pacific slope, producing sugar, coffee, and other tropical staples, while the plateau is fertile in cereals and the maguey. The mountains of the state are mineral-bearing, yielding gold, but particularly silver, also copper, cinnabar, lead, sulphur, antimony, lithographic stone, with quarries of fine marble and other valuable building-stone. Its manufactures are cotton and woollen cloths, some of the latter of much excellence, glass and porcelain equal to that imported from Europe, chocolate, sugar, salt, and soda from the saliferous deposits of the lakes of the valley, which are of immense extent. The state government is administered by an elective governor, who appoints his secretaries, and a legislature of a single chamber, having a member from each of the sixteen districts into which the state is divided—namely, Toluca, Ixtlahuaca, Tenango, Chalco, Jilotepec, Texcoco, Lerma, Tlalnepantla, Sultepec, Villa del Valle, Temascaltepec, Tenancingo, Otumba, Cuautitlan, Zumpango, and Zacualtipan, which are further subdivided into 117 municipalities with 3 cities, 18 towns, 605 villages, and 391 haciendas, with a total population in 1882 of 710,579. The property subject to taxation at the same period was assessed at $22,304,054. Public instruction is receiving the special attention of the public men of the state, and a literary institute at Toluca, a thorough collegiate school, is well supported by the state. THOMAS JORDAN.

Mexico, a city and federal district, capital of the republic of the same name, is situated in lat. 19° 25′ 45″ N., lon. 99° 7′ 8″ W. from Greenwich, at an elevation of about 7435 feet above the level of the sea. Founded, according to Aztec tradition, about the year 1325 on an island in Lake Texcoco, by tribes from the N. W., by whom it was named Tenochtitlan ("nopal upon a stone"), it was the largest and most civilized city of America at the time of the Spanish conquest, since which time the waters of the lake have receded eastward. Built upon the ruins of the Aztec capital in 1521–22, upon uniformly level ground, the streets are about forty feet wide, well paved for the most part, well lighted, and lined by structures of a solid, handsome architecture. Subdivided into eight chief quarters, with an aggregate of 304 streets (each of a single block) and 90 public squares, the city has a circumference of about 16 miles. The chief structure is the cathedral, erected upon the site of the great teocalli of the Aztec Mars (Huitzilopochtli). Begun in 1593, it was dedicated in 1677; as then finished, the cost had been $1,757,000, subsequently increased to $2,500,000. Highly enriched with carvings, the precious and other metals, with costly altars, statuary, and paintings, there is no more sumptuous church-interior in the world. On the S. of the cathedral is the chief square, or Plaza de Armas, which is 810 by 600 feet. The E. side of the same is occupied by the government palace, which contains the residence of the president, bureaus of the cabinet ministers, the general post-office, the national archives, the national museum, and many other public offices, with a botanical garden in one of the courts. Under the Spanish régime this was the residence of the viceroys. One of the public squares, the plaza of Santo Domingo, is faced by several remarkable buildings—that of the old Inquisition, formally established in Mexico in 1571, now occupied as a school of medicine; the custom-house, and the convent of Santo Domingo with its beautiful chapel. The city is well provided with markets which are supplied with vegetables and flowers brought upon the canals from the *chinampas* or "floating islands," public hospitals, asylums, and other institutions of beneficence. The National Museum contains a rare collection of articles throwing light upon the aboriginal history of Mexico, including the great Calendar Stone of the Toltecs, a huge statue of Huitzilopochtli, and a massive sacrificial stone. The Academy of San Carlos, founded by Charles III. of Spain, contains the largest and most valuable collection of paintings in America. The principal public pleasure resorts are the Alameda, shaded with superb trees; the Paseo de la Viga, along the canal of that name; and the Paseo de Bucareli, or public drive, adorned with fountains and a fine bronze equestrian statue of Charles IV. Several societies are fostered by the government, such as that of natural history, of mines, and of geography and statistics, a particularly useful and creditable association, from the comprehensive, zealous, intelligent labors of its members. The National Library, occupying the ancient church of San Agustin, lately remodelled and rebuilt at great expense by the government, has 103,000 volumes. Another library, founded in 1870, known as the "Cinco de Mayo," embraces only about 12,000 volumes, many of which, however, are well-selected, recent acquisitions in French and English. Two noble aqueducts constitute a striking architectural feature of the city. The city government is presided over by a governor appointed by the president, and an elective municipal council or *ayuntamiento*. The population of the city was 137,000 in 1803, 205,430 in 1838, and is now (1882) estimated at 300,000. Most of the inhabitants are pure-blood Indians and mestizoes. Nearly all the trade, however, is in the hands of foreigners, chiefly Frenchmen, but also Englishmen, Germans, Americans, and Spaniards; and, while a large portion of the natives are mendicants or vagrants, the foreigners, being the capitalists, bankers, merchants, and dealers of the city, exercise an influence which is altogether out of proportion to their number. The criminal element is very large (over 25,000) and not easily kept in order by the police force (over 1300); 3000 robberies and 5000 knife-attacks are annually reported. The pop. of the federal district (461 square miles, including the cities of Tacubaya, Guadalupe, and Tlalpam) is 439,769. T. JORDAN.

Mexico, R. R. junction, cap. of Audrain co., Mo. (see map of Missouri, ref. 3–H, for location of county), 108 miles N. W. of St. Louis, contains a female seminary, fine court-house, and mills. Pop. in 1870, 2602; in 1880, 3835.

Mexico, on R. R., Oswego co., N. Y. (see map of New York, ref. 3–G, for location of county), has an academy, flour and grist mills, a foundry, tannery, carriage-factories, etc. Pop. in 1870, 1204; in 1880, 1273.

Mexico, Gulf of, is a vast inlet of the Atlantic on the eastern shore of North America, between the two peninsulas of Yucatan and Florida, bounded by Mexico, the U. S., and the island of Cuba, and covering an area of nearly 800,000 square miles. The Gulf Stream enters it through the Yucatan Channel, traverses it in a curved line, and leaves it through the Florida Channel, and this circumstance makes the temperature of its water several degrees higher than that of the Atlantic. From September to March it is visited by violent northern gales. During high and low tides the water of the Pacific varies several feet from that in the Gulf.

Meyer (HEINRICH AUGUST WILHELM), TH. D., b. at Gotha Jan. 10, 1800. As early as 1831 his labors as an exegetical commentator upon the New Testament were recognized in Germany as uniting sound learning and the most searching criticism with an orthodox, conservative faith. From that day to the period of his death (June 24, 1873) the circle of his commentaries spread wider and wider, and with the aid of kindred scholars he was constantly putting forth new editions, masterpieces of exegesis. Besides these commentaries he also edited a leading work on the Evangelical confession, and at the same time held high office (*Ober-consistorialrath*) in the church at Hanover, where he resided and preached for the larger part of his life. An English translation of his writings, designed to be complete, was in 1876 in course of publication at Edinburgh under the supervision of Drs. W. P. Dickson, D. D., of the University of Glasgow, and F. Crombie, of St. Mary's College. Four or five vols. had already appeared, embracing the commentaries on Galatians, translated by G. H. Venables; Romans, 2 vols., by Rev. J. C. Moore; and the Gospel of John, by Rev. Wm. Urwick. The work was completed in 20 vols. in 1882. T. JORDAN.

Mey'er (JOHANN GEORG), b. at Bremen Oct. 28, 1813; studied at the Academy of Düsseldorf 1833–42; settled in Berlin in 1852; painted first biblical subjects, but turned afterwards to genre painting, in which field he achieved a great reputation. His pictures, of which several have been sold in America, and many become widely known by engravings, are always strikingly impressive.

Mey'erbeer (GIACOMO), otherwise JAKOB MEYER BEER, b. in Berlin Sept. 5, 1794; d. in Paris May 2, 1864. His father, James Beer, a wealthy Jew, who appreciated the value of culture and had a fondness for art, gave his three sons, Michael, Wilhelm, and Jakob, the full advantages of education. Giacomo (or Jakob) had a genius for music, and enjoyed the benefit of the best teaching that could be commanded. His instructors were Franz Lanska for the piano, and Karl Friedrich Zelter, the friend of Goethe and teacher of Mendelssohn, in musical science. His proficiency as a pianist became soon manifest, but the ambition to excel as a dramatic composer carried him away in that direction, and under new masters, Bernhart Anselm Weber and Georg Joseph Vogler, he pursued his career. In 1810 he was admitted to Vogler's select school at Darmstadt, and in close intimacy with Karl Maria von Weber, who had already composed operas, he studied hard and successfully for two years. At this time Meyerbeer composed an oratorio, *Gott und die Natur*. In 1812, under Vogler's auspices, the opera of *Jephthah* was produced at Munich. It failed, and the disconcerted composer, dropping dramatic music for a time, returned to the piano, and achieved great distinction in Vienna. A second opera, *Die Beiden Kalifen*, failed. Italian music alone was popular, and Meyerbeer went to Italy to learn the methods of the Italian school. Thenceforward his labor was successful. His *Romilda e Costanza* (1812) at Padua, his *Semiramide* (1819) at Turin, his *Emma di Resburgo* (1820) at Venice, were received with applause. In 1822, *Margaret of Anjou* was brought out triumphantly at the Scala in Milan. The next year *L'Esule di Grenata* was produced with Lablache and Pisaroni. In 1825 the *Crociato* was received with immense favor at Venice. This closed the first period in the composer's career. The second period opened in Paris with *Robert le Diable*, which was brought out in 1831, and roused unprecedented enthusiasm, not in Paris only, but in Germany and all over Europe. *The Huguenots* followed in 1836, and added new laurels to Meyerbeer's fame, it being the first of what may be termed "historical" as distinguished from the purely romantic lyric drama. The appearance of *The Huguenots* made an epoch in operatic art. Thirteen years passed before the *Prophète* was completed. In 1854 came *L'Étoile du Nord*, four years later *Dinorah*, both works inferior in dignity to the two preceding. *L'Africaine*, the work of years, waited long for an opportunity, and was not produced till 1865, a year after the composer's death. Other works by Meyerbeer comprise a *Miserere*, a *Te Deum*, a *Stabat Mater*, eight *canticles*, and numerous miscellaneous compositions, the *Camp of Silesia*, an opera, and music for *Struensee*, a drama composed by his brother Michael. Their brilliancy as dramatic compositions, the splendor of their vocal and instrumental effects, together with the implied magnificence of their setting, entitle them to a distinguished place in the order of works to which they belong. (For the life of Meyerbeer see Blaize de Bury (1865) and Henri Mendel (1868).) O. B. FROTHINGHAM.

Meyersdale, formerly **Dale City,** also called **Meyer's Mills,** Somerset co., Pa. (see map of Pennsylvania, ref. 6–C, for location of county), 113 miles S. E. of Pittsburg, is on Pittsburg division of Baltimore and Ohio R. R. and the Casselman River, and contains an iron-foundry, planing-mills, flouring-mill, stone-ware manufactory, furniture-works, etc. Pop. in 1880, 1423.

Meyr (MELCHIOR), b. at Ehringen in Ries, a fertile plain included by the Franconian and Suabian Jura, Bavaria, June 28, 1810; studied at Munich and Heidelberg; devoted himself to literature; lived at Berlin 1840–52, afterwards alternately at Munich and Ehringen, where he d. Apr. 22, 1871. His best-known productions are *Stories from Ries* (1856), *New Stories from Ries* (1871), *Duke Albert* (1852), and *Charles the Bold* (1862).

Meyr'ick (FREDERICK), b. in England in 1826; educated at Trinity College, Oxford, where he was successively scholar, fellow, and tutor, and has since held the university offices of select preacher and public examiner. He was the chief founder of the Anglo-Continental Society; published *The Practical Working of the Church in Spain* (1851), *The Moral Theology of the Church of Rome* (1857), *The Outcast Poor of London* (1858), and controversial writings against Roman Catholicism; has contributed to Dr. Smith's *Dictionary of the Bible* and to the *Speaker's Commentary*.

Meyrick (Sir SAMUEL RUSH), LL.D., b. in London in 1783; educated at Queen's College, Oxford, and became an advocate in the ecclesiastical and admiralty courts, but devoted his chief attention to archæological studies, and contributed innumerable papers to the *Gentleman's Magazine*. His specialty was the collection and illustration of ancient armor, of which he ultimately formed a fine and well-arranged museum. Among his works were *The History and Antiquities of the County of Cardigan* (4to, London, 1810), *The Costume of the Original Inhabitants of the British Islands* (1815), *A Critical Inquiry into Ancient Armor* (1824; improved ed., 3 vols., 1844), with more than 100 carefully illuminated plates, and *Engraved Illustrations of Ancient Arms and Armor, a Series of 154 Etchings of the Collection at Goodrich Court* (2 vols., 1830). D. at London Apr. 2, 1848. His collection of armor is now deposited in the South Kensington Museum, London.

Mezeray', de (FRANÇOIS EUDES), b. in 1610 near Falaise, Normandy; commenced his literary career as a poet, but turned soon to historical studies, and published in 1643 the first volume of his *Histoire de France*, which procured for him the patronage of Richelieu, who gave him a pension of 4000 livres and the title of historiographer. His *Abrégé chronologique de l'Histoire de France* (1668) is considered better than the principal work. D. July 10, 1683.

Meze'reon [Pers. *madzaryoun*], in materia medica the bark of *Daphne mezereum*, *D. laureola*, *D. gnidium*, and other species of the genus, handsome shrubs of Europe and Asia, sometimes seen in cultivation in the U. S. They are of the order Thymeleaceæ. The bark has strongly irritant-narcotic properties. It was once extensively employed in medicine, and now has a limited use in rheumatism and other diseases. The fresh bark will quickly blister the skin.

Mézières', a fortified town of France, the capital of the department of Ardennes, stands on the Meuse, opposite Charleville, with which it is connected by a bridge. In 1520 it was successfully defended by Bayard against

Charles V., and his banner is still preserved in the hôtel de ville. The anniversary of the deliverance of the town, Sept. 27, is still observed. The present fortifications were planned by Vauban. The school of military engineering originally founded here was successively transferred to Metz and Fontainebleau. The iron industry has gradually been concentrated at Charleville. Pop. in 1881, 6119.

Mézières (Alfred), b. Nov. 19, 1826, at Rehon, in the department of Moselle, France; studied literature, and was appointed professor in Nancy in 1854, and at the Sorbonne in 1863. His most prominent works are *Prédécesseurs et Contemporains de Shakspeare* (1863), *Petrarque* (1867), both crowned by the Academy, and *Goethe, les œuvres expliquées par la vie* (1872–73, 2 vols.).

Me'zö-Tur, town of Hungary, on the Berettyo, has large manufactures of pottery and earthenware and a considerable trade in wine, corn, and cattle. Pop. 21,213.

Mez'zo [It.], in music, a term of diminution, signifying the half, middle, or mean between two things of a positive nature or description. Thus, a mezzo-soprano voice is one whose range is between the soprano and alto. Mezzo forte (or *m. f.*) is rather loud; and mezzo piano (or *m. p.*) rather soft. Mezzo voce, in like manner, implies the use of only half of the usual force of the voice.

Mezzofan'ti (Giuseppe Gaspardo), b. at Bologna Sept. 17, 1774. At the age of fifteen, besides Greek and Latin, he already knew many foreign European languages. Having entered the priesthood, he was appointed professor of Oriental languages and librarian at Bologna. In 1831 he removed to Rome, in 1833 succeeded Angelo Mai as chief keeper of the Vatican library, and in 1838 was made a cardinal. He is said to have spoken over one hundred languages, and some fifty or sixty of them, belonging to widely separated families, even with full understanding of dialectic peculiarities. But this faculty was not combined with any great measure of intellectual power, and did not rise far above a mere object of curiosity. D. at Rome in 1848. His books and papers became the property of the library of Bologna. There exists but a single printed work of his, an eulogy pronounced in 1819 upon his old master in Greek, Emmanuele da Ponte. (See his *Life*, by Charles William Russell (1858; 2d ed. 1863.).)

Mezzoju'so, town of Sicily, in the province of Palermo, in a rich grain and vine-bearing district. The inhabitants are in part Albanese, who took refuge here from the Turks in the fifteenth century, and who still speak their own language and observe the rites of the Greek Church. Pop. 7161.

Mezzotint Engraving. See Engraving.

Mgleen, or **Mglin,** town of Russia, in Tchernigov, on the Sudinka, has cloth manufactures. Pop. 6165.

Miako. See Japan.

Mi'all (Edward), b. at Portsmouth, England, in 1809; was educated at the Protestant Dissenters' College at Wymondley; became an Independent minister at Ware, and afterwards at Leicester; removed to London in 1841 and established the *Nonconformist;* was an unsuccessful candidate for Parliament in 1845 and 1847; was elected for Rochdale July, 1852; lost his seat 1857, but was again returned for Bradford in 1869. Mr. Miall was perhaps the most conspicuous parliamentary advocate of manhood suffrage and opponent of all religious endowments. These services, added to those performed in an editorial capacity, were splendidly recognized by his political admirers, who entertained him at a dinner at the Crystal Palace July 18, 1873, and presented him the sum of 10,000 guineas. Among his works are *Views of the Voluntary Principle* (1845), *Ethics of Nonconformity* (1848), *Title-Deeds of the Church of England to her Parochial Endowments* (1861), *Politics of Christianity* (1863), and *Wayside Musings and Reminiscences* (1865). D. Apr. 29, 1881.

Miami, cap. of Dade co., Fla. (see map of Florida, ref. 5–G, for location of county), is situated on the Atlantic coast. Pop. not in census.

Miami (or **Mineam'i**) **Indians,** a tribe of Algonkins who once occupied a large part of the W. and N. W. of Ohio and a part of Indiana. In 1764 they had 350 warriors. They fought against the U. S. in the war of 1812. In 1818 they left Ohio, and in 1846 the greater part left Indiana, where a few still remain; 500 people of this tribe were removed in that year to what are now Linn and Miami counties in Kansas. They have been mostly destroyed by vice and intemperance. A few have become civilized. The Indiana Miamis are good and peaceable citizens. The Miamis (Western) Quapaw agency, Indian Territory, numbered 60 in 1884, all wearing citizens' dress; 46 able to speak English, and 40 to read.

Miami River, in Dade co., Fla., rises in the Everglades and flows into Biscayne Bay. At its mouth is a fine grove of cocoa-palms.

Miami River, of Ohio, rises in Hardin co., runs in a S. W. course, passing the cities of Troy, Dayton, and Hamilton. It is a rapid stream, flowing through a beautiful, fertile, and populous valley, and joining the Ohio below Cincinnati. A canal has been cut along the river. It is 150 miles long, and furnishes much water-power. Its ultimate source is 1335 feet above tide.—The Little Miami is a smaller unnavigable stream, flowing through a fertile and hilly region to the E. of the Miami, and reaching the Ohio 6 miles above Cincinnati.

Miami University, an educational institution at Oxford, Butler co., O., incorporated in 1809; commenced as a grammar school in 1818, and as a college in 1824. It derives its origin from a grant of the township of Oxford, made by Congress to the State of Ohio in 1803, to be held in trust for educational purposes. The university is governed by a board of 18 trustees appointed by the governor of the State. The presidents have been Rev. R. H. Bishop, D. D., 1824–40: Rev. George Junkin, D. D., 1840–44; Rev. E. D. McMaster, D. D., 1844–49; Rev. W. C. Anderson, D. D., 1849–54; Rev. J. W. Hall, D. D., Rev. A. D. Hepburn, and R. W. McFarland.

Miam'isburg, R. R. junction, Montgomery co., O. (see map of Ohio, ref. 6–C, for location of county), in the centre of the tobacco-growing region of the Miami Valley, 50 miles N. of Cincinnati, has extensive water-power, excellent schools, several mills and factories, 1 foundry, a fire department, etc. Pop. in 1870, 1425; in 1880, 1936.

Miantonomoh, sachem of the Narragansett Indians and nephew of Canonicus, assumed the government about 1636, in which year he concluded an alliance with the government of Massachusetts. He aided the colonists in the Pequod war 1637, and was friendly to Roger Williams and other early settlers of Rhode Island, to whom he made grants of land. Having engaged in war with Uncas, sachem of the Mohegans, he was taken prisoner, carried to Hartford, and by the advice and consent of the commissioners of the United Colonies was put to death by the tomahawk, Sept., 1643, near Norwich, on the spot where he had been defeated, afterwards called Sachem's Plain. A monument was there erected to his memory in 1844.

Mias'ma [Gr. *μίασμα*, "stain," from *μιαίνειν*, to "contaminate"], an emanation, especially that from the earth in low marshy districts, which is capable of penetrating the human system, and producing therein certain manifestations of disease. Of the nature of it we know nothing, whether gaseous, animal, or vegetable. It is never generated unless the average temperature of the day is 60° F., and sometimes a much higher temperature is required, as in yellow fever, which never occurs below 80° F. Another thing necessary for its production is moisture, hence we do not find it in dry or sandy regions. Besides these, it is essential that there should be vegetation; accordingly, we find it in the extensive marshes of warm latitudes, and not in high and cold regions. Exceptions to this rule may be found in the Dismal Swamp and in the bogs of Ireland, which do not produce it. New alluvial soils, when there is a subsoil of clay, are especially adapted to its production. Miasmatic diseases may and do occur where miasm is not produced, as it may be carried from one place to another by rivers, and it seems to be more prevalent on the eastern than on the western bank. It is also found at the mouths of rivers. The drying up of an inundation is apt to reproduce it where it has previously existed. It is formed about meadows that have been flooded for the purpose of cultivation. A wet season followed by dry weather is eminently productive of it, but a continuous wet season not so. In miasmatic regions turning up the soil will give rise to this poison in great abundance. In the excavation of the Erie Canal the fever was renewed in regions where it had ceased. Mill-dams have been known to produce miasm. It can be conveyed by the wind over level surfaces for several miles.

The circumstances which are unfavorable to the production of miasm are — 1st, high latitudes and altitudes. Mountain-regions are generally free from this disease. Primitive forests are little subject to miasmatic affections, but whether this is due to the shade or to absorption by the leaves is not known. Free ventilation diminishes the danger, and the more stagnant the air the more concentrated will be the poison. Obstacles may be interposed to cut off the miasm. A screen of trees will very often preserve a house from malarious influence; this is true also of hills. Inundation appears to drown it out for a time, but as soon as the water disappears it returns. Cultivation of the soil while continued will drive away the miasm. The drainage of marshes is a protective measure, although it requires some years to exhaust it. This is very strikingly illustrated in the drainage of large cities. Cold has the power of destroying it, and when miasmatic diseases occur in winter they are due to exposure during the previous season. Certain plants growing in the marshes have the power of destroying it. Night adds to the power of the poison—day dissipates it. No point in the history of miasm is probably better settled than this. It is known to be more active on the ground than on neighboring elevations, and the upper stories of a house are safer than the lower. Many persons suffer from miasm without having fever; these persons lack mental and physical power; the countenance is pale, and the period of life is shortened. The influence of the poison may be seen even in animals, which are fat enough, but certain diseases of the viscera appear when they are prepared for market. Miasmatic fevers may return any number of times. Quinine will both cure and prevent them. EDWARD J. BERMINGHAM.

Miau'lis (ANDREAS VOKOS), b. in 1768 or 1772 at Negropont; received his surname, MIAULIS, from his commanding a small merchant vessel (Turk. *miaul*); settled in Hydra, where he built up an extensive commercial business; joined in 1821 the Greek revolution; was made commander-in-chief of the Greek fleet, and achieved several brilliant successes over the Turkish and Egyptian fleets, but retired in 1827 when Lord Cochrane was placed at the head of the Greek navy. Although afterwards reinstated in his office by Capo d'Istria, the president of the Greek republic, he joined the opposition; was member of the provisory government established in Hydra, and became much involved in the intrigues of the different parties. He was a member of the deputation which in 1832 went to Munich to offer the Greek crown to King Otho. D. at Athens June 24, 1835, and was buried near the mausoleum of Themistocles.

Miau-tse, or **Meau-tse,** one of the aboriginal tribes of China, inhabiting the steep and almost inaccessible mountain-ranges in the southern part of the empire, the provinces of Yunnan, Kwei-chow, Kwang-se, and Kwang-tung, and living more or less independent of the Chinese, sometimes even waging war against them. As is proved by both their language and their ethnic characteristics, they are closely allied to the Siamese, Anamese, Cambodians, and the inhabitants of Hainan. Originally they inhabited the central plain of the empire, but were gradually driven farther and farther back among the mountains by the Chinese. It was, however, only by means of treachery that the latter at one time compelled them to acknowledge their supremacy; and in reality the Chinese exercise very little authority over the Miau-tse. The tribe is divided into a number of clans, each having its own name, and there seems to be considerable difference between the different clans. Those which have lived in communication with the Chinese have adopted various features of Chinese civilization, while others are almost savages. But even when not free from Chinese influence, they exhibit a totally different—not to say hostile—character. (See *Sketches of the Miau-tse*, by E. C. Bridgman, and *The Miau-tse Tribes*, by J. Edkins.)

Mia'va, town of Hungary, on the Miava, has manufactures of linen and cloth, breweries, distilleries, coal-mines, and extensive forests in which numerous herds of swine are fed. Pop. 10,018.

Mi'ca [Lat. *micare*, to "shine"]. The micas constitute a group of very interesting and widely spread minerals, belonging to the Unisilicates, and containing silicic acid, with varying proportions of the alkalies, magnesia, lime, and protoxides of iron, with the sesquioxides of aluminium, iron, and manganese, usually a little fluorine, and more rarely titanium. Titanium occurs to the extent of 7 or 8 per cent. in the rare mica *astrophyllite*, which also contains zirconia. *Lepidolite*, which is confined to a few localities, and the very rare *cryophyllite*, contain an important percentage of lithia, with a little rubidia and cæsia. The micas occur generally in thin, shining scales, usually transparent, but opaque in some very dark varieties of *biotite* and *lepidomelane* (an iron-potash mica). More rarely, some of the micas are found in large plates, and occasionally six-sided prisms. Unless decomposed they are distinguished by a very easy cleavage, splitting readily into extremely thin, elastic laminæ, and showing usually a pearly lustre on the cleavage faces. The most important micas are *phlogopite, biotite, lepidolite*, and *muscovite*. *Phlogopite*, or *magnesia mica*, contains magnesia as well as potash, among the protoxides, with very little of the oxides of iron. It is orthorhombic, with an optic-axial divergence of 3°–20°. It is light colored, usually yellowish-brown, and very liable to alteration. Phlogopite occurs chiefly in serpentine, crystalline limestone, and dolomite. *Biotite* (*magnesia-iron mica*) is hexagonal, generally dark green or black, and is similar in composition to phlogopite, but with 5–10 per cent. of sesquioxide of iron; sometimes much more. *Lepidolite* is very interesting, because it contains the rarer alkalies. *Muscovite* (*potash mica*) contains principally potash among the protoxide bases, with some soda, and among the sesquioxides alumina, with generally 2 or 3 per cent. of sesquioxide of iron. It is orthorhombic, and has an optic-axial divergence of 44°–78°. Muscovite includes nearly all common mica, and is a constituent of granite, gneiss, and mica-schist; it is also found sometimes in shales and other sedimentary rocks in small scales, and may occur in eruptive rocks and granular limestone. Being usually of light color, quite transparent, and very tough, it becomes valuable when found in plates of considerable size, and is then used in stoves for doors, etc. There are very few localities where marketable mica is found, the supply for this country being almost confined to mines in Haywood, Yancey, Mitchell, and Macon cos., N. C., where the mineral is found in granitic rock with coarse feldspar. It is regularly mined, and there are manifest traces of work done by the inhabitants of the same region many years ago. Mica is reported to have been found in working quantity near Salt Lake, but none is yet obtained for the market. At present mica is exported from this country to Europe. It has been proposed to import it from the East Indies, where it is said to occur in quantity. The demand for mica exceeds the supply, and hence it is a valuable article of commerce. The mineral is sold by the pound, at prices varying according to the size of the plates and regulated by a scale. The plates can be split to suit the purchaser. H. B. CORNWALL.

Mi'cah, one of the minor Hebrew prophets, was b. at Moresheth, near Gath. He lived in the latter half of the eighth century B. C. He was an older contemporary of Isaiah. Mic. iii. 12 is quoted in Isa. xxvi. 18 to justify the latter in foretelling the destruction of Jerusalem. Micah's prophecies are written in a vivid, poetical style, and refer chiefly to the fate awaiting the two Hebrew nations. The style is not unlike that of Isaiah. Micah deals with social and popular rather than political sins. He named Bethlehem as the birthplace of the Messiah (Micah v. 2).

Mica'li (GIUSEPPE), b. at Leghorn about 1776; studied archæology, travelled much, and published in 1810 *Italia avanti il dominio de' Romani* (4 vols., with maps and illustrations); in 1832, *Storia degli antichi popoli italiani* (3 vols.; much enlarged in 1843); and *Monumenti Antichi* (1 vol., with 120 plates) in 1844.

Mi'ca-Schist, a metamorphic, stratified, schistose, crystalline rock, always foliated in texture, and composed of variable proportions of mica and quartz. It gradually passes in one direction into gneiss and in another into quartz-schist. *Argillaceous mica-schist*, according to Cotta, may be regarded as "an imperfect mica-schist, or as a somewhat crystallized clay-slate." EDWARD C. H. DAY.

Michael Angelo. See ANGELO BUONARROTI.

Michael Palæologus. See BYZANTINE EMPIRE.

Michae'lis (JOHANN DAVID), b. at Halle Feb. 27, 1717; studied theology, Oriental languages, and biblical archæology under his father, who was professor at the university; travelled in Holland and England, and was appointed professor in 1745 at the University of Göttingen, where he d. Aug. 22, 1791. His works, the results of immense learning and great acuteness, are very numerous, and contributed much to a fuller understanding of Holy Writ, especially the Old Testament. His theological standpoint may be indicated as a transition from the old orthodoxy to the subsequent rationalism, and on his age he exercised a considerable influence. His principal works are *Introduction to the New Testament* (2 vols., Göttingen, 1750), translated into English by Bishop Marsh, and *Commentaries on the Laws of Moses* (6 vols., Frankfort, 1770–75), translated into English by Alexander Smith (1814). Of great importance is also his *Supplementa ad lex. hebr.* (1786, 2 vols.), which contains excellent contributions to the knowledge not only of the language, but also of the antiquities and history, of the Old Testament.

Mich'aelmas, the festival of St. Michael the Archangel, celebrated on Sept. 29.

Michaud' (JOSEPH), b. at Albens, Savoy, June 19, 1767; went to Paris in 1790; wrote in the *Gazette Universelle*, *Postillon de la Guerre*, and *Courrier Républicain*, three royalist papers, and showed himself a staunch defender of the monarchy; founded in 1794 the *Quotidienne*; was condemned to death Oct. 27, 1795, for his anti-revolutionary opinions, but succeeded in getting the verdict annulled; was banished to Cayenne by the Directory, but escaped and hid himself among the Jura Mountains, where he wrote his popular poem, *Le Printemps d'un Proscrit*, which was published in 1803; returned to Paris under the consular government, but continued to adhere to the cause of the Bourbons, and addressed his *Adieux à Bonaparte* and

Derniers Adieux à Bonaparte Victorieux to Napoleon, for which he was confined in the Temple; formed, with his brother and Giguet, a publishing firm, and devoted himself principally to historical studies, though he once more, after the Restoration, took up journalism and renewed the *Quotidienne*. His principal historical works are—*Histoire de l'Empire de Mysore* (2 vols., 1801), *Histoire de Croisades* (3 vols., 1812–17), *Correspondance d'Orient* (7 vols., 1830–39), *Collection de Mémoires pour servir à l'Histoire de France* (20 vols.). He also participated in the production of the edition of the *Biographie Universelle* published from 1811 to 1828. D. at Passy Sept. 30, 1839.

Michaux' (ANDRÉ), botanist, b. at Satory, near Versailles, France, Mar. 7, 1746, was the son of a rich farmer, and was bred to agriculture; studied botany under the Jussieus; in 1779 sent many British trees to France for culture; botanized in Spain in 1780, and collected seeds for French cultivators; was in Asia 1782–85, whence, after many adventures, he returned with a rich supply of seeds and plants; was 1785–97 the French agent in North America for the collection of useful trees and shrubs for naturalization in France; made near Charleston, S. C., and New York, large nurseries for arboriculture. After suffering shipwreck and the loss of his effects, and waiting in poverty and hunger for the arrears of his pay, he started in 1800 upon Baudin's expedition to Australia, but at the Mauritius left the expedition and went to Madagascar, where he d. Nov. 13, 1802. His principal works are a *Treatise on the Oaks of North America* (in French, 1801) and a *Flora Boreali-Americana* (1803).

Michaux (FRANÇOIS ANDRÉ), M. D., son of André Michaux, b. at Versailles in 1770; for a time was his father's assistant in the U. S., and was himself sent in 1802, and again in 1806, to explore the botany of the Mississippi Valley and collect useful seeds. He published a *Treatise on the Naturalization of American Forest Trees* (1805), a *Journal* of his travels, a work on the Bermudas (1806), *North American Sylva* (in French, 1810–13; in English, the translation by Mr. Hillhouse, 1817–19; completed by Nuttall and others 1842–50). In 1816, Michaux was received into the French Academy of Sciences. D. at Vauréal, France, Oct. 23, 1855.

Michel' (FRANCISQUE XAVIER), b. at Lyons, France, Feb. 18, 1809; educated at the Lyceum of Charlemagne, Paris, wrote a few novels; edited a vast number of old English, Anglo-Saxon, and French MSS.; became in 1839 professor of foreign literature at Bordeaux; translated several important works from the English (Sterne, Goldsmith, Shakespeare, and Tennyson); between 1834 and 1842 edited over thirty more or less important manuscripts relating to the history and the literature of the period extending from the eleventh to the fourteenth century. Author of *Histoire des Races maudites de la France et de l'Espagne* (1847), *Le Livre d'Or des Métiers* (1851–54), *Histoire des Tissus de Soie au Moyen Age* (1852–54), *Le Pays Basque* (1858), *Les Écossais en France et les Français en Écosse* (1862), *Histoire du Commerce, etc. à Bordeaux* (1867–71), *A Critical Inquiry into the Scottish Language* (1882), etc.

Michel (Sir JOHN). See APPENDIX.

Michelet' (JULES), b. at Paris Aug. 21, 1798, and educated at the Lyceum of Charlemagne, in which he was elected professor in 1821. After the revolution of 1830 he was appointed chief of the historical section of the royal archives, and in 1838 professor of history and morals at the Collége de France. In 1851 he lost his position both at the archives and at the university, as he refused to take the oath of allegiance to Louis Napoleon. D. at Hyères Feb. 9, 1874. Of his historical writings, the most important are, *Histoire de France* (12 vols., 1833–60), *Histoire de la Révolution* (7 vols., 1847–53), *Précis de l'Histoire moderne* (1827), *Histoire Romaine* (2 vols., 1831); of his polemical writings are *Les Jesuits* (1843), *Du Prêtre, de la Femme, de la Famille* (1844), *Le Temple* (1846), *Pologne et Russie, Legende de Kosciusko* (1851), *Principautés danubiennes* (1853); of his miscellaneous writings, *L'Oiseau* (1856), *L'Insecte* (1857), *L'Amour* (1858), *La Femme* (1859), *La Montagne* (1868), *Nos Fils* (1869).—His second wife, ATHANAISE MICHELET, who survived him, assisted him in these latter works.—As an historian Michelet pictures the general state of the civilization of an age and the principal agents in the historical evolution, but he does not demonstrate the underlying continuity of facts. In his polemics it is his sarcasm and his pathos which gain the victory, not his arguments; and in his moral and miscellaneous writings it is his ready sympathy with everything beautiful and noble and good, rather than his ideas, which captivates us. His style is a combination of all kinds, naïve and paradoxical, dry and inspired, sarcastic and enthusiastic; but it is always clear and suggestive.

Michelet (KARL LUDWIG), b. at Berlin Dec. 4, 1801; studied first law and afterwards philosophy, and was appointed professor of philosophy at the University of Berlin in 1829. Of interest for the study of Aristotle are his *Ethik des Aristoteles* (1827) and *Examen critique du Livre d'Aristote, intitulé Métaphysique* (1836), which was crowned by the French Academy. Interesting for the study of German philosophy are his *Geschichte der lezten Systeme der Philosophie in Deutschland* (1837), *Schelling und Hegel* (1839), *Entwickelungsgeschichte der neuesten deutschen Philosophie* (1873). His own standpoint—a modern reconstruction of Neo-Platonic Christianity—is principally developed in his *Die Persönlichkeit des Absoluten* (1844), *Der historische Christus* (1847), *Die Zukunft der Menschheit* (1852), *Naturrecht oder Rechtphilosophie* (1866).

Michigan, mish'-e-gan, one of the N. Central States of the Union, lying among the great lakes, and forming on its N. line a part of the N. boundary of the U. S., between 41° 42' and 48° 22' N. lat., and 82° 26' and 90° 30' W. lon. Its N. boundary is the line running through Lake Superior which forms the boundary between the U. S. and British America; its E. boundaries are the north-easternmost channel of the straits connecting Lake Superior and Lake Huron, St. Clair River or Strait, Lake St. Clair, and the Detroit River or Strait; the S. boundary of the lower peninsula is a part of the States of Ohio and Indiana: the upper peninsula is bounded on the S. by Lake Huron, the Straits of Mackinaw, Lake Michigan, Green Bay, and the N. line of Wisconsin; the W. boundary of the lower peninsula is Lake Michigan; of the upper peninsula, Lake Superior and Wisconsin. Area, 58,915 square miles, or 37,705,600 acres.

THE GREAT SEAL OF THE STATE OF MICHIGAN
E PLURIBUS UNUM
TUEBOR
SI QUÆRIS PENINSULAM AMŒNAM
CIRCUMSPICE
A.D. MDCCCXXXV

Seal of Michigan.

Michigan, by census of 1880, ranked 9 among the States in population, 8 in value of agricultural products, and 9 in value of manufactures.

Face of the Country.—The State is naturally divided into two irregular peninsulas, separated from each other by the Straits of Mackinaw, the lower having its projection northward: the upper, eastward. The latter has a rugged, mountainous, and broken appearance, a range of mountains called the Porcupine Range forming the watershed between the streams flowing into Lake Superior and those flowing into Lake Michigan. From this range there proceeds on either side an elevated table-land sloping gradually toward the lakes. The country is rocky, abounding in mineral wealth, but generally sterile. The lower or S. peninsula is very nearly level. The watershed is nearer Lake Huron than Lake Michigan, and has a gentle slope toward the latter; the shores of the lakes are often steep and elevated.

Coasts, Lakes, Bays, and Rivers.—The extent of the lake-coast of Michigan is very great, exceeding 1100 miles, and including numerous bays and excellent harbors. The N. peninsula has Keweenaw Bay, Marquette Harbor, Tequamenon Bay, the bays and inlets around St. Mary's River: and on its S. shore, Mackinaw Bay and Strait, the Big and Little Bays de Noquet, and the long and deep Green Bay. The lower peninsula has on the Lake Huron side Thunder Bay, Saginaw Bay, and the roadsteads of Port Huron, the St. Clair and Detroit rivers, and Lake St. Clair; and on Lake Erie, Monroe Harbor. On the W. or Lake Michigan side are several artificial harbors, such as New Buffalo, South Haven, Grand Haven, and Ludington, and, farther N., Grand Traverse and Little Traverse bays. Besides the four great lakes and St. Clair, there are hundreds of small lakes; the larger share of these is in the N. peninsula, though the S. has a considerable number. The principal rivers of the State are in the upper peninsula; the so-called Detroit and St. Clair rivers are only straits connecting the lakes with one another. The islands are very numerous: Isle Royale in Lake Superior, the Beaver, Fox, and Manitou isles in N. part of Lake Michigan, Bois Blanc in Mackinaw Straits, Drummond Island in Lake Huron, Sugar Islands in Straits of St. Mary.

Geology and Mineralogy.—From the extreme end of Keweenaw Point, in the upper peninsula, we find the copper-bearing strata extending westward to the Minnesota line. These strata are perhaps more fully charged with copper ores of great richness and value than any other copper-bearing rocks in the world. Beyond these, on the N. W. shore of the peninsula, at the back of the long promontory of Keweenaw Point, these copper-bearing rocks are overlaid by sandstone. The lower peninsula is composed wholly of the groups of the Appalachian series, the coal-measures, the highest member of the series, occupying the central portion of the peninsula and covering an area of 7000 square miles. The coal-field proper extends from about the middle of Saginaw Bay to the line of the Michigan Central R. R. The coal is bituminous and of fair quality, though not the best. Salt is another product of the coal-measures, and immense quantities are made, of excellent quality, in the neighborhood of Saginaw Bay. In Bay, Saginaw, and Kent counties, outside the coal-field, the underlying Carboniferous limestone crops out, yielding at some points plaster of Paris and gypseous shales. Around these appear the Portage and Chemung groups, mainly slates and sandstones. The principal value of these is to give fertility to the soil; they contain no minerals of importance. The production of copper and iron from the ores, and of salt from the salt-springs of the Saginaw region, has placed Michigan in the first rank of mining States, and her other productions of the quarry and the mine—such as the slates from the upper peninsula, coal, gypsum, grindstones, petroleum, building-stone, etc.—though important, are hardly to be considered in connection with these greater interests.

Soil and Vegetation.—It was long supposed that the soil of the S. peninsula of Michigan was too swampy and its climate too deadly to make it habitable. And yet this region has proved to be the garden of the North-west. The forests of pine, spruce, hemlock, and tamarack proved to be themselves sources of wealth, and the soil of the lower peninsula was found to possess remarkable fertility. The soil of the upper peninsula is more sterile, but will yield fair crops with diligent cultivation, while its immense mineral wealth renders it desirable for a residence, independent of the qualities of its soil. The timber of this region is mostly white pine, spruce, hemlock, birch, aspen, oak, elm, maple, and ash. Indian corn will not always ripen, in consequence of the shortness of the season, but wheat, rye, barley, and oats do well. In the S. peninsula Indian corn and all the cereals grow very abundantly, and the State is one of the great grain-growing States. The S. W. part is also noted as a fruit-region, supplying peaches, pears, and apples to the whole North-west; the upper portion of this S. peninsula is remarkable for its fine forests, and its pine, spruce, hemlock, and cedar lumber is largely exported. Its forest-trees also include black walnut, sugar-maple, hickory, oak, basswood, linden, ash, beech, elm, locust, dogwood, sycamore, chestnut, tamarack, and cypress.

Zoology.—The black bear, wolf, lynx, wild-cat, panther, fox, weasel, marten, badger, skunk, mink, otter, raccoon, opossum, marmot, beaver, hare, rabbit, and squirrel are yet in considerable numbers: the elk is rare, while deer are plenty. The lakes abound in fish, and the trade in whitefish is very large. Much pains have also been taken by the commissioners of fisheries to stock the waters of the State with salmon, shad, trout, black bass, and other edible fish. The birds of the State are numerous.

Climate and Meteorology.—The lower peninsula, being almost surrounded by large bodies of water, has a milder climate than regions farther E. in the same latitudes, but the upper peninsula has a rigorous climate in winter and a short, hot summer. The mean annual temperature of the lower peninsula is about 47.25°; that of the upper peninsula, about 40.40°.

Agricultural Products.—The census of 1880 shows a crop of Indian corn in Michigan of 32,461,452 bushels; wheat, 35,532,543 bushels; oats, 18,190,793 bushels; potatoes, 10,924,111 bushels. Of tobacco only 83,969 pounds were raised, of coal 100,800 tons were mined, in 1880. In wool Michigan ranks third among the producing States, having yielded 11,858,497 pounds in 1880.

*Farm Animals.**—In 1880 there were in Michigan, 378,778 horses, 891,631 cattle, 2,189,389 sheep, and 964,071 swine.

Manufactures.—This State is extensively engaged in manufacturing lumber for home consumption and for export; 3,938,187,227 feet were manufactured in 1880. The production of salt was 12,425,885 bushels in 1880, valued at $2,271,913, and exceeding that of any other State. The copper-mines of Michigan annually produce over $9,000,000 in value. The pig iron and iron ore produced amounted to 2,036,121 tons, valued at $19,457,427. Her iron and steel manufactures amounted to $4,591,613, employing 3089 hands and paying $922,597 in wages. The manufacturing industries of all kinds in this State aggregate 8873 establishments, with 77,591 hands, $92,930,959 capital invested; wages paid, $25,313,682; total value of products, $150,715,025. Detroit produced manufactures to the value of $30,181,416 in 1880.

Fisheries.—The lake-fisheries of Michigan produced $716,170 in the census year 1879, employing 1781 fishermen. Whitefish constitute more than half the total product.

COUNTIES.	† Ref.	Pop. 1880.	Pop. 1884.	COUNTY TOWNS.	Pop.
Alcona	4–J	3,107	4,033	Harrisville	549
Allegan	7–H	37,815	38,724	Allegan	2,305
Alpena	4–J	8,789	12,717	Alpena	9,210
Antrim	4–I	5,237	8,790	Bellaire	65
‡ Arenac	5–J	......	4,032	Omer.	
Baraga	2–F	1,804	3,040	L'Anse	1,014
Barry	7–I	25,317	24,217	Hastings	2,638
Bay	5–J	38,081	51,265	Bay City.	29,415
Benzie.	4–H	3,433	4,394	Benzonia §	375
Berrien	8–G	36,785	37,814	Berrien Springs	758
Branch	8–I	27,941	27,678	Coldwater	5,102
Calhoun	8–I	38,452	41,526	Marshall	4,081
Cass	8–H	22,009	21,268	Cassopolis	912
Charlevoix	4–I	5,115	9,308	Charlevoix	512
Cheboygan	3–I	6,524	9,973	Cheboygan	2,269
Chippewa	2–I	5,248	8,372	Ste. de S. Marie	1,947
Clare	5–I	4,187	5,496	Harrison	129
Clinton	7–I	28,100	27,165	Saint John's	2,370
Crawford	5–I	1,159	2,390	Grayling §	846
Delta	3–G	6,812	9,997	Escanaba	4,339
Eaton	7–I	31,225	31,929	Charlotte	3,598
Emmet	3–I	6,639	7,945	Harbor Springs.	
Genesee	7–J	39,220	38,825	Flint	9,035
Gladwin	5–I	1,127	1,539	Gladwin §	373
Grand Traverse	4–H	8,422	12,111	Traverse City	1,897
Gratiot	6–I	21,936	25,090	Ithaca	600
Hillsdale	8–J	32,723	31,695	Hillsdale	3,550
Houghton	1–E	22,473	26,151	Houghton.	
Huron	6–K	20,089	24,551	Bad Axe	190
Ingham	7–J	33,676	34,960	Mason	1,882
Ionia	7–I	33,872	32,652	Ionia	4,643
Iosco	5–J	6,873	10,622	Tawas City	712
Isabella	6–I	12,159	16,077	Mt. Pleasant	1,115
Isle Royale	L. Su.	55			
Jackson	8–J	42,031	45,359	Jackson	19,136
Kalamazoo	8–H	34,342	35,447	Kalamazoo	13,938
Kalkaska	4–I	2,937	4,499	Kalkaska	496
Kent	7–H	73,253	84,765	Grand Rapids	41,934
Keweenaw	1–F	4,270	4,677	Eagle River.	
Lake	5–H	3,233	7,574	Baldwin	165
Lapeer	7–K	30,138	30,118	Lapeer	2,897
Leelanaw	4–H	6,253	7,180	Leland	838
Lenawee.	8–J	48,343	49,324	Adrian	9,350
Livingston	7–J	22,251	21,573	Howell	2,071
Mackinac	2–I	2,902	5,163	St. Ignace	2,236
Macomb	7–K	31,627	31,330	Mt. Clemens	3,827
Manistee	5–H	12,532	19,859	Manistee	10,373
Manitou	3–H	1,334	873	St. James	168
Marquette	2–F	25,394	31,370	Marquette	5,612
Mason	5–H	10,065	13,431	Ludington	5,433
Mecosta	6–I	13,973	20,632	Big Rapids	5,917
Menominee	3–F	11,987	19,129	Menominee	5,578
Midland	6–I	6,893	8,784	Midland	1,529
Missaukee	5–I	1,553	3,388	Lake City	61
Monroe	8–K	33,624	33,344	Monroe	5,216
Montcalm	6–I	33,148	35,423	Stanton	1,740
Montmorency	4–J	......	846	Hillman.	
Muskegon	7–H	26,586	37,681	Muskegon	17,845
Newaygo	6–H	14,688	19,055	Newaygo	1,097
Oakland	7–K	41,537	41,167	Pontiac	5,348
Oceana	6–H	11,699	14,557	Hart	464
Ogemaw	5–J	1,914	3,641	West Branch	139
Ontonagon	2–D	2,565	4,838	Ontonagon §	1,855
Osceola	5–H	10,777	13,989	Hersey	472
Oscoda	4–J	467	1,376	Mio.	
Otsego	4–I	1,974	3,907	Gaylord	292
Ottawa	7–H	33,126	36,308	Grand Haven	5,914
Presque Isle	3–J	3,113	4,067	Rogers City	325
Roscommon	5–I	1,459	2,610	Roscommon §	171
Saginaw	6–J	59,095	75,813	Saginaw	13,767
St. Clair	7–K	46,197	46,813	Port Huron	10,390
St. Joseph	8–H	26,626	26,299	Centreville	705
Sanilac	6–K	26,341	29,623	Sandusky.	
Schoolcraft	2–G	1,575	3,853	Manistique §	1,151
Shiawassee	7–J	27,059	28,098	Corunna	1,451
Tuscola	6–J	25,738	29,935	Caro	1,282
Van Buren	8–H	30,807	30,446	Paw Paw	1,482
Washtenaw	8–J	41,848	41,704	Ann Arbor	7,922
Wayne	8–K	166,444	189,348	Detroit	133,269
Wexford	5–H	6,815	10,538	Cadillac	3,916
Total		1,636,937	1.856,100		

Railroads, etc.—In 1880 there were in operation 3607 miles of railway, costing $136,086,961, with net earnings

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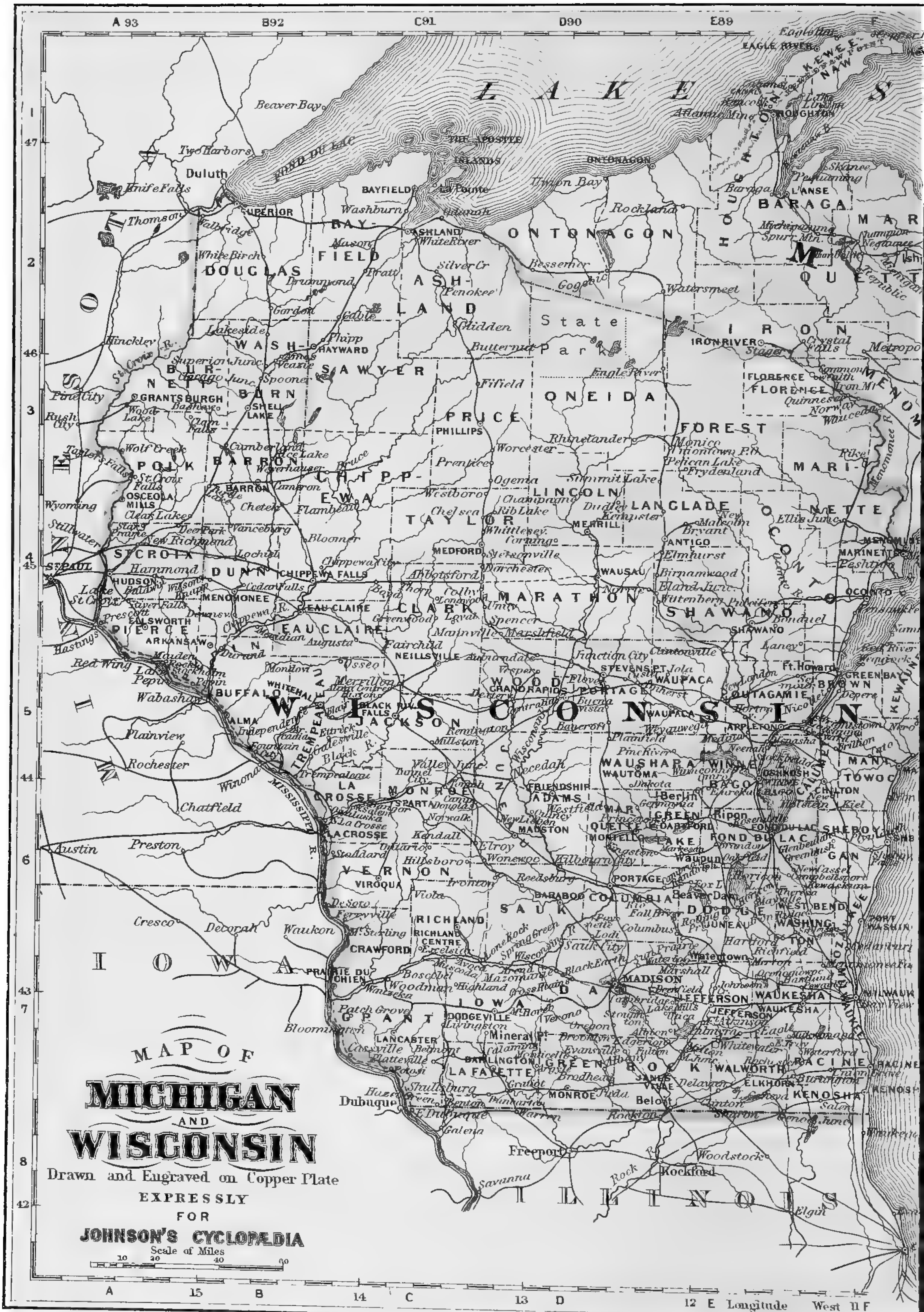
† Reference for location of counties. See map of Michigan.
‡ Formed since census of 1880. § Township.

* On farms only.



MAP OF

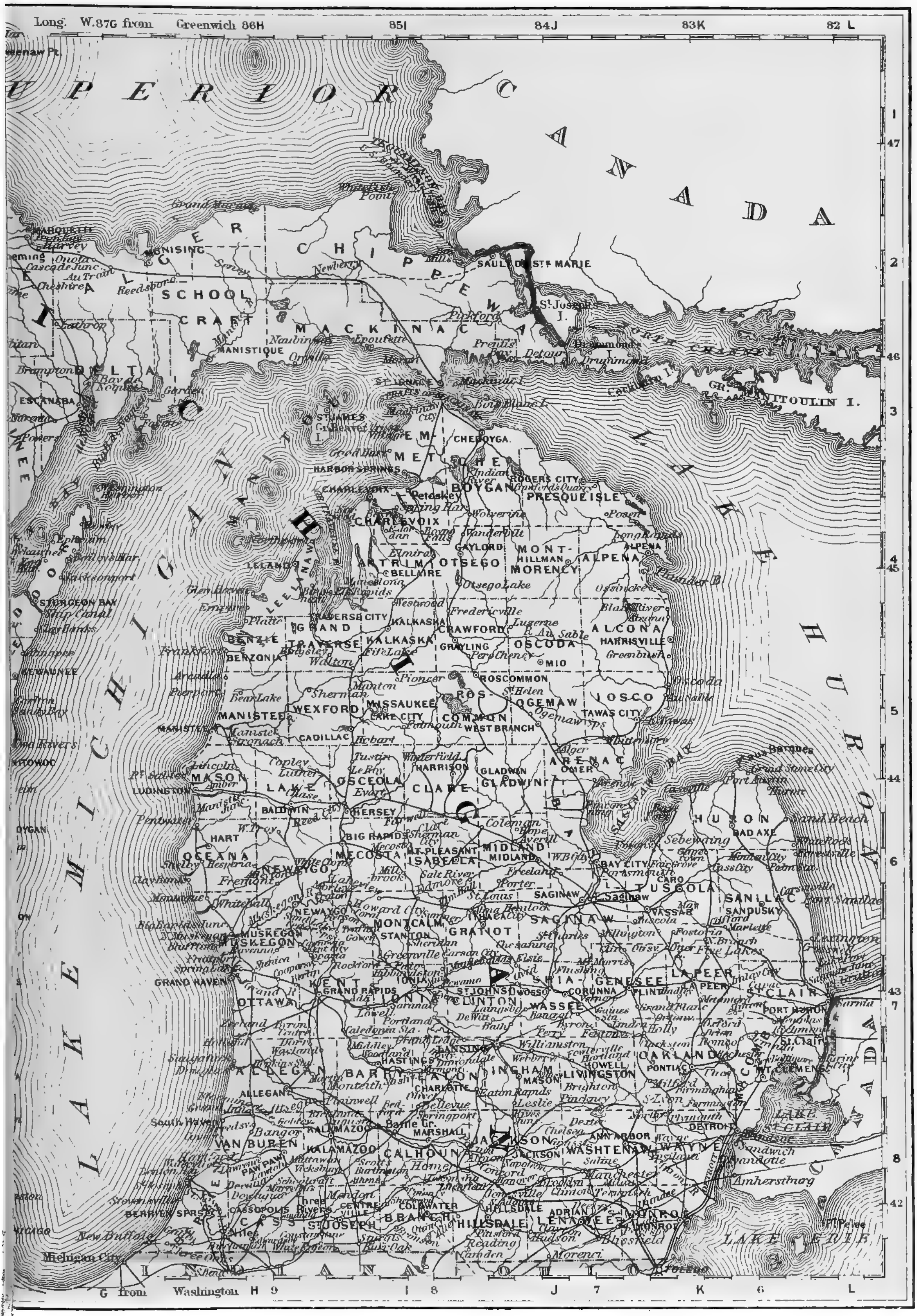
MICHIGAN

AND

WISCONSIN

Drawn and Engraved on Copper Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPÆDIA

Scale of Miles


Long. W.87G from Greenwich 86H
85I
84J
83K
82 L
SUPERIOR
CANADA
LAKE HURON
LAKE MICHIGAN
LAKE ST. CLAIR
LAKE ERIE
INDIANA
OHIO
G from Washington H 9
I 8
J 7
K 6
L
47
46
45
44
43
42
1
2
3
4
5
6
7
8
ALGER
SCHOOL CRAFT
CHIPPEWA
MACKINAC
DELTA
SAULT DE STE MARIE
ST. IGNACE
CHEBOYGAN
EMMET
PRESQUE ISLE
CHARLEVOIX
ANTRIM
OTSEGO
MONTMORENCY
ALPENA
LEELANAW
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
BENZIE
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
HURON
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
OTTAWA
KENT
IONIA
CLINTON
SHIAWASSEE
GENESEE
LAPEER
ST. CLAIR
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST. JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
MARQUETTE
MANISTIQUE
ESCANABA
CADILLAC
LUDINGTON
GRAND RAPIDS
LANSING
BATTLE CR.
DETROIT
PORT HURON
BAY CITY
SAGINAW
FLINT
ANN ARBOR
TOLEDO
GR. MANITOULIN I.
DRUMMOND I.
ST. JOSEPH I.
BEAVER I.
GRAND HAVEN
MICHIGAN CITY

of $6,706,566; amount paid in interest and dividends, $5,402,362. The shipping interest is large, Michigan having 470 sailing and 393 steam vessels, with tonnage of 162,196 in 1881. There is a ship-canal at St. Mary's Falls, and also in Houghton county.

Commerce and Navigation.—The foreign commerce of Michigan (principally with Canada) amounted to $8,311,417 exports and $2,460,962 imports. There were 2949 vessels entered and 2852 cleared at Detroit in 1879, and at Huron 905 vessels entered and 844 cleared.

Finances.—The taxed valuation of property in 1881 was $810,000,000, real and personal; State tax, 12.78 cents on $100; amount raised for State expenditure, $804,831; total taxation, State, city, and town, 1880, $8,632,677; State debt in 1881, $904,150; total debt, local and State, $8,803,144.

Banks, Savings Banks, etc.—There were in Oct., 1881, 80 national banks in Michigan, with $14,806,917 capital: circulation, $5,614,977; U. S. bonds to secure circulation, $6,375,300; deposits, $24,363,956. Of State banks and trust companies there were 28, with $9,292,248 deposits, 1 savings-bank, with $2,586,087 deposits. and 144 private bankers, with $6,164,082 deposits. In 1880 there were 211 insurance companies doing business: risks, $1,523,454,000 for that year; premiums, $20,651,480; losses, $11,457,967.

Education.—The number of children of school-age (five to twenty years) in 1880 was 506,221, of whom 362,459 were enrolled in the common schools, with average attendance of 263,775. Total expended for public schools, $3,112,468, of which $1,920,618 was for teachers' salaries. School-houses, 8608; teachers, 8608. There are 9 colleges and universities, with 138 instructors and 2232 students, paying $81,760 tuition fees. There were, in 1882, 452 periodicals published, 35 of them daily.

Churches.—The Methodist Episcopal Church has 573 churches and 61,701 members; Baptists, 336 churches, 27,036 members; Lutherans, 224 churches, 27,750 members; Congregationalists, 236 churches, 17,064 members; Presbyterians, 173 churches, 16,576 members: Roman Catholics, 229 churches; and about 25 other denominations, from 125 to 1 church each.

Population.—From the time when the Territory was set off from Indiana Territory to the present the State has shown a remarkably rapid increase in population, rising from 551 pioneers in 1800 to the following figures; 1860, 749,113; 1870, 1,184,059; 1880, 1,636,937 (white 1,614,560, colored 22,377, including 7249 Indians, 27 Chinese, and 1 Japanese); in 1884, 1,856,100.

Principal Cities and Towns, Pop. 1884.—Detroit, 133,269; Grand Rapids, 41,934: Bay City, 29,415: East Saginaw, 29,100; Jackson, 19,136; Muskegon, 17,845: Kalamazoo, 13,938: Saginaw, 13,767; Manistee, 10,373; Battle Creek, 10,021; Lansing (cap.), 9779; Adrian, 9350; Alpena, 9210: Flint, 9035; Ann Arbor, 7922; Ishpeming, 6843; Grand Haven, 5914; Marquette, 5612; Ludington, 5433; Pontiac, 5348; Ypsilanti, 5302; Monroe, 5216; Coldwater, 5102; Ionia, 4643; Niles, 4606.

History.—Michigan derives its name from the Indian words *Mitchi Sawgyegan*, signifying "lake country"—a very appropriate name, since it is almost surrounded by lakes. There were no white inhabitants within its present limits prior to 1641, though the French Jesuit missionaries had visited Detroit as early as 1620. The first settlement was made in 1641 at the Falls of St. Mary, in the upper peninsula. This was only temporary, however, and no permanent colony was established until 1668, when Allouez, Dablon, and James Marquette founded the mission of St. Mary at St. Mary's Falls. In 1671, Father Marquette laid the foundations of a fort at Michilimackinack (now Mackinac). In July, 1701, a colony was planted at Detroit by M. Antoine de la Motte Cadillac. As a consequence of the great battle on the Heights of Abraham (Sept. 13, 1759), between Wolfe and Montcalm, the French surrendered to the English Crown, on Sept. 8, 1760, Detroit, Michilimackinack, and all other places within the government of Canada then remaining in the possession of France; and this surrender was ratified by the Treaty of Paris, Feb. 10, 1763. Silver and copper were discovered, and the mines worked to some extent in 1772 and 1773. During the war of the Revolution, Michigan was included within the bounds of Canada, and was not the scene of any battles. Though it was claimed as being included in the territory ceded to the U. S. by Great Britain, it was not formally surrendered till June, 1796, and was then included in the North-west Territory. This Territory was divided into two May 7, 1800, and the eastern portion, which included Michigan, was called Indian Territory, and Gen W. H. Harrison appointed governor. On June 30, 1805, Indiana Territory was divided, and Michigan Territory was organized with substantially the present boundaries of the State, Detroit made the seat of government, and Gen. William Hull appointed governor. He entered upon his duties July 1, 1805, but the little settlement of Detroit had been destroyed by fire nineteen days before. In its rebuilding it was laid out on a handsome and extensive plan, which it has since retained. On June 18, 1812, war was declared between the U. S. and Great Britain, and Gen. Hull appointed commander-in-chief of the forces of the North-west. The appointment was unfortunate, for he not only took no aggressive measures, but within thirty-seven days after taking command ingloriously surrendered Detroit and its fort to the British. It was occupied by them with a small garrison, and all of the Territory came under their control: but the naval battle of Lake Erie (Sept. 10, 1813) resulted in the restoration of Michigan to the U. S., and on the 29th of the same month Detroit was occupied by a detachment of the army of Gen. Harrison. In Oct., 1813, Col. (afterward Gen.) Lewis Cass was appointed governor of Michigan Territory. In 1823 a legislative council of nine members, appointed by the President from eighteen persons elected by the people of the Territory, was ordered, and entered upon their duties in June, 1824. They, with the governor, constituted the actual government of the Territory, which had previously been vested in the governor and judges. In 1831, Gen. Cass was succeeded by George B. Porter as governor, and on his death, in July, 1834, Stevens T. Mason was appointed his successor. In 1835 a controversy arose between Michigan and Ohio in regard to their boundary-line and the right to a strip of land to which both laid claim. At first there was danger of bloodshed, but the excitement passed away without it. A constitution was adopted and a State government elected in 1835, which were accepted by Congress June 15, 1836, and the State admitted into the Union with the condition that Michigan should accept the boundary claimed by Ohio. This condition was very unsatisfactory to the people of Michigan, but it was finally accepted under protest Dec. 15, 1836, and the State was allowed to record its vote for President that year, though it was not formally declared a State by act of Congress until Jan. 26, 1837. On May 16, 1847, the seat of government was removed from Detroit to Lansing. In 1850 a constitutional convention was held, and a new constitution reported and ratified by the people in November of that year. The legislature of 1873, by joint resolution, provided for the appointment of a commission of two persons from each congressional district in the State to revise the constitution and report to the legislature of 1875 such amendments or such revision of the constitution as in their judgment might be necessary for the best interests of the State and the people. The action of Michigan during the late civil war was highly creditable to her patriotism. She sent to the field 90,747 able-bodied and efficient men of all arms, or more than one-ninth of her entire population, and none of them disgraced the State whose standards they bore. During the four years of the war 357 commissioned officers and 14,466 enlisted men from the State fell in defence of their country's honor, and their names are inscribed on its "roll of honor." The State, counties, cities, and towns paid during the war for bounties, premiums for recruits, relief of soldiers' families, and other war purposes, $16,548,992.91, besides liberal appropriations by the State and large gifts by its citizens for disabled soldiers.

Governors.

Under French Dominion.

Samuel Champlain	1622–35
M. de Montmagny	1636–47
M. d'Ailleboust	1648–50
M. de Lauson	1651–56
M. de Lauson (son)	1656–57
M. d'Ailleboust	1657–58
M. d'Argenson	1658–60
Baron de Avangour	1661–63
M. de Mesey	1663–65
M. de Courcelles	1665–72
Count de Frontenac	1672–82
M. de la Barre	1682–85
M. de Nonville	1685–89
Count de Frontenac	1689–98
M. de Callieres	1699–1703
M. de Vaudreuil	1703–25
M de Beauharnois	1726–47
M. de Galissoniere	1747–49
M. de la Jonquiere	1749–52
M. de Quesne	1752–55
M. de Vaudreuil de Cavagnac.	1755–63

Under British Dominion.

James Murray	1763–67
Guy Carleton.	1768–77
Frederick Haldimand	1777–85
Henry Hamilton	1785–86
Lord Dorchester	1786–96

Territorial.—N. W. Territory.

Arthur St. Clair	1796–1800

Indiana Territory.

Wm. Henry Harrison	1800–05

Michigan Territory.

William Hull	1805–13
Lewis Cass	1813–31
George B. Porter	1831–34
S. T. Mason, *ex-officio*	1834–35

State.

Stevens T. Mason	1835–40
William Woodbridge	1840–41
J. Wright Gordon (act.)	1841–42
John S. Barry	1843–45
Alpheus Felch	1846–47
Wm. L. Greenly (act.)	1847
Epaphroditus Ransom	1848–49
John S. Barry	1850–51
Robert McClelland	1852–53
Andrew Parsons (act.)	1853–54
Kinsley S. Bingham	1855–58
Moses Wisner	1859–60
Austin Blair	1861–64
Henry H. Crapo	1865–68
Henry P. Baldwin	1869–72
John J. Bagley	1873–77
Charles M. Croswell	1877–81
David H. Jerome	1881–83
Josiah W. Begole	1883–85
R. A. Alger	1885–87

REVISED BY A. R. SPOFFORD.

Michigan City, R. R. centre, La Porte co., Ind. (see map of Indiana, ref. 1-D, for location of county), 70 miles E. by rail from Chicago, is situated on Lake Michigan, and has the Northern Indiana State prison, foundries, planing-mills, and an extensive lake-trade in lumber, salt, and iron ore. Pop. in 1870, 3985; in 1880, 7366.

Michigan, Lake, the second in area of the great lakes of the St. Lawrence basin, and the only one entirely within the limits of the U. S. Area, 25,600 square miles. Its greatest length is 340 miles; average depth, 990 feet; height of surface above the ocean, 578 feet—the same as that of Lake Huron. Its shores are generally low and often sandy. It has comparatively few bays or very good harbors. The principal bays are Green Bay in Wisconsin and Grand Traverse Bay in Michigan. It receives many streams the mouths of which in some instances (as at Chicago, Ill.) have by artificial means been converted into capacious harbors. Most of the islands of this lake are in the N. part. Lake Michigan is subject to violent storms, but it is an important area of commerce, being traversed by many steamboats, three-masted schooners, and other craft. It has the State of Michigan on the E. and N., Wisconsin and Illinois on the W., while its S. extremity reaches Illinois and Indiana. It has extensive fisheries, the whitefish and several large trout being the most important species caught.

Michigan University, an institution of learning at Ann Arbor, Mich. Congress in the year 1826 set apart two townships in the Territory of Michigan for the future foundation of a university, which was accordingly established by the first legislature of the new State Mar. 18, 1837, though not opened until Sept. 20, 1841. It is supported by the State, and open to both sexes on payment of a small matriculation fee and of an annual charge of from $20 to $35. Michigan University is now the largest and most prosperous institution of the kind in the Northwestern States. To the original academic institution a medical department was added in 1850, a law department in 1859, and subsequently a school of pharmacy, a homœopathic medical college, and a dental college. A school of political science has also been organized. The department of literature, science, and the arts embraces seven regular courses of four years and a post-graduate course. The total number of instructors in 1883–84 in the various departments was 81; the number of students was 1337. The libraries contain about 45,000 volumes; the various museums have above 320,000 specimens. A fine observatory was erected by citizens of Detroit in 1854. The grounds of the university embrace 40 acres, and the buildings were erected at a cost of $470,000. The university fund, derived from the sale of lands, now annually yields about $38,500. A twentieth of a mill tax levied by the State for the university yields about $40,500. The legislature at each session for many years has made generous appropriations for the university. The annual expenditure averages about $190,000. The government is in the hands of eight regents, elected by the popular vote of the State. President, since 1871, James B. Angell, LL.D.

J. B. Angell.

Michmash, a town of Palestine, in the tribe of Benjamin, 9 Roman miles N. of Jerusalem, was a point of great strategical importance, and played a conspicuous part in all the wars of the Israelites (1 Sam. xiv.).

Michoacan′, state of the Mexican confederation, extends along the Pacific from lat. 18° to 21° N., bounded on the other sides by the states of Jalisco, Guanajuato, Queretaro, Mexico, and Guerero, and comprises an area of 25,689 square miles, with 661,634 inhabitants, most of whom are mestizoes and Indians. The middle part is mountainous, traversed by the Sierra Madre; the mountains are of volcanic origin, rich in metals, and covered with vast forests. The highest point is the Cerro de Santa Rosa, in the district of Tlapujahua, about 17,000 feet high; among the volcanoes is the famous Jorulla. Between the ridges stretch elevated valleys dotted with lakes—among which Chapala, about 60 miles long and 20 miles broad, and Patzcuaro, 30 miles in circumference, are the most remarkable—and watered by numerous mountain-torrents, and even by large rivers, such as the Lerma, the Mescala, etc. The soil is everywhere extremely fertile (maize yields in most parts four hundred-fold) and the climate mild and healthy. Only the low coast-land is hot, and in some places unhealthy. Cattle, horses, mules, asses, hogs, and poultry are extensively reared, and the lakes and rivers swarm with fish. Shawls, blankets, and silver-ware are manufactured; silver, gold, and copper are mined to the value of $1,175,300 annually, and form the principal items of exportation besides cabinet and dyewood, coffee, indigo, silk, etc. Cap. Morelia.

Michon (Jean Hippolyte), b. at La Roche Fressange, in the department of Corrèze, France, Nov. 21, 1806, was educated in the College of Angoulême; studied theology in the Seminary of St. Sulpice, in Paris; was ordained a priest in 1830; preached with great success in Bordeaux, Angoulême, Perigueux, Paris, and other places; accompanied De Saulcy twice to the East, in 1850 and in 1863; was made an honorary canon of Bordeaux and Angoulême, and d. at Montanzier, in the department of Charente, May 8, 1881. His numerous works belong to apologetics or archæology or to that new science he has designated as "graphology." The first group comprises *La femme et la famille dans le catholicisme* (1845), *Apologie chrètienne au XIX. siècle* (1863), *Vie de Jesus* (2 vols., 1865); the second, *Statistique monumentale de la Charente* (1844–48), *Monographie du château de la Rochefoucault* (1848), *Solution nouvelle de la question des lieux saints* (1852), *Voyage religieux en Orient* (2 vols., 1854); the third, *Système de graphologie* (1874) and the semi-monthly review *Graphologie.*

Micipsa. See Jugurtha.

Mickie′wicz (Adam), b. at Novogrodek, Lithuania, in 1798; studied natural science, history, and literature at Minsk and Wilna; was appointed teacher of Latin and Polish at the gymnasium of Kovno, and published in 1822 two volumes of poems, which at once gave him rank among the greatest poets of the Polish literature, and decided the contest between the old classical and the new romantic school. In 1824 he was banished for participation in the conspiracy of Zan to the interior of Russia, and here he wrote his celebrated sonnets and the epic *Konrad Wallenrod* (1828). Having received permission to make a tour in Europe, he went to Germany and Italy, but never returned. In 1832 he published *Books of the Polish Nation*, and in 1834 a new epic, *Pan Tadeusz.* In 1832 he settled in Paris, and in 1840 he was appointed professor of the Slavic language and literature, and his brilliant lectures attracted much attention: but afterwards he became much mixed up with various fantastical religious and political plans, and his lectures were suspended, as he used his chair as a propaganda for his mystical ideas of the second advent of the Saviour, etc. In 1851, Napoleon made him librarian at the arsenal in Paris. D. at Constantinople Nov. 27, 1855, whither he had gone on the suggestion of Napoleon III. to form a regiment of Polish volunteers to fight against the Russians in the Crimean war.

Mic′kle (William Julius), b. at Langholm, Dumfriesshire, Scotland, Sept. 29, 1734; was educated at Edinburgh; was first engaged in the brewing business, in which he failed, when he came to London and devoted himself to literature; became in 1765 corrector to the Clarendon press at Oxford, where he edited a collection of poems, many of which were his own production. Having become interested in Portuguese literature, he published in 1771 the first book of a translation of Camoens' *Lusiad* into English verse as a specimen of a complete translation, which he executed by shutting himself up in a farmhouse for four years. The work was published in 1775, and brought him great credit. He was sent in an official capacity to Lisbon about 1780, and realized a handsome fortune as his commission on the sale of naval prizes. He passed his closing years in literary leisure at Forest Hill, Oxfordshire, where he d. Oct. 28, 1788. Some of the finest pieces in F. Evans's *Old Ballads* (1777) were from his pen. That entitled *Cumnor Hall* suggested to Sir Walter Scott his novel of *Kenilworth.* Mickle's poetical works were printed in 3 vols. (1806).

Mic′macs, a tribe of Indians residing in New Brunswick, Nova Scotia, Prince Edward's Island, and Newfoundland. They were apparently the earliest aborigines of the continent to come in contact with Europeans, since there is reason to believe that the Indians carried to England by Cabot in 1497 were of this tribe, as well as those taken to France by Aubert in 1508. The French called them "Souriquois," and by the interior tribes they were known as "Salt-water Indians," from the fact of their residing near the sea-coast and their expertness as fishermen and canoe-men. In remote times they carried on warfare with the Esquimaux N. of the St. Lawrence. After the French colonization of Acadia they adopted many of the habits of civilization, were converted to Catholicism, and became staunch allies of the French in their warfare with the English and the New England colonies. For many years they were a source of great annoyance to the English. In 1722 they captured eighteen English vessels and plundered as many in the Bay of Fundy, and in their prizes they cruised about and actually attacked English armed vessels. Down to 1760 they continued the active enemies of the English in Nova Scotia; and when threatened by the English governor on account of their annoying the English settlers in that region, their chief answered scornfully: "The land on which you sleep is mine. I sprang out of it as the grass does; I was born on it from sire to son. It is mine for ever." Very soon, however, the English were able to accept the challenge, and the council of Halifax simply offered ten guineas for every one of the Micmacs taken or killed, to be paid on producing the savage or his scalp. The Indians then began to suffer indescribably: and when, in 1760, Canada was captured by the English, the Richibucto Micmacs, the most warlike of the tribe, laid down their arms and submitted to English rule. Several treaties were afterward made with them, and reservations assigned to them. They now reside chiefly on the Basin of Minas in Nova Scotia and on the upper St. John's River in New Brunswick. At the close of the sixteenth century they numbered about 3500, and in 1873 they still numbered 3600, of whom 2165 were in Nova Scotia (including 400 on Cape Breton), 1386 in New Brunswick, and 70 in Newfoundland. The Micmacs constitute the most eastern division of the Algonkin family, their language being closely akin to that of the Penobscots of Maine. A peculiar kind of hieroglyphics, partly original with the Micmacs, but modified by Father Leclercq, a Catholic missionary, has been current among them for nearly 200 years, its chief use being in connection with the Catholic devotional services. Protestant missions have been established among the Micmacs in Nova Scotia for some thirty years, and portions of the Scriptures have been translated into their language by Rev. S. R. Rand, and printed at New York, partly in phonetic type. The same zealous missionary philologist has formed an extensive Micmac dictionary, still unpublished. A Micmac grammar by Abbé Maillard, revised by Bellenger, was printed at New York in 1864. PORTER C. BLISS.

Micras'ter [Gr. μικρός, "small," and ἀστήρ, "star"], a genus of Echinoidea or sea-urchins belonging to the family Brissidæ, and occurring fossil in the Cretaceous formation. *M. cor-anguinum* is one of the characteristic fossils of the Upper Chalk of Europe. EDWARD C. H. DAY.

Mi'crocosm [Gr. μικρόκοσμος, "little world"], a name which was applied by the astrological philosophers of the Middle Ages to man, who was conceived of as the epitome or miniature representation of the universe, which was named by them *Macrocosm*, or the great world. This theory, a very ancient one, was believed to explain the supposed influence of the stars upon the events in the history of the human race and of individual men.

Microcos'mic Salt, also called phosphorus salt, ammonic-sodic phosphate $(NH_4)NaHPO_4.4H_2O$, used as a flux in blowpipe analysis. (See PHOSPHATES.)

Microm'eter [Gr. μικρός, "small," and μέτρον, "measure"], an apparatus for measuring small distances. The term is usually limited to a contrivance placed in the field of view of a telescope or microscope. Gascoigne in 1640 first suggested the idea of measuring distances in the field of view of a telescope by separating mechanically the edges of two brass plates placed in the focus of the eyepiece. Auzout and Picard in 1666 described a micrometer in which silver wires take the place of the brass edges. Felix Fontana in 1775 substituted spiders' web for the silver wires, which seems to be, in connection with the previous suggestions of Bradley, the incipient idea of our modern position micrometer. A fixed micrometer is mentioned by M. Cassini, and M. Cavallo used a strip of mother-of-pearl ruled to $\frac{1}{200}$th of an inch. Roemer hints at the heliometer with two object-glasses in 1675, and Bouger first calls it by that name in 1748; but it remained for Dolland in 1753 to construct a heliometer with a divided object-glass. The simplest form of micrometer is the reticulated micrometer shown in Fig. 1, which consists of a network of lines whose distances apart are known for the telescope to which it is applied. The apparent size of an object in the field of view then becomes known by noting how many divisions of the micrometer are occupied by its image. Scales ruled on glass, such as shown in Fig. 2, are sometimes substituted for the reticule. These lines are rendered visible at night by artificial light. For the observation of very faint objects, Prof. Rood suggests (*Am. Jr. Arts and Sci.*, 3d series, vol. vi. p. 44) an inexpensive scale micrometer made as follows: A dead black surface is formed on a thin plate of silver. Lines are ruled through the blackened surface, ending at the edge of the plate. These lines look bright on a dark background. The plate is then put in the focus of the eye-piece, so as to obscure less than half the field of view. The lines are illuminated by the light of a distant lamp or diffused light, which reaches them through an opening cut in the telescope-tube between the observer's eye and the ruling on the silver plate. The ring micrometer is simply an exactly circular metallic ring suspended in the focus of the telescope, such as shown in Fig. 3. The filar micrometer, shown in Fig. 4, is composed of a rectangular frame *a a a a*. (See Loomis's *Pract. Astronomy*, p. 33.) Two rectangular forks, *b*, *b*, *b* and *c*, *c*, *c*, slide in this frame, and can be moved by the screws *f*, *f* by turning the graduated heads *g*, *g*, which are graduated usually into 100 equal parts; at *a* and *a* are two pointers. If the head is turned so that 100 divisions will pass the point *a*, obviously we move one of the forks a distance equal to the distance between the threads of the screw *f*. The forks carry two spider-lines, *e* and *d*. The distance apart of any two points in the field of view may be determined by making the line *e* bisect one of them, and the line *d* the other, and at the same time having the line joining them parallel to *l*. For every entire revolution of the screw *f* the line *e* or *d* passes over a single tooth of the comb *c*. By noting the number of teeth included between the lines *e* and *d*, and also noting the readings of the pointers *a* and *a*, the exact distance between the two points becomes known, expressed in terms of the distance between the threads of the micrometer screw *f*, *f*, which has usually about 100 threads to the inch. One division on the head of the micrometer screw would in this case be equal to $\frac{1}{10000}$th of an inch. When the filar micrometer is attached to a graduated circle, so that it can be rotated around the axis of a telescope, as shown in Fig. 5 (see Loomis's *Pract. Astr.*, p. 35), it is then called a position micrometer. The spider-lines are illuminated by lamplight at night. Browning suggests (*Month. Not. R. Astr. Soc.*, vol. xxx. 3, p. 72), for measuring faint lines in spectra, a micrometer shown in Fig. 6, where *c* is the head of the micrometer-screw, which moves across the opening *o* a plate which is opaque with the exception of two intersecting lines. These lines are illuminated by light reflected from the mirror *m*. The rays from the intersecting lines are reflected from the anterior surface of the prism *p* to the eye at *e*, after being brought to

FIG. 1.

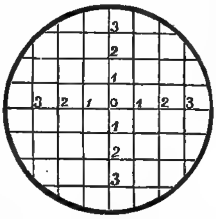


FIG. 2.

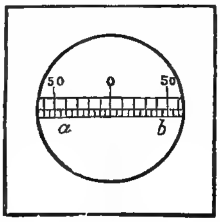


FIG. 3.

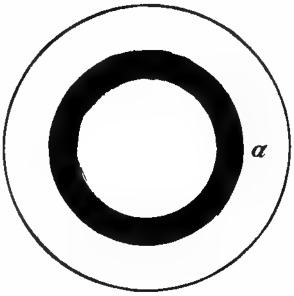


FIG. 4.

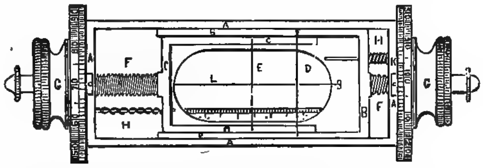
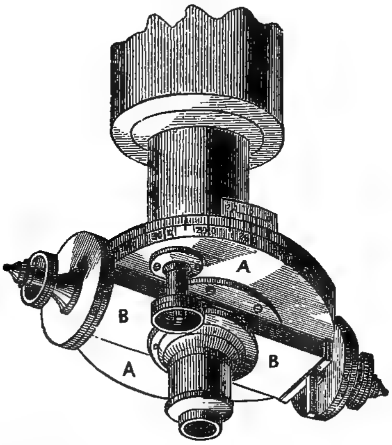
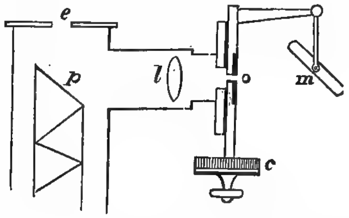


FIG. 5.



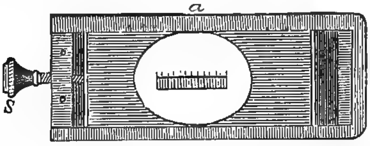
a proper focus by the lens *l*. The observer at *e* can thus measure the position of the spectrum lines by bisecting the spectrum lines by the reflected image of the intersecting lines at *o*.

FIG. 6.



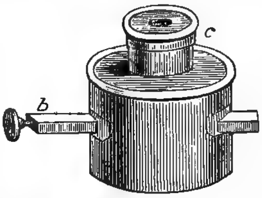
Instead of the intersecting lines, a fine clear white pointer may be substituted. In the double-image micrometer the images of two objects are made to coincide in the field of view, either by the motion of the two halves of a divided object-glass of a telescope, in a line parallel to the line of section, or by the separating of the two halves of a simple eye-lens.

FIG. 7.



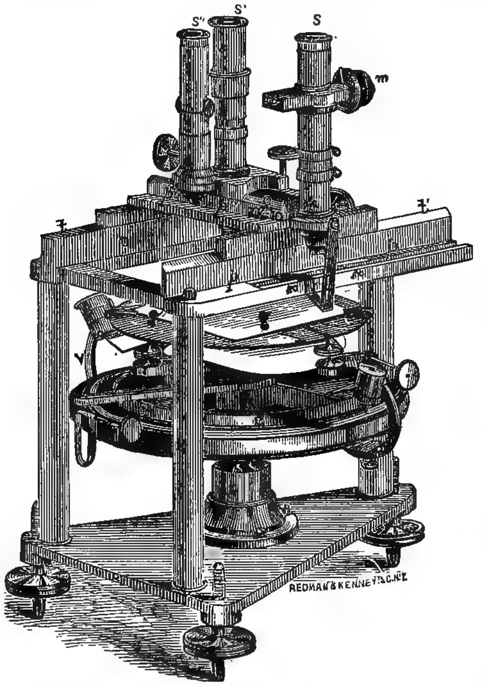
The motion in either case is effected by proper micrometer-screws, and the displacement of the lenses necessary to effect a coincidence gives the data necessary to determine the angular distance between two objects.

FIG. 8.



The first form of instrument is called the heliometer, and is superior to the position micrometer in that much larger distances can be measured. The second form is known as the double-image eyepiece micrometer.

FIG. 9.



Either the reticulated or the filar micrometer may be used with the microscope, but perhaps one of the best microscope micrometers is that known as Jackson's micrometer, and shown in Figs. 7 and 8, where *a* is a frame containing a glass plate on which a scale of fine lines is ruled. This scale can be moved by a screw *s*, so that when placed in the focus of the eyepiece *b c*, any desired line of the scale may be made to bisect any point in the field of view. The distance between two points may easily be determined in terms of the scale divisions.

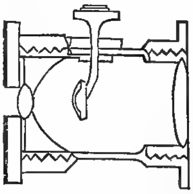
The application of photography to astronomy has rendered necessary some means of measuring the photographs made. A micrometer for this purpose is shown in Fig. 9, where *g g'* is the plate containing the photograph to be measured, supported in the focus of the microscope *s'* over the graduated circle *c c'*, whose position is read by the two verniers *v* and *v'*. The microscope *s'* has two motions—one parallel to the bearings *p' p* and *t t''*, and the other perpendicular to these bearings and parallel to the bearings *p'' p'''*. A glass scale is inlaid at *p' p*, which can be read by the microscope micrometer *s m m'* as it traverses the bearing *p' p t'*. A second glass scale is inlaid at *p'' p'''*, which may be read by the microscope *s''*, which is attached to an arm from the microscope *s'*, and moves with *s'* perpendicular to the bearing *p' p t'*. The co-ordinates of any point on the plate to be measured may be expressed either in rectangular or polar co-ordinates by using the two glass scales alone, or by using the micrometer *s m m'*, with the glass scale *p' p*, in conjunction with the circle *c c'*. The figure is engraved from a micrometer designed by L. M. Rutherford, Esq., and now in his possession.

(See for discussion of errors of micrometers Chauvenet's *Manual of Practical Astronomy*. For description of various forms of micrometers see *Monthly Notices Royal Astr. Soc.*, vol. xix. p. 324; same journal, vol. xviii. p. 58; same journal, vol. xxxiv. p. 395. For index of literature on micrometer, and descriptions of, see Dr. Philipp Carl on *Die Principien der astronomische Instrumentkunde*, Leipsic, Voight & Gunther, 1863.) L. WALDO.

Micronesia, the general name given to the small islands E. of the Philippines. The Caroline and Marshall Islands, each embracing a great number of smaller groups, are the principal divisions.

Microscope. Those objects which are too minute to be seen by the unaided vision are brought into view by the instrument called *microscope* (from μικρός, "small," and σκοπεῖν, "to see"). It is scarcely necessary here to record all the evidences which would tend to prove that the simple microscope or magnifying-glass was known long ago. But the period at which the microscope first became generally known was about the year 1590, Zacharias Jansens and his son having made the instrument at this time. Fontana (1618) and Stellati (1685) also made use of the microscope, and the latter published a description of the anatomy of the bee, including its minute structure. With the simple microscope (a single lens) Swammerdam, Leeuwenhoeck, and others made many discoveries; in fact, it would seem that the simple lens served to establish the immense value which this instrument was destined to render, and has rendered, almost every department of science. The form of single microscope used by Dr. Nathaniel Lieberkuhn (1740) consisted of a small lens placed in the centre of a polished concave speculum of silver, thus allowing a brilliant light to be reflected upon the surface of the object. (Fig. 1.)

FIG. 1.



Leeuwenhoeck's discoveries were made with a single lens mounted between two plates, each plate pierced with a hole. The objects were fastened to needles or plates of talc, which could be brought into position by means of screws. As each instrument was arranged for only two or three objects, Leeuwenhoeck had a large number of such simple microscopes. From the time of Zacharias Jansens (1590) to the period when uncorrected instruments were being abandoned, many forms of microscopes were constructed by scientists and opticians of England, France, Germany, and Italy. The names of Adams, Baker, Hill, Delabarre, and Wollaston remain as pioneers in the perfection of the optics of the microscope. The great difficulty which beset these early microscopists was the *spherical and chromatic aberrations* of the lenses, by which the image formed was distorted in figure and surrounded by a colored fringe. Wollaston and Fraunhofer directed their attention to the improvement of these defects, which resulted in the celebrated Wollaston doublet called by its inventor "periscopic microscope," and the combination by Fraunhofer of two glasses in juxtaposition, forming a single achromatic object-glass (1816). Euler as early as 1776 discovered the achromatic objective. The value of clear definition had now become so established that the greatest scientists of the day were engaged upon the subject of achromatism, both theoretically and practically. In 1829, Mr. Jackson Lister effected one of the greatest improvements in the construction of the object-glass, using a plano-concave lens of flint glass and a double convex of crown. These two lenses were cemented together by Canada balsam. The details developed by Mr. Lister will be more fully treated of under the head of the *Object-Glass.* With the principles laid down by Lister rapid strides were made in the perfection of lenses used in the microscope, and, owing to the constant care and attention to points of minutiæ, the compound achromatic microscope of to-day may be said to represent almost "theory perfected in practice."

In order fully to appreciate the exact construction of the microscope, the division of the subject into *simple* and *compound microscopes* is necessary. By a *simple* microscope is understood a single lens or set of lenses, by means of which the object is viewed directly. The ordinary hand-magnifier or pocket-lens is an example. Here one, two, or three lenses may be employed. A more convenient form consists in having the simple microscope mounted upon a stand provided with an arm made to move up and down by means of a rack and pinion or other device. The steadiness attained by this addition enables much useful work to be accomplished, such as dissecting animal and vegetable tissues, studying in a rough way fragments of rock, plants, etc. Hand-magnifiers, to be serviceable, must range in focal length between two inches and half an inch. High powers on this plan are generally known as the "Coddington lens," "Stanhope lens," and "Wollaston doublet." It seems that the Coddington lens was really invented by Sir David Brewster, its present name having been given to it by Mr. Carey, who constructed one for Mr. Coddington, and supposed that he was the originator. This Coddington lens consists of a sphere of glass with a groove cut all around it and filled with dark opaque material; the definition is good, and the instrument is used very much in collecting specimens for study with the larger microscopes, or where a rapid view is desired of many objects. Under the head of *compound* microscopes may be included those furnished with an object-glass, and an eyepiece, or ocular, which further amplifies the image formed by the object-glass. A stand furnished with stage or object-carrier, quick and slow motions for focusing, with many accessories, constitutes the complicated though easily-managed modern instrument.

In order fully to comprehend the optical arrangements of the microscope it seems best to consider very briefly some of the laws of optics which are immediately connected with it, and, as lenses are the chief parts to be looked into, to begin with their study. "A lens is a piece of glass or other transparent substance having its two surfaces so formed that the rays of light in passing through it have their direction changed, and are made to converge or diverge from their original parallelism, or to become parallel after converging or diverging." "When a ray of light passes in an oblique direction from one transparent medium to another of a different density, the direction of the ray is changed both on entering and leaving; this influence is the result of the well-known law of refraction, that a ray of light passing from a rare into a dense medium is refracted toward the perpendicular, and *vice versâ.* (Fig. 2.) The ray ke falling perpendicularly on the piece of glass at e is continued in a straight line to h. Now, if the same ray should take the course ae—that is, obliquely—instead of passing in a straight line $aemb$, it will be turned out of its course, or refracted, to d, which is nearer the perpendicular $a'kh$. ae is the incident ray, and the angle aek the angle of incidence with the perpendicular kh. From e to d is the refracted ray, and the angle deg is the angle of refraction to the perpendicular. After the change in the course of the ray has taken place in the glass, we find that when the ray is allowed to pass out from the glass, as at dc, another bending takes place, by means of which the course is made parallel with the incident ray ae, only its course is shifted a little to one side. With any radius, as de, describe a circle from the centre e; then the angle of incidence aek is measured by the arc aa', and the arc $g'd$ measures the angle of refraction ged. The line ak equals the sine of the angle of incidence, and dg equals the sine of the angle of refraction. The sine of the angle of incidence (in a given transparent medium) has always the same ratio to the sine of the angle of refraction with all degrees of obliquity of the incident ray.

FIG. 2.

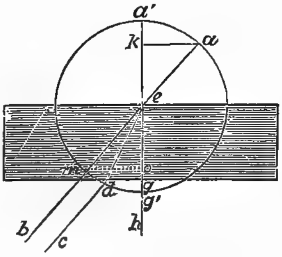
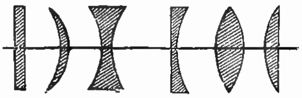


FIG. 3.



Lenses are of various forms, and change the course of light passing through them according to their special figure. In Fig. 3 are represented the different shapes of lenses. a is simple parallel glass, b a meniscus or concavo-convex lens, c a double concave, d a plano-concave, e a double convex, and f a plano-convex. In the optical construction of the microscope, convex and concave lenses are chiefly employed, the convex being the most important form, as the concave is used more for the purpose of correcting the errors which exist in simple convex glasses. The course of parallel rays when they pass through a convex lens is changed, and brought to a point called a focus, *the principal focus,* and the distance from the centre of the lens to this point is the focal length. Diverging rays are rendered parallel in their passage through a convex lens, and the focal distance for a double convex will be one-half that of a plano-convex having the same curved surface. The focal length depends upon the curvature of the lens and its index of refraction, so that a lens of crown glass will have a longer focus than one of flint with the same curvature. The principal focus, in general terms, may be considered as the distance of its radius for a double convex lens (that is, in its centre of curvature), and at twice the distance of its radius for a plano-convex, parallel rays being understood as passing through in both cases. A concave lens refracts light in exactly the opposite manner from a convex; hence, parallel rays are caused to diverge, etc. By means of a convex lens a great number of rays proceeding from some point of an object are united in one point; each ray carries with it the image of the point from which it proceeded; therefore all the rays united form an image of the object, and the image is brighter in proportion to the number of rays united. "If an object be placed at twice the distance of the principal focus, the image, being formed at an equal distance on either side of the lens, will be of the same dimensions with the object." (Fig. 4.) As the object approaches the lens, the image increases both in size and distance from the lens; and as the object is withdrawn from the lens, the image is smaller and closer to the glass. The smaller the image the more brilliantly it is illuminated; and on the other hand, the light decreases as the image increases in size. Images formed by simple lenses are first distorted, and secondly surrounded by a colored fringe. These defects are due to the spherical form in which the lenses are ground, as practically such curves as the ellipse and hyperbola cannot be accurately made. The rays of light, then, in passing through a convex lens are not *all* brought to the same focus, but those on the periphery come to a point first—*i. e.* nearest to the lens—and then those rays passing through closer to the centre, afterward or farther from the lens. (Fig. 5.) This produces a curved image, and is called spherical aberration. A concave lens has precisely the same defects, but of an opposite character; hence, as will be seen further on, by combining the convex and concave a compound lens is obtained in which figure-distortion is greatly reduced. Chromatic aberration is due to the fact that the light, which consists of rays of different degrees of refrangibility, in its passage through the lens has the more refrangible rays brought to a focus first, and those of less degree at a greater distance from the lens. (Fig. 6.) Chromatic aberration can be corrected by the combination of two media of opposite form and of different refracting and dispersing power; and by the neutralizing of the dispersion the refraction is not entirely overcome, but only modified. With a lens of crown glass, double convex, index of refraction 1.519,

FIG. 4.

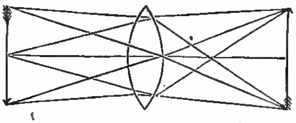


FIG. 5.

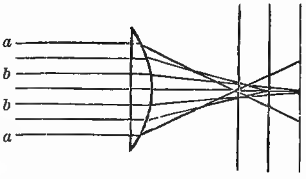
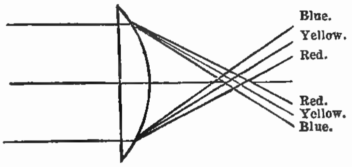
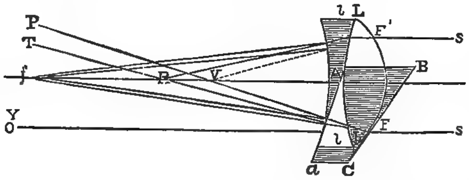


FIG. 6.



dispersive power 0.036, focal length 4½ inches, cemented to a concave lens of flint, index of refraction 1.589, dispersive power 0.0393, focal length 7⅔ inches, the combined focal length 10 inches, an image free from color will be produced, which can be better understood from Fig. 7. L L is a double convex of crown glass, and *l l* is a concave of flint glass. The ray S falling on the lens L L at F is refracted just as it would be were it to fall on a prism A B C whose faces touch the lens at points of entrance and emergence of the ray. The ray S F goes on to form the spectrum P T, with F V, the violet ray, crossing the axis *f* V, and going to the upper end of the spectrum, and the red ray going to the lower end of the spectrum T. The flint-glass lens, however, *l l*, or the prism A *a* C, instead of allowing the rays to take the course indicated above, unites the rays F V, F R at *f*, refracting the ray S F without color from S F Y to F *f*. The ray S′ F′ is refracted in the same manner to *f*.

FIG. 7.



The Magnifying Power of a Lens.—In order that an object may be seen, it must be at such a distance as to form an image of some appreciable size upon the retina; and it must furthermore be sufficiently illuminated to produce an impression. The apparent size of an object depends upon the angle which it subtends to the eye, or the angle formed by two lines drawn from the extremities of the object to the centre of the eye. (Fig. 8.) The lines from A and R form twice the angle at the centre of the eye that O and W do; therefore, the object O W seems one-half the size of A R. The angles formed as just described are called the visual angles. The eye can receive rays of a certain character only to produce distinct vision, and the rays must be parallel or slightly divergent, so that the crystalline lens may form an image of the object upon the retina. The distance or limit of distinct vision ranges from six to ten inches; and when an object is brought closer to the eye, although it appears larger, it becomes more and more indistinct as the distance decreases, due to the fact that the rays which enter the eye are becoming more and more divergent. When a convex lens is interposed between a near object and the eye, it reduces the divergence of the rays forming the pencils issuing from it, and in this manner enables the rays to enter the eye so that an image may be formed upon the retina. (Fig. 9.) The more important laws of optics relating to the microscope will be considered as the various parts of the instrument are described.

FIG. 8.

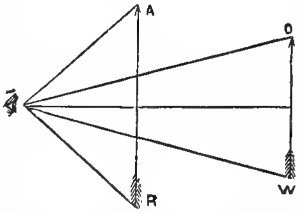
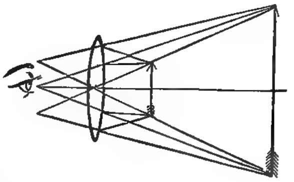


FIG. 9.



In the simple microscope, as has been seen, several lenses may be used, but they all act as a single glass; now, in the compound microscope, there are two parts, the object-glass, which may be a single lens, and the eye-piece or ocular, and this can also be a single lens. (Fig. 10.) The object-glass C D forms an enlarged and inverted image A′ B′ of the object A B, and the eye-glass L M receives the diverging rays from this image, as if from an object, and brings them to the eye at E, so that the object appears greatly magnified, on the same principle as the simple instrument. The magnifying power can be varied by changing the power of the objective, of the eyepiece, and by altering the distance between object and object-glass, eye-glass and object-glass. By approaching the object to the objective, and moving the ocular to a greater distance from the object-glass, the image is increased in size; and, conversely, by increasing the distance from object to object-glass, and lessening that between the latter and eye-glass, the image is reduced in size. In order that a greater portion of the object may come within range of the eyepiece, and so be made visible, a third lens (F F, Fig. 11) is placed between the objective and the eye-glass. As the third lens limits the circle of light or field of view which is seen in looking into a microscope, it is called the *field-glass*. The eye-glass and field-glass together are considered as one, and termed eyepiece or ocular. The Huyghenian is the most usual form of eyepiece, and consists of two plano-convex lenses (Fig. 12, E E and F F) with their plane surfaces toward the eye. The lenses "are placed at a distance equal to half the sum of their focal length, or, to speak with more precision, at half the sum of the focal length of the eye-glass and of the distance from the field-glass at which an image of the object-glass would be formed by it. A stop or diaphragm B B must be placed between the two lenses in the visual focus of the eye-glass, which is, of course, the position wherein the image of the object will be formed by the rays brought into convergence by their passage through the field-glass. Huyghens devised this arrangement merely to diminish the spherical aberration, but it was subsequently shown by Boscovich that the chromatic dispersion was also in great part corrected by it."

FIG. 10.

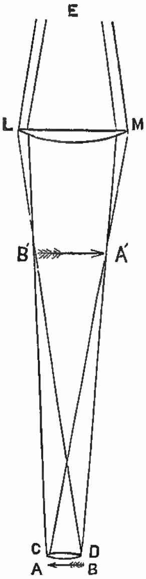


FIG. 11.

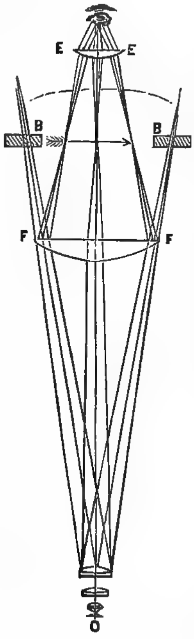
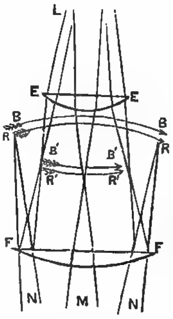


FIG. 12.



The *object-glass*—which, as has been stated, may be a single lens—is of the utmost importance; it is this part of the instrument that requires the greatest amount of care and skill in construction, and therefore requires special attention. The distortions known as spherical and chromatic aberration are the obstacles to be overcome in the construction of the object-glass. Now, it has been shown that, by combining a double convex lens of crown glass with a plano-concave of flint, the spherical and chromatic errors may be remedied—not in a single combination of flint and crown glass, but by means of two or more so-called achromatic lenses. To Mr. Joseph Jackson Lister is due the discovery by means of which the errors in the object-glass may be almost if not entirely overcome. Mr. Lister in 1830 communicated his investigations to the Royal Society about as follows: Plano-convex achromatic lenses, of the form shown in Fig. 13, are most easily constructed. When the convex and concave lenses have their inner surfaces of the same curvature cemented together, much less light is lost by reflection than if the lenses are not cemented. Every such plano-convex combination has some point *f*, not far from its principal focus, from which radiant light falling upon the lens will be transmitted free from spherical aberration; the point *f* is called the *aplanatic focus*. The incident ray *f d* makes, with the perpendicular *i d*, an angle considerably less than the emergent ray *e g* makes with the perpendicular at the point of emergence. The angle of emergence is nearly three times as great as the angle of incidence, and the rays emerge from the lens nearly parallel, or converging to a focus at a moderate distance from the lens. If the radial point is now made to approach the lens so that the ray *f d e g* becomes more divergent from the axis as the angles of incidence and emergence become more nearly equal to each other, the spherical aberration becomes negative or over-corrected. But if the radiant point *f* continues to approach the glass, the angle of incidence increases, and the angle of emergence diminishes and becomes less than the angle of incidence, and the negative spherical aberration produced by the outer curves of the compound lens becomes again equal to the opposing positive aberrations produced by the inner curves which are cemented together. When the radiant has reached this point *f′* (at which the angle of incidence does not exceed that of emergence so much as it had at first come short of it), the rays again pass the glass free from spherical aberration. The point *f′* is called the shorter aplanatic focus. For all points between the two aplanatic foci *f* and *f′* the spherical aberration is over-corrected, or negative; and for all radiant points more distant than the longer aplanatic focus *f*, or less distant than the shorter aplanatic focus *f′*, the spherical aberration is under-corrected, or positive. These aplanatic foci have another singular property. If a radiant point in an oblique or secondary axis is situated at the distance of the longer aplanatic focus, the image situated in the corresponding conjugate focus will not be sharply defined, but will have a coma extending outward, distorting the image. If the shorter aplanatic focus is used, the image of a point in the secondary axis will have a coma extending toward the centre of the field. These peculiarities of the coma, produced by oblique pencils, are found to be inseparable attendants on the two aplanatic foci. These principles furnish the means of entirely correcting both chromatic and spherical aberration, and of destroying the coma of oblique pencils, and also of transmitting a large angular pencil of light free from every species of error. Two plano-convex achromatic lenses (A M, Fig. 14) are so arranged that the light radiating from the shorter aplanatic focus of the anterior combination is received by the second lens in the direction of *f″*, its longer aplanatic focus. If the two compound lenses are fixed in this position, the radiant point may be moved backward or forward within moderate limits, and the opposite errors of the two compound lenses will balance each other. Achromatic lenses of other forms have similar properties. It is found in practice that larger pencils free from errors can be transmitted by employing three compound lenses, the middle and posterior combinations being so united as to act as a single lens, together balancing the aberrations of the more powerful anterior combinations. (Fig. 15.)

FIG. 13.

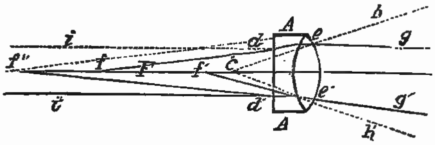


FIG. 14.

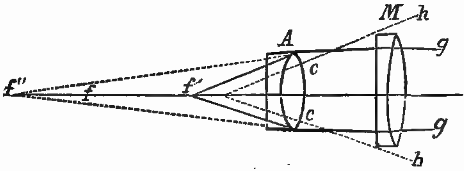
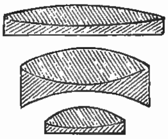


FIG. 15.



In many objectives it is required that there should be what is termed a large "angle of aperture," by means of which the definition is much improved. "The angle of aperture is that angle which the most extreme rays that are capable of being transmitted through the object-glass make at the point of focus." A much larger quantity of light passes through a lens of high angular aperture. The lenses constructed upon the principles given are termed *dry lenses*—*i. e.* a layer of air is between the objective and the front of the combination; for higher powers, however, the *immersion system* is now generally used, which is simply the intervention of a drop of water between the object and the lens, and consequently the rays of light from the object pass through water instead of air. The interposition of the water seems to prevent reflection of certain rays which would otherwise be lost; and therefore with the immersion system a greater amount of light can pass into the glass. Immersion lenses, as a rule, cannot be used dry, although at the present time objectives are made by Tolles, Wales, and Powell & Lealand that work both as wet or dry. Some makers construct two fronts, one for *dry* and the other for *wet*, the middle and posterior combinations remaining the same in both instances.

The great perfection obtained by opticians in late years has rendered imperfect the performance of certain higher powers when different thicknesses of glass are used for covering the object. The discovery was made by Mr. A. Ross, that a very marked difference exists in the precision of the image according as the object is viewed with or without the thin cover.* A correction for this has been effected by Mr. Ross by giving to the *front* pair of the objective an excess of positive aberration, by under-correcting it, and by giving an excess of negative aberration to the middle and posterior combinations. When the lenses are adjusted for an uncovered object, by bringing the anterior combination closer to the middle and posterior a certain amount of positive aberration can be produced, which will neutralize the negative aberration caused by the covering glass. A *screw-collar* is added, therefore, to those lenses which require the change in the position of the front lens, and in this manner the different thicknesses of glass covers are easily disposed of.

Objectives are named according to their magnifying power. Unfortunately, there is no uniform system upon which the lenses are constructed. In England and America lenses are called 1-inch, ½-inch, ¼-inch, etc. On this principle it is supposed that ten inches is considered the standard for distinct vision, and therefore the 1-inch object-glass would produce an image at ten inches distance enlarged ten diameters,† the ½-inch (at the same distance) twenty diameters, the ¼-inch forty diameters, etc. Lenses made in France and Germany are named according to an arbitrary system adopted by the maker himself; and Hartnach of Paris simply gives a series of numbers, 1, 2, 3, 4, etc., to designate the various powers. The eyepieces of American and English manufacture receive the letters of the alphabet to distinguish them; the A eyepiece magnifing five diameters; B, ten; C, fifteen, etc. Hence the 1-inch objective with A eyepiece gives a power of fifty diameters; ½-inch, 100 diameters. Continental eyepieces are named 1, 2, 3, in just the same manner as are the objectives. Low-power objective glasses are those of longer focus than the ½-inch; medium, $\frac{4}{10}$ths, ¼th, and ⅛th; high, from ⅛th to $\frac{1}{75}$th, which is about the highest.

It is not proposed to discuss the various properties of the objective, such as *penetration, definition, resolution*, as these topics are fully described in special treatises on the microscope. Object-glasses of rare excellence are made by Wales, Tolles, and Spencer in the U. S., by Ross, Powell & Lealand, and others in England, and Hartnach and Gundlach in France and Germany.

Reference has been made, in a general way, to the *stand*, which carries the eyepiece and object-glass, together with the object. The most perfect form of stand is that of Powell & Lealand of London, which combines more in perfection of workmanship, as well as completeness of detail, than any other. The "*coarse*" or rapid adjustment is effected by milled heads, which move the tube by means of rack and pinion, while the "*fine*" adjustment is made by a delicate screw (also provided with milled head), which acts upon a lever, and this lever moves the nose carrying the objective. The stage or object-carrier is moved by milled heads up and down and from side to side; at the same time it can be caused to rotate concentrically. A scale of graduations is so arranged that the exact position of the stage can be recognized or effected, so that after an object has been placed in position, and clamped, and some particular part brought into the centre of the field, it is simply required to take the reading of the graduations; and when the same place is sought for in the object again, adjust the stage to the reading, put the object in place on the stage, and it will be found in the centre of the field of view. Below the stage is what is termed the sub-stage, into which can be fitted the "achromatic condenser," "polariscope," and various other accessories. The sub-stage is provided with centring screws, rotation, and vertical motion. The achromatic condenser is the most perfect known. This addition is for the purpose of concentrating the light which is reflected from the mirror, and in this manner any amount of illumination of the object is produced. By means of the polariscope the effect of polarized light may be studied upon the minute structures. In like manner, the addition of the "spectroscopic eyepiece" enables the smallest portions of substances to be submitted to the spectroscopic test. The various accessories which are of so much value to the microscope can be best studied in the larger works devoted to the special subject.

J. W. S. ARNOLD.

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* Microscopical objects are examined upon plates of glass one inch by three inches, and covered with a disk or square of thin glass; this cover is for the purpose both of protecting the object and of preventing the formation of moisture or deleterious vapors from reaching the exposed portion of the objective.

† As the image is enlarged equally in all directions, ten diameters would represent a space occupied by the image 100 times greater than the original object. The simple form of writing magnifying power is, × 10, which means magnified ten diameters. When very high magnifying power is used, the expression in diameters is more convenient than superficial measurement.

Microscopic Organisms. See GENERATION, SPONTANEOUS, by PRES. F. A. P. BARNARD.

Mi′das, a common name among the Phrygian kings; Herodotus mentions three. One of them, a son of Gordias by Cybele, was a pupil of Orpheus, promoted the worship of Dionysus, and became the centre of a number of popular myths. Thus, Dionysus gave him the power of transforming everything he touched into gold. But the gift proved a terrible curse. The man would have starved to death had not the god helped him a second time. By bathing in the river Pactolus the auriferous power was transferred from the body of Midas to the waters of the river, and they became henceforth productive of gold. Another time he was chosen umpire in a musical contest between Apollo and Pan. He gave the prize to the latter, and the angry god punished him by changing his ears into those of an ass. Midas concealed the deformity under a Phrygian cap, but one of his slaves happened to discover the secret. Unable to keep it to himself, and yet not venturing to tell it to anybody, the slave dug a hole in the soil, whispered the secret down into the hole, and covered it up with earth. But the reeds which grew upon the spot always sang when the wind blew among them, "Midas has ass's ears."

Mid′delburg, town of the Netherlands, capital of the province of Zealand, situated on the island of Walcheren. It is a handsome town, surrounded and traversed by canals lined with trees, and it has many public squares and interesting buildings, among which the town-hall is the most remarkable, built by Charles the Bold in 1468, and ornamented with twenty-five colossal statues of counts and countesses of Flanders. Its trade has greatly declined, but it has some manufactures of soap, vinegar, leather, and lace. The town is mentioned in the middle of the twelfth century, and received its charter in 1225. The brilliant point in its history is the defeat of the Spaniards in 1574 after a siege of two years. The wars between France and England in the beginning of this century entirely ruined its commerce. Of its 3800 houses in 1739, only 3000 are still standing, and of them 600 are vacant. Pop. 16,046.

Middelburg (PAUL), b. at Middelburg, island of Walcheren, in 1445; studied at the University of Louvain; took holy orders, and was appointed chaplain at the church of St. Bartholomew in his native city; but, preaching a little too zealously against ignorance, drunkenness, gluttony, and other Middelburg fashions of that day, he was expelled from the city, and returned to Louvain, where he lectured with great success on mathematics. Chosen by the grand council of Venice to the chair of mathematics in Padua, he afterward became physician to the duke of Urbino, on whose recommendation he was appointed bishop of Fossombrone in 1494 by Pope Alexander VI. With Julius II. and Leo X. he stood in great favor, and presided over the fifth Lateran Council (1512–18). D. at Rome Dec. 15, 1534. He was one of the first to urge the necessity of reforming the calendar, showing in his learned work *Paulina, de recta Paschæ Celebratione, et de Die Passionis Domini nostri Jesu-Christi* (fol., 1513), that the great Easter festival was not celebrated on the day determined by the Council of Nice, but sometimes a whole month earlier and sometimes a whole month later. Some of his many other writings treat the same subject, such as the *Epistola ad Universitatem Lovaniensem: De Paschate recte observando* (1487), which occasioned a long controversy, during which he furthermore published *Epistola apologetica Magistri Pauli de Middelburgo, Alumni Universitatis Lovaniensis*, in answer to a criticism by Pierre de Rivo, professor of theology at Louvain.

Middle Ages. This is the term generally used to designate that great historical period lying between the ancient and modern epochs of the world's civilization, and separating them from each other as *young* manhood separates youth from *mature* manhood.

1. *Chronology.*—Concerning the exact date of the beginning and end of the mediæval period differences of opinion exist, some authors regarding the triumph of the Franks over the remnants of the Roman power in Gaul at the battle of Soissons (486 A. D.), others the overthrow of the West Roman empire in 476 A. D., and still others the accession of Charlemagne in 768 A. D., or the dissolution of the Frankish empire in 843 A. D., as the opening events; and consider, some the discovery of America, others the discovery of printing, most the German Reformation, and a few the Westphalian Peace (1648), as marking the close; which differences show that the Middle Ages is no epoch whose opening and closing can be put down to the credit of any single year or event, but began and ended through a series of years and events, as all epochs of civilization must. The most definite statement we can make is that those historians who consider ancient history to comprehend the *world's history* down to the dissolution of the Roman state begin the Middle Ages with the overthrow of the Roman power by the Germans and the settlement of the Vandals, Goths, Anglo-Saxons, Franks, and Burgundians upon Romanic soil in the last half of the fifth century; while those who regard *Teutonic history* in its more *specific light*, and consider each nationality as having its own childhood, youth, manhood, and old age, are inclined to look upon the life of the Teutonic peoples down to the dissolution of the Frankish European empire (see article on the FRANKS) as the period of their wardship, and hence to set the beginning of the following period of young manhood or middle age between the years 814 and 843 A. D.; while, as regards the boundary of the epoch on the other side, very nearly all are agreed that the great events of the fifteenth and sixteenth centuries—viz. the discovery of printing, the discovery of America, the employment of gunpowder, the development of the absolute monarchy in the state, and the Reformation in the Church—designate the point where the spirit of civilization was throwing off its mediæval and taking on its modern form.

2. *Events.*—The cardinal events of the Middle Ages were—

(*a*) The reaction of the spirit of nationality against the artificial union of the Frankish European empire, producing the treaty at Verdun in 843 A. D. between the different sovereigns of the Carlovingian house, whereby the empire was divided into three independent kingdoms, corresponding in their territorial extent very nearly to the geographical basis of three distinct types of nationality, which had been for three and a half centuries developing themselves, and which may be termed from that time forward Italian, German, and French.

(*b*) The reaction of individuality against the authority of law imposed from without, and which may be termed a great *series* of events rather than an event, realizing themselves all through the mediæval period, and splitting Europe up into a multiplicity of petty sovereignties, standing closed and hostile over against each other, blockading trade and intercourse, and producing unceasing intestine strife.

(*c*) The great invasion of the Scandinavian vikings (836–912 A. D.), striking the deathblow to the tottering Carlovingian powers, already threatened by the Saracens in the S. and the Magyars in the E., compelling the members of this dynasty, in their impotence to defend their lands and peoples, to give way to stronger arms and cleverer genius, occasioning thus the elevation of the Capetians to the throne of France, changing Germany into an elective monarchy, and delivering emperorless Italy over to three-quarters of a century of most fearful intestine struggles.

(*d*) The settlement of the Northmen upon the territory of Northern France, founding there the dukedom of Normandy, accepting the culture of the Romanized Franks both in state and Church, setting the great North into connection with the Continent, and opening it up to the influences of Christianity and the civilization of the Romanic world; and then from this continental basis making conquest both of England (1066 A. D.) and Southern Italy (1029–85 A. D.), and founding independent kingdoms upon Anglo-Saxon and Italian soil.

(*e*) The Crusades, eight in number, and reaching chronologically from the year 1096 to 1270 A. D. In this great European movement, in which the chivalrous type of Christianity, beginning with the consecration of King Clovis's sword to the service of the Church, culminates, the peoples of Europe, especially those of Romanic nationality, impelled chiefly by the power of religious fanaticism, threw themselves back upon Asia with the nominal purpose of freeing the Holy Sepulchre from the desecrations of the Turks. In 1099 A. D. Jerusalem was captured and a European kingdom erected in Palestine, which existed with changeable fortune for nearly two centuries. In 1291 A. D. the last remnants of European sovereignty in Syria were extinguished, but the influence which the movement and its results exercised upon the course of European civilization was all-guiding and permanent. Six millions of men perished in these undertakings. Among these the nobility as a class suffered far the most severely both in loss of life and property. From some districts this class was almost entirely obliterated. Moreover, the establishment of a political connection with Asia had led to the establishment of an intercourse and trade which enriched the burgher class as much as the wars had impoverished the nobility. The effect of this change in the conditions of property upon the political constitution of Europe was most marked. The political power passed over more and more to the cities and the burgher class, and the old feudal constitution began to be undermined. The results as regards the Church were of a double nature. Its temporalities had been immensely increased, in that it fell heir, for the most part, to the property of those who perished in these great religious adventures, having been made the guardian of the same during the absence of the owners. But its moral power entered upon the period of its sinking, not only because the increased wealth of the Church led to luxurious living on the part of the clergy, but because also that power of religious fanaticism and unreflecting devotion upon which the Church of that age so much rested had been broken of its intensity and exhausted. The Crusades were, after all, among the most powerful elements in opening the way for the absolute monarchy and the Reformation.

(*f*) Lastly, we mention the re-establishment of the Carlovingian imperium by Otho the Great (962 A. D.), under the name of "Holy Roman Empire of the German Nation," thus bringing, both for weal and for woe, the German and the Roman into direct contact with each other, and paving the way for that great conflict between pope and emperor for the supremacy over European Christendom which, of all the movements of the Middle Ages, was the most continuous, important, and heavy with results.* The clergy had ever regarded the Carlovingian imperium as their own creation. In it European Christendom had found its point of unity. No wonder, then, that they sustained it to the last, and when it fell, felt themselves compelled to look for a new centre and a new head. And what more natural than that all eyes should be turned towards the bishop of Rome? From the moment of the dissolution of the Carlovingian imperium the watchword had been the establishment of the "*papal monarchy,*" and the withdrawal of the Church, with its property and its *personnel,* from under the jurisdiction of the secular powers to unite it under the sovereignty of the pope, both as regards temporal and spiritual matters. In this way it would make good that which had been lost in the dissolution of the imperium—viz. the *principle of unity* in European Christendom. During the century and a quarter between the Treaty of Verdun (843 A. D.) and the re-establishment of the empire by Otho (962 A. D.) this had been the reigning idea in the Church; and the chief reason why it did not *then* come to realization was the lack of a mighty personality upon the papal throne, by the power of whose genius that which lay in the consciousness and desire of the Church might be made an objective reality. This power was first attained when Hildebrand became first the manager and maker of popes, and then pope himself under the title of Gregory VII. The creation of the college of cardinals with the sole power of electing the pope, and the laws against marriage and simony, were the chief means made use of in the establishment of the European papal monarchy. These measures, or something with the same nominal purpose, were indeed, to a certain extent, justified by the needs of the time. The conflict between the emperors and the nobility of Rome over the papal appointment had been productive of such confusion and bloodshed as to become an offence to all Christendom, while the unchastity and venality of the clergy had risen to a most fearful height. But these measures, though nominally taken for correcting these abuses (and which fact justified them fully in the eyes of the unthinking masses), were attended by far more wide-reaching results, and were used for the execution of a far more wide-reaching plan in the mind of Gregory and his assistants. He had conceived the relationship of the Church to the state to be that of the soul to the body, and meant to realize in the world of fact the forms of his idea. By the constitution of the college of cardinals he would withdraw the papal office from under the influence both of the secular princes and the laity, and place it under the immediate control of a narrow ecclesiastical aristocracy of the Roman diocese. *It was not meet that the body should choose the organ through which the soul realized its will.* By the forbiddance of priestly marriage he would cut the bond of blood and interest which connected the servants of the Church with society at large, and make the clergy the complete and willing executors of the papal will; and by the laws against simony he would withdraw the bishops and abbots from their feudal relationship to the secular princes in whose territories their bishoprics and cloisters lay, *and bring the property for which they owed feudal service to the state under the complete and independent ownership of the Church.* It was one of the most daring attempts to unsettle and transform the relationships of property which the world has ever known. Borne by the power of such personalities as Gregory VII., Alexander III., Innocent III., and Boniface VIII., the cause of the papacy and the universal Church monarchy was for two and a half centuries, from the beginning of the eleventh to the middle of the fourteenth, powerfully and successfully pushed forward upon the road of universal European sovereignty. By the help of the great German dukes, who were ever striving for more independence of the imperial power, the triumph over the mightiest secular lord of Christendom, the Roman German emperor, was secured, while England, Scotland, Poland, Hungary, Aragon, and the Two Sicilies became little more than fiefs of the papal throne. It was Philip the Fair of France (1285–1314 A. D.) who first opposed with success this growing and threatening power. Through force and intrigue the papal seat was removed by him from Rome to Avignon (1307 A. D.), and became thenceforth a luxurious court devoted to pleasure and the interests of French politics. From this time forth the moral influence of the papacy and of the Church declined from year to year; and the scientific discoveries and revival of learning in the fifteenth century, and the Reformation in the sixteenth, lifted society above that stage of its civilization where the Church can absorb the state.

3. *Spirit and Genius of the Middle Ages.*—From the above-mentioned facts it is not difficult to generalize a conception of the spirit and genius which brought them forth. Defiant self-reliance upon rude physical force in regard to the attainment of all things temporal, and superstitious subjection to a sacerdotal order in regard to things unseen, unknown, and represented as eternal; narrow selfishness in regard to the duties and functions lying near and in the common course, connected with the most chivalrous devotion to the mystical, the undefined, and the distant; the direst immorality and disobedience to law and order, coupled with the most exaggerated and enthusiastic religiosity; bold adventuresomeness without defined purpose; fancy and imagination without reflection; faith without reason; devotion without humanity,—these are some of the contradictions which characterize the mediæval spirit. Those great cathedral piles testify not only to the power of the imagination and devotion of the age, but also to the under-valuation of the human sufferings and sacrifices through which they were founded and builded.

4. *Institutions of the Middle Ages.*—This spirit and genius incorporated itself in the two all-comprehending institutions, the feudal state and the hierarchical Church. The spirit of the age was far too objective to conceive of the authority of law as based upon the common consciousness of the governed. The individual felt no *internal* behest to observe the rights of his neighbor any further than he had by contract or promise agreed to do so. Personal contract, varying in the details of its terms with time, place, and circumstances, occupied thus the proper ground of universal political law. Under such an order the common man could only protect himself by contracting for his protection by some great man, whose land and people furnished him the means of protection. The cost of such protection to the common man was the surrender of his own land to the *ownership* of the lord, retaining only the *possession* of the same as a fief, and rendering certain tributes or services to the lord for such possession and protection. The vassals of the same lord were connected with each other not directly, but only through their feudal relation to a common lord, and different lords only through their feudal relation to a common superior or by *contract* with each other, and so on until the sovereign lord of the land was reached—the apex of the feudal pyramid; only the pyramid was inverted, with the greatest weakness where the greatest strength ought to be. These actual relationships were legalized through the ratification obtained mediately or immediately from the kingship and the imperium, in which latter office the sum and substance of all authority was theoretically held to exist as the immediate gift of God to *one man* through his vicegerent upon earth—the pope. The practical result of such a system was anarchy in the state. In regard to the Church, the same externality of idea manifests itself in the conceptions of authority and grace. The sum and substance of all authority and grace were conceived as proceeding from Christ to the chief of his apostles, to whom the pope was successor; by the latter dealt out again upon the bishops in their consecration, and then by these in turn upon the priests and laity. The power to bind and to loose, to damn and to save, became thus, according to this conception, the property of a close corporation, which by the power of excommunication from the company of the saved upon earth, with all its attendant consequences upon the social and political status of the individual, and of the threats of eternal punishment hereafter, held the souls of men in a state of spiritual subjection of a most degrading nature. The practical result of such a system was spiritual despotism in the Church.

Men have been wont to call the Middle Ages "Dark Ages." But, on the contrary, they are full of light. In them the great questions of the relationship of individual right to political right, of local government to central government, and of ecclesiastical government to secular government, were lighted and drawn into conscious consideration. Had the European empire of Charlemagne been perpetuated, Europe might have become a second China, but would never have been what it is—viz. the source of the civilization of the modern world. The unceasing conflicts of the Middle Ages between private right and public law, local government and central government, state authority and Church authority, were necessary to bring men out from under the monotony of slavish subjection to the artificial, external, Church-State system of the Carlovingian empire, and develop them by the antagonism of thought and will into the power of producing systems more reflected and more free. (See FEUDAL SYSTEM.)

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* See article on the FRANKS.

The reader may further consult—for history of the Middle Ages, Hallam, Leo, Kortüm, Rückert; for history of the period of the German emperors, Giesebrecht and Waitz; and for history of the city of Rome in the Middle Ages, Gregorovius. JOHN W. BURGESS.

Mid'dleboro', R. R. junction, Plymouth co., Mass. (see map of Massachusetts, ref. 4–J, for location of county), has an academy, a public library, and large manufacturing interests. Pop. of tp. in 1880, 5237; in 1885, 5173.

Mid'dlebourne, cap. of Tyler co., West Va. (see map of West Virginia, ref. 3–D, for location of county), 10 miles S. E. of Sisterville Landing. Pop. in 1870, 182; in 1880, 241.

Middleburg, cap. of Snyder co., Pa. (see map of Pennsylvania, ref. 4–F, for location of county), on the Pennsylvania R. R., has a sash-factory and a tannery, etc. Pop. in 1870, 370; in 1880, 398.

Middlebury, cap. of Addison co., Vt. (see map of Vermont, ref. 5–A, for location of county), on Otter Creek and the Central Vermont R. R., has an excellent public-school system, a public library, flouring-mills, iron-furnace, woollen, cotton, paper, and leather manufactories, door, sash, and blind factories, 6 marble quarries, and good water-power. The village is incorporated, has a fire department, and is the seat of Middlebury College, founded in 1797. Pop. in 1880, 1834.

Middle C, in music, the note standing a fifth *above* the F or bass clef and a fifth *below* the G or treble clef. Its place is therefore on the ledger-line between the bass and treble clefs. It takes its name from this circumstance, and also from its midway position on the general scale. The C clef, whether placed on the third, fourth, or any other line, is always representative of the note or sound called "middle C," and the lines and spaces above and below are named accordingly.

Middle Park, in Grand co., Col., consists of several minor parks, the whole some 15 miles wide and 70 miles long. It has an elevated basin, surrounded by mountains of gneiss, and abounding in grass, timber, and lignite. Its drainage is by tributaries of the Colorado of the West.

Middleport, Niagara co., N. Y. (see map of New York, ref. 4–C, for location of county), on the Erie Canal and New York Central and Hudson River R. R., midway between Rochester and Buffalo, has saw and planing-mills, paper-mill, furniture-factory, foundries, a grist-mill, boat-yard and dry dock, a cheese-factory, and is an important shipping-point for produce, etc. Pop. in 1870, 731; in 1880, 771.

Middleport, on R. R. and Ohio river, Meigs co., O. (see map of Ohio, ref. 7–G, for location of county). Pop. in 1870, 2236; in 1880, 3032.

Mid'dlesborough, town of England, county of York, at the mouth of the Tees. It has very important iron-works and considerable exports of coal, besides shipyards and manufactures of ropes and sailcloth. It was founded in 1830, and in 1831 it had a population of 154; in 1841, of 5709. In 1851 the presence of ironstone was discovered in Eston Hills, and in 1881 the population had increased to 55,934. In the same year 130 blast-furnaces were in operation and about 2,000,000 tons of pig-iron were produced. The docks, opened in 1842 and extended in 1872, have 1700 feet of quays, and can accommodate vessels of 3000 tons burden.

Middlesex, the metropolitan county of England, is bounded S. by the Thames, and E. and W. by its two affluents, the Colne and the Lea. Area, 281 square miles. Pop. 394,089. The soil is mediocre, mostly employed for grass-farming and gardening for the supply of London with milk, hay, and vegetables. According to the census of 1882, 82,782 acres were under permanent pasture, 16,337 under corn crops, 13,451 under green crops (potatoes, 3019; cabbage, 1188), 6900 in market-gardens, 3419 in orchards, etc. The county possessed in the same year 23,283 cattle, 23,916 sheep, 12,035 pigs, and 5939 horses.

Mid'dleton, town of England, in the county of Lancashire, near the Irwell, with manufactures of cotton cloths and silks. Pop. in 1881, 10,346.

Middleton (ARTHUR), b. in South Carolina in 1743, was a son of HENRY MIDDLETON, who was president of Congress 1774–76, and the latter was a son of ARTHUR MIDDLETON, who was governor of South Carolina 1725–31. The younger Arthur Middleton was educated at Harrow, Westminster, and Cambridge, England, where he graduated in 1764; was in Congress 1776–77; signed the Declaration of Independence; assisted by arms and by the effective use of his pen in the cause of freedom; was long a prisoner of war, and suffered great pecuniary losses in the Revolution; was again in Congress 1781–83. D. Jan. 1, 1788.

Middleton (CONYERS), D. D., b. at Richmond, Yorkshire, Dec. 27, 1683; graduated at Trinity College, Cambridge, 1702, where he became a fellow 1706. He was for years engaged in an acrimonious quarrel with Dr. Bentley; wrote *A Letter from Rome showing an Exact Conformity between Popery and Paganism* (1729); became principal librarian of Cambridge; was Woodwardian professor of mineralogy 1731–34. His best known works are the *History of Cicero* (1741) and the *Free Inquiry* (1749) concerning miracles, which in his own day was regarded as an infidel work. D. at Hildersham July 28, 1750.

Middleton (HENRY), son of Arthur Middleton (1743–88), b. in 1771; was 1801–18 a State legislator of South Carolina; governor 1810–12; U. S. minister to Russia 1820–31. D. at Charleston, S. C., June 14, 1846.—His son ARTHUR (1795–1853) was for some time in the U. S. diplomatic service.—Another son, HENRY, b. 1797, graduated in 1815 at West Point, studied at Edinburgh, was admitted in 1822 to the bar of Charleston, and became a political and economical writer of distinction.—JOHN IZARD MIDDLETON, a brother of Henry, Senior, b. 1785, educated at Cambridge, England, resided for many years in Paris, and published a valued work on *Cyclopean Walls* (London, 1812, folio). D. Nov., 1849.

Middleton (PETER), M. D., b. in Scotland; educated at Edinburgh. In 1750 he assisted Dr. Bard of New York in making the first recorded dissection in America; in 1767 took part in establishing a medical school in New York, in which he was professor of physiology and pathology and instructor in materia medica 1767–76; was governor of King's (now Columbia) College 1775; author of some medical works. D. in 1781 in New York.

Middleton (THOMAS), b. probably at London about 1570; studied law at Gray's Inn; became a dramatic author; assisted Rowley, Massinger, Fletcher, and Ben Jonson in the composition of some of their plays, and produced several dramas, among which are *A Mad World, my Masters*, *The Roaring Girl*, *Women beware Women*, *A Trick to Catch the Old One*, especially *The Witch*, which resembles Shakspeare's *Macbeth*, and it is doubtful which was the earlier production. Toward the close of his life he had some difficulties with the privy council. In 1623 he wrote a very clever satirical comedy (*A Game at Chess*) on Prince Charles's unsuccessful wooing of the Spanish infanta. The performance of the play was stopped by royal order, but the action against the author was afterward dropped. Middleton often imitates Shakespeare very closely in his diction, but of all the imitators he is that one who comes nearest to the master. His plays were edited by Rev. Alexander Dyce (5 vols., 1840). D. July, 1627.

Middleton (THOMAS FANSHAW), D. D., b. at Kedleston, England, Jan. 26, 1769; educated at Christ's Hospital and at Pembroke Hall, Cambridge; took orders in the Church of England; became archdeacon of Huntingdon 1812, and consecrated at Lambeth first bishop of Calcutta May 8, 1814. In 1808 he had published a learned work on *The Doctrine of the Greek Article, applied to the Criticism and Illustration of the New Testament* (5th ed. 1855). He arrived at Calcutta in Nov., 1814, where he d. of fever July 22, 1822. A volume of his sermons, charges, and tracts was published in 1824. Bishop Middleton was an elegant scholar, and was for some time editor of the *British Critic*. (See his *Life*, by Rev. C. W. Le Bas, 2 vols., 1831.)

Mid'dletown, city and R. R. centre, port of entry, and semi-capital of Middlesex co., Conn. (see map of Connecticut, ref. 6–E, for location of county), on the W. bank of the Connecticut River, in 41° 33′ 8″ N. lat. and 72° 39′ W. lon., 31 miles above the mouth of the Connecticut River, 15 miles S. of Hartford, and 24 miles N. E. of New Haven. The town was settled in 1650, and the city was incorporated in 1784. The Hartford and New York steamboats make daily landings here on their passages each way. The river is navigable here for vessels of 10 feet draught, and the tide rises from 18 to 24 inches. Middletown is pleasantly situated, partly on an acclivity that commands a wide, varied, and beautiful prospect that has attracted much attention. The vicinity is rich in minerals, some of which, as columbite, are very rare. There is a quarry of feldspar. Gold and silver are found, and a silver-mine has been worked. A lead-mine yielded considerable lead before the Revolutionary war, but the working of it has been abandoned as unprofitable. The streets of the city are wide, pleasant, and well shaded by trees. There are excellent schools, both public and private. Wesleyan University, a flourishing college, is located on High street. Within a few years costly buildings, a fine telescope, a well-appointed museum rich in its varied collections, and other important resources have been added to the institution. The Berkeley Divinity School, under the superintendence of Right Rev. John Williams, D. D., bishop of the diocese of Connecticut, is located on Main street. The city has a public library in a large, well-appointed building; the Connecticut hospital for the insane; the Connecticut industrial school for girls; numerous incorporated and manufacturing companies; a fine custom-house and a court-house. Pop. of city, in 1870, 6923; in 1880, 6826.

Middletown, R. R. junction, St. George hundred, Newcastle co., Del. (see map of Delaware, ref. 2–H, for location of county), 52 miles S. W. of Philadelphia, at the head of the great peach district of Delaware and Maryland, has an academy, fruit-preserving establishments, and a fine public hall. Pop. in 1870, 915; in 1880, 1280.

Middletown, Frederick co., Md. (see map of Maryland, ref. 2–D, for location of county), 53 miles W. of Baltimore, on the Baltimore and Ohio R. R., has 2 academies, carriage-factories, etc. Pop. of v. in 1870, 746; in 1880, 705.

Middletown, R. R. centre, Wallkill tp., Orange co., N. Y. (see map of New York, ref. 7–J, for location of county), 67 miles N. W. of New York, has the State homœopathic asylum for the insane, saw and file works, and wool-hat factories. Pop. in 1870, 6049; in 1880, 8494.

Middletown, R. R. centre, Butler co., O. (see map of Ohio, ref. 6–C, for location of county), 32 miles N. of Cincinnati, has tobacco-factory, 7 paper-mills, paper bag and scissors factory, foundry, planing-mill, and flour-mills, and is supplied by Holly waterworks. Pop. in 1870, 3046; in 1880, 4538.

Middletown, Dauphin co., Pa. (see map of Pennsylvania,, ref. 5–G, for location of county), a borough, post-town, and station on the Pennsylvania R. R., 9 miles S. E. of Harrisburg, at the junction of the Swatara Creek with the Susquehanna River. The town was founded in 1756, and, being the southern limit of the early navigation of the Susquehanna, owing to the dangerous rapids 3 miles lower down the river, grew rapidly, and so continued until the era of internal improvements. In the centre of a fine agricultural country, and the Swatara Creek affording excellent water-power, few towns possessed greater natural advantages. From 1810 to 1850 the population was stationary. The establishment of industrial works has materially added to its population and wealth, and it has consequently risen to be an important manufacturing town. As early as 1793 a furnace was erected here for the manufacture of "blister steel"—the first in America. The principal industrial establishemnts are the American Tube and Iron Works (one of the largest in the U. S.), the Susquehanna Iron Works, the Middletown Car Works, the Cameron Iron Furnaces, and the Middletown Furniture Company's factory. There are a number of planing-mills, which have been established many years, while the lumber trade has for over a century been the leading business of the town. It has 2 weekly newspapers, and an orphan school founded by the munificence of George Frey. The western terminus of the Union Canal, commenced as early as 1790, is at Middletown, while the Pennsylvania Canal passes along the river-front. The town was incorporated Feb. 19, 1828. Pop. in 1870, 2980; in 1880, 3351; in 1885, 5000. WILLIAM H. EGLE.

Mid'dleville, Barry co., Mich. (see map of Michigan, ref. 7–I, for location of county), 21 miles S. E. of Grand Rapids, on the Michigan Central R. R., has foundry and machine-shop, saw-mills, grist-mill, and sash and door factories. Pop. in 1870, 541; in 1880, 712.

Midge [Ang.-Sax. *mygge*], a name applied in England to several dipterous insects resembling gnats and mosquitoes in their habit of feeding upon the blood of men and animals. Some are of the family Chironomidæ, which has representatives in North America. But in the U. S. the name is especially given to the *Cecidomyia tritici*, or wheat midge, a most destructive insect, which lays its eggs in the blossoming ears of wheat. Deep ploughing destroys many of them by burying their cocoons deeply in the earth, and late-sown spring wheat generally blossoms so late as to escape their ravages.

Midhat Pasha, a Turkish statesman, b., according to some, in Constantinople 1822, according to others in the island of Chio 1824, and again according to others in Bulgaria 1825, was educated in Constantinople and very early entered the civil service of the Turkish government. In 1856 he was sent to Room-Elee to reduce the country to order and suppress the various forms of disturbance which had arisen there in consequence of the Crimean war; he was very successful. Other and still more difficult tasks were confided to him, and he made a long visit to France and England. In 1860 he was created a pasha and appointed governor of Uscup and Prisrend. The reforms he introduced there attracted much attention, and he was called to Constantinople to take part in the elaboration of the law concerning the *vijalets*, which separated the executive from the judicial power, established civil and criminal tribunals, organized administrative boards of councils, to which, also, Christians were admitted, etc. In 1862 he was appointed governor of Bulgaria, and his five years' administration proved a brilliant success. He constructed more than 2000 miles of road, built over 1500 bridges, founded schools, etc. In 1867 he was made a member of the central government, and in 1871 grand vizier. But he was vehemently opposed by an Old-Turkish party in the palace and by Russian intrigues. As grand vizier in 1876 he caused first Abdul Aziz and then Murad V. to be deposed. Under Abdul Hamid II., however, he held office only a few months. On Feb. 5, 1877, he was dismissed and banished. He lived for some time in Paris, where he published *La Turquie son passé, son avenir* (1878). In Sept., 1878, he was recalled and made governor of Syria: but in 1881 judicial investigation was instituted against him and several other pashas for complicity in the murder of the late sultan, Abdul Aziz. He was convicted and condemned to death, but the sentence was commuted to imprisonment for life. D. in Constantinople May 11, 1884.

Mid'ianites, an ancient Arabian race, the descendants of Midian, the fourth of the six sons of Abraham by Keturah. They were idolaters. They appear to have dwelt mainly to the S. of Moab. The Sinaitic peninsula was a part of their territory, and the Tawarah Arabs, now dwelling there, are supposed to be their descendants.

Mid'idæ [from *Midas*, the principal genus], the lowest family of anthropoid Primates, or monkeys, having, like the Cebidæ, the septum of the nose broad and flattened and the nostrils proportionally distant, no bony external auditory meatus, and the tympanic membrane attached by a ring close to the surface; but distinguished by the presence of only 32 teeth—viz. M. $\frac{2}{2}$, P. M. $\frac{3}{3}$, C. $\frac{1}{1}$, I. $\frac{2}{2} \times 2$; and the manus or hand with the inner digit not opposable, but on the same plan as the rest of them, with elongated compressed claws instead of nails. This family is represented by two genera—viz. *Saguinus*, Lacépède (= *Hapale*, Geoffroy), and *Midas*, Geoffroy, which have been, however, much subdivided by Dr. Gray. The species are of small size, and confined to South and Central America. The marmosets or squirrel-monkeys are the best-known representatives.

Midland, cap. of Midland co., Mich. (see map of Michigan, ref. 6–I, for location of county), 21 miles N. W. of East Saginaw, with which it is connected by the Flint and Père Marquette R. R., has saw-mills, grist-mill, and several shingle-factories. Pop. of v. in 1870, 1160; in 1880, 1529.

Mid-Lothian. See EDINBURGH.

Mid'rash [Heb., "explanation"], a general name for the Talmudical writings of the Jews, including both the Halacha and the Haggada, together constituting a large body of literature.

Mid'shipman, in the U. S. navy, is an officer of the ninth grade, ranking next below ensign. After appointment midshipmen now pass six years at the Naval Academy as cadet midshipmen. At the end of this time, after satisfactory examination, they become midshipmen of the navy, and enter the line of promotion in active service.

Midwifery. See OBSTETRICS.

Mie'ris, van (FRANS), THE ELDER, b. at Delft in 1635; became a pupil of Gerard Dow, and painted like him small genre pictures of social life with a wonderful precision and delicacy. D. at Leyden in 1681. Even during his lifetime his pictures commanded a very high price, and now they are very seldom for sale. The galleries of Dresden, Munich, and Florence possess quite a number of them. His two sons—WILLEM VAN MIERIS, b. in 1662, d. in 1747, and JAN VAN MIERIS, b. in 1660, d. in 1690—were both painters, disciples of their father, and the elder reached a high degree of perfection in his art.—FRANS VAN MIERIS THE YOUNGER, son of Willem, confined himself mostly to copying after his father and grandfather. He wrote *Historie der Nederlandsche Vorsten* (3 vols., the Hague, 1732–35) and several other works. He was b. in 1689, and d. in 1763.

Mifflin (Thomas), b. in Philadelphia in 1744 of Quaker stock; was educated at Philadelphia College; became a merchant, and in 1772–73 was in the legislature; went to Congress in 1774; joined the Revolutionary army; rose to be brigadier-general in 1776 and major-general in 1777, serving with great honor; withdrew from active service after the battle of Germantown; was sent to Congress in 1782, becoming its president in 1783; Speaker of the State legislature in 1785; was in the convention of 1787 which formed the U. S. Constitution; president of the Pennsylvania executive council 1788–90; president of the State convention of 1790; governor 1791–1800. D. Jan. 21, 1800.

Mif′flinburg, on R. R., Union co., Pa. (see map of Pennsylvania, ref. 4–F, for location of county), has excellent schools, steam flouring and planing mill, steam factory, and extensive deposits of limestone, iron, and soft and hard coal. Pop. in 1870, 911; in 1880, 1168.

Mif′flintown, cap. of Juniata co., Pa. (see map of Pennsylvania, ref. 5–F, for location of county), 49 miles W. of Harrisburg, on the Juniata River and the Pennsylvania Central R. R. Pop. in 1870, 857; in 1880, 842.

Migne (Jacques Paul), b. at Saint-Flour, in the department of Cantal, France, Oct. 25, 1800; studied theology at Orleans; was ordained priest in 1824, and appointed curate at Paiseaux; went in 1833 to Paris, and founded the Ultramontanist journal *L'Univers*, and founded in 1836 the Imprimerie Catholique, which soon became one of the most remarkable industrial establishments in Paris. From this office issued *Collection des Orateurs Sacrés* (100 vols. 1846–68), *Patrologiæ Cursus Completus* (390 vols.), *Encyclopédie Théologique* (171 vols.). In the establishment were also manufactured organs, statuary, pictures, and all kinds of church utensils. In Feb., 1868, the establishment was destroyed by fire. D. Nov., 1875.

Mignet′ (François Auguste Marie), b. at Aix in Provence May 8, 1796; was educated at Avignon; studied law at the Academy of Aix at the same time with M. Thiers; removed to Paris in 1822; produced a dissertation on feudalism and the institutions of St. Louis; then followed *Histoire de la Révolution Française* (1824), *Histoire de Marie Stuart* (1851), *Vie de Franklin, Antonio Perez et Philippe II.* (1845), *Charles Quint, son abdication et sa mort* (1854), *Éloges Historiques* (1864), etc.; was in 1830–48 director of the archives of the foreign ministry; member of the Institute and of the Academy, and commander of the Legion of Honor, etc. D. Mar. 24, 1884.

Mignonnette′ [Fr., "little darling"], the *Reseda odorata*, an herb, sometimes half shrubby, a native of North Africa, universally cultivated for its delicious fragrance. It belongs to the order Resedaceæ, and is frequently seen in window and parlor cultivation.

Migrations of the American Aborigines. The writer of this article has elsewhere presented at length the evidence (*N. A. Review*, Apr., 1869) which seems to him to establish several points which form an indispensable preliminary to the statement of his conclusions in regard to the migrations of the various families of Indians. As this evidence cannot be here presented, it is necessary to assume the following facts: I. The valley of the Columbia River in Oregon, on account of the abundance of food afforded by its fisheries, was for thousands of years the centre of a rapidly increasing population, from which successive groups of aborigines radiated to the extremities of North and South America. II. Owing to the vast expanse of prairie, impassable to a purely hunting community, there were but four routes for migration eastward—namely, by the Saskatchewan River in the Dominion of Canada, by the Missouri, the Platte, or the Arkansas River, the first and fourth of these routes being by far the most practicable. III. There was a time, however remote, when neither North nor South America possessed any human inhabitants. IV. The present aboriginal tribes, with the exception of the Esquimaux, correspond to each other so closely in physical and mental characteristics and systems of consanguinity as to constitute but one race. It will be further assumed, V., that the original status of the parent family on the Columbia River was one of savagery, and, VI., that this status had been diffused to the extremities of the southern continent before favoring circumstances, especially the cultivation of maize in the central table-lands, afforded the basis for rising to the lower and middle levels of barbarism. The writer even believes it probable that the earlier Columbian colonies would, by following southward the great natural highway provided by the slopes of the Andes, reach the Straits of Magellan before any other offshoot from the parent stem would surmount the intervening obstacles between the Columbia River and Florida. That the great stretches of prairie, whether fertile or desert, really constituted a barrier to the advance of the hunting tribes, is sufficiently evident from the fact that nearly all this territory was a solitude at the period of European discovery. Even the Mound-builders, who are known on sufficient evidence to have depended rather upon horticulture than upon fishing and the chase for the means of subsistence, were overmastered in the struggle for life by the rigor of the climate, and retired to seek more propitious conditions. They may, not improbably, have formed one of the successive waves of population which flowed into the valley of Mexico, and founded there that confederation of peoples in the middle status of barbarism which romantic writers have dignified with the illusory title of the "Aztec empire."

Between 1600 and 1700 A. D. the area between the Atlantic and the Mississippi, and from Hudson's Bay to the Gulf of Mexico, had been sufficiently explored to render both the English and the French familiar with the locations of the several Indian tribes within these limits. Some knowledge of the Dakotas and of the Missouri tribes had also been obtained. But it was not until the eighteenth century that the same degree of information was acquired of the tribes in the interior and upon the Pacific coast. Our systematic knowledge of the aborigines dates from the present century. Their unity of origin will be assumed on the basis of evidence furnished by their "systems of consanguinity and affinity." (See *Smithsonian Contributions to Knowledge*, vol. xvii.) The 150 dialects, more or less, spoken N. of New Mexico have been reduced to a number of stock-languages, which resolve the aborigines into a limited number of linguistic groups, whose migrations will be considered separately. As a general rule, the tribes speaking dialects of the same stock-language were found in territorial continuity, as would have been expected.

I. *Migrations of the Algonkin Tribes.*—A much larger area was occupied by the Algonkin tribes than by any other single stock of the Ganowanian family. (This name signifies the Family of the Bow and Arrow.) N. of the great lakes the tribes of this lineage were spread from the eastern slopes of the Rocky Mountains to the coast of Labrador. They also occupied the Atlantic coast from New Brunswick to the confines of South Carolina, and along the E. side of the Mississippi from Lake Superior to the Ohio. They were thinly scattered over these immense regions, and held them free from intrusion, with the exception of the Winnebagoes in Wisconsin and the Iroquois and their kindred tribes in New York and Western Canada. That they were migrants from the western side of the continent by a high northern route is plainly shown by the continuous line of their occupation. It will not be necessary to discuss their traditions of a north-western origin or their secondary migrations, except to make a single point. These tribes fall into the following subdivisions: 1, The Atlantic tribes; 2, the Great Lake tribes; 3, the Mississippi tribes; and 4, the Rocky Mountain tribes. It can be shown that they had within their areas two centres of population where tribes were grown and thrown off. One of these was upon the head-waters of the Mississippi, from which they were displaced by the Dakotas. The Shiyans, Arapahoes, Ahahuelins (Gros Ventres of the Prairie), the Menomonees, Kickapoos, Sauks and Foxes and Shawnees seem to have been derived from this secondary source. The other was upon the outlet of Lake Superior, the original home of the Ojibwas, Ottawas, and Pottawattamies, and possibly of the Crees. In this area and upon its fisheries the Miamis and the tribes known collectively as the Illinois—namely, the Peorias, Weas, Kaskaskias, and Piankeshaws—originated, and migrated from thence into the areas between the Mississippi and the Ohio, where they were found. It affords a striking illustration of the influence of great fisheries in developing tribes of men under institutions which belong to this status of society.

II. *Migrations of the Dakotan Tribes.*—Some evidence both with respect to the migrations of the several tribes and the general direction of their advance as one of the great stocks of the Ganowanian family may be derived from the relations of the dialects, and from the geographical positions of the numerous tribes of this lineage. They were either lake or river Indians, which gave a peculiar character to their area of occupation. Since these lakes were in the midst of prairies, and since the rivers had a narrow border of forest, while all beyond was open prairie, unsuitable for Indian occupation, the tribes of this stock spread over great distances N. and S. along the banks of the rivers, without any corresponding lateral expansion, except in the lake region of Minnesota. Besides, as their area, with the exception of the lake region, was a comparatively poor one, it created a tendency among the more vigorous and warlike bands, like the Iroquois, who were probably an early offshoot from the Dakotan stem, to seek new habitations in distant regions.

1. *Dakotas.*—The Dakotas proper held a broad as well

as compact area on the head-waters of the Mississippi and in the lake region of Minnesota, from which they ranged eastward to Lake Superior and westward to the Missouri. A portion of them when discovered were permanently established on the Missouri. They are now divided into some twelve great bands, and occupy the plains between the Mississippi and the Rocky Mountains, forced westward, as other tribes have been, by the progress of the incoming race. When Carver visited the Dakotas in 1756, they were divided into eleven bands. (*Travels*, Philadelphia ed., 1796, p. 37.) They acknowledged seven primary divisions, as stated by Riggs (*Lexicon*, Introd., p. xv.; *Smithsonian Contributions*, vol. iv.), of which the Tetons were the seventh, now subdivided into several bands. The name *Dakota*, by which they call themselves as one people, signifies "leagued" or allied. They also speak of their confederacy as the "seven council-fires." They are divided into thirteen bands—Santees, Yanktons, Sissetons, Ogallallas, Brulés, Unkpapas, Blackfeet Dakotas, Channonpas, Sans-arcs or Itazipcos, Minnekanjoos, and Two Kettles. Isaunties is a generic term used by the western Dakotas to describe their kindred on the Mississippi; and Tetons another employed by the latter to describe the former. As the language has two dialects, the distinction is dialectical.

2. *Assiniboines.*—This tribe was originally one of the constituent bands of the Dakotas, but became detached and independent shortly before their discovery. They moved northward to Rainy Lake, and ranged thence westward to the Missouri and northward to Lake Winnipeg.

3. *Missouri Tribes.*—The nearest congeners of the Dakotas were the eight Missouri tribes, who inhabited both banks of this river and some of its tributaries from the Ponka River on the N. to the mouth of the Missouri, and thence southward to the Arkansas on the S. They fall dialectically into three groups—first, the Ponkas and Omahas; second, the Iowas, Otoes, and Missouris; and third, the Kaws, Osages, and Quappas.

4. *Winnebagoes.*—This tribe is clearly affiliated with the Missouri tribes above mentioned. Under the French name of Puants they were found near Lake Winnebago in Wisconsin, and ranged to Green Bay. They were an offshoot from the Dakotan stem, which, advancing eastward toward the forest area, were arrested by Lake Michigan, and very likely by the tribes in possession of the narrow peninsula between it and Lake Superior. This was the natural route of migration to the valley of the St. Lawrence from the Mississippi region, and probably the one previously taken by the Iroquois.

5. *Upper Missouri Tribes.*—N. of all the tribes named are the Mandans, who speak a dialect of the Dakota language; and also the Minnitarees or Hidatsa and the Crows, whose dialects have so large an infusion of Dakotan vocables that they have been regarded as of this descent. Their real connection seems to be with the Gulf tribes—namely, the Creeks, Choctas, and Seminoles.

6. *Hodenosaunian Tribes.*—This group consists of the five Iroquois tribes (Senecas, Cayugas, Onondagas, Oneidas, and Mohawks), the Hurons or Wyandottes, Eries, Neutral Nation, Susquehannocks, Nottowas, and Tuscaroras. The home-country of the Iroquois before they occupied New York was upon the N. bank of the St. Lawrence, near Montreal. (*League of the Iroquois*, p. 5.) Their last migration, of which they have preserved a full tradition, was from that district into the lake region of Central New York, where they had been established at least a century and a half when first discovered in 1608. The Hurons remained upon the Georgian Bay and around Lake Simcoe, and ranged southward to Lake Erie; the Wyandottes of Kansas are the remains of this people. The Neutral Nation occupied the banks of the Niagara River and the N. E. shore of Lake Erie, and the Eries the S. E. shore of the same lake. Both tribes were defeated and expelled by the Iroquois about 1650–55, and are now extinct. The Susquehannocks lived on the lower Susquehanna, in Pennsylvania, the Nottowas in Virginia, and the Tuscaroras in North Carolina, until their expulsion in 1712, when they settled in New York. It will be observed that the Iroquois and their kindred tribes are classed with the Dakotas. The evidence of this connection is found in their dialects, the words of which are very similar, although not identifiable; in their systems of consanguinity, which are identical in minute particulars; in the common term, *Nä-do-es-sioux*, applied by the Ojibwas and other Algonkin tribes to the Dakotas, the Iroquois, and the Hurons; and from the tradition of the Hurons that the Dakotas were descended from them, which asserts their common descent. From what quarter these tribes or the mother-tribe entered the Algonkin area we have no positive knowledge. It seems at least probable that they passed through the peninsula between Lakes Superior and Michigan, and thence to the valley of the St. Lawrence, where their traditionary history commences; and that the Winnebagoes were following on the same general line when their further progress eastward was arrested by the superior power of the tribes which then held the peninsula. Both migrations probably antedate the occupation of the head-waters of the Mississippi by the Dakotas. The initial point from which the Dakotans migrated into the central section of the continent was necessarily remote. They were northerners climatically, and their natural relations were to the western side of the continent. They must have reached the Missouri either by way of the Arkansas or the Platte, on either of which 800 miles of prairie must have been traversed. In their eastern movement, which was in progress at the epoch of European discovery, they were later in time than the Algonkin tribes, and later than the Gulf nations.

III. *Migrations of the Gulf Tribes.*—Arranged according to language, these tribes are the following; 1, Catawbas; 2, Natches; 3, Cherokees; 4, Creeks, Choctas, Chickasaws, and Seminoles. Concerning the migrations of these tribes, and of the smaller tribes along the Gulf W. of the Mississippi, no knowledge is preserved. It is only by ascertaining their connection with tribes whose migrations are traceable that this knowledge can be recovered.

IV. *Migrations of the Pawnee Tribes.*—The Pawnees and Arickarees speak closely-allied dialects. When first known, the Pawnees, in four subdivisions, occupied the upper waters of the Kansas River, and ranged from thence to the Platte. After their separation from the main stock the Arickarees removed to the upper Missouri, near the Mandans, where they became horticultural village Indians. Neither they nor the Pawnees ever lived E. of the Missouri. Their only known congeners are the Huecos, Witchitas, Keechies, and Towaches of the Canadian River and Red River of Arkansas. They all speak dialects of the same stock-language, and have been prairie Indians since first known, subsisting upon the buffalo through the possession of the horse. This branch of the Ganowanian family is thus referred to the Rocky Mountain chain near the head-waters of the Arkansas, along which, without doubt, they traversed the prairies into their modern areas. The line of their migration, which was comparatively recent, points to the valley of the Columbia as the home of their ancestors.

V. *Migrations of the Athapasco-Apache Tribes.*—The Athapascans, who occupy the greater part of the Hudson's Bay territory from the Saskatchewan to the Yukon, and from the bay westward to the Rocky Mountains, and beyond, together with the several tribes of the Apaches and the Navajoes and Pinols of New Mexico, speak dialects of the same stock-language. Their migrations present the remarkable spectacle of a stock dividing in some central area—one branch moving northward and becoming established in a nearly arctic climate, and the other moving southward into a semi-tropical region. The Apaches did not come into notice until after they became possessed of horses, which have raised many Indian tribes from obscurity.

VI. *Migrations of the Shoshonee Tribe.*—The tribes speaking dialects of this language are the Shoshonees or Snake Indians in subdivisions, who inhabit the Lewis Fork of the Columbia, and range southward to the Humboldt River and eastward to the Wind River Mountains; the Utes in several subdivisions, who inhabit the Territory of Utah from the region of Great Salt Lake southward to New Mexico, and the W. side of the Colorado southward to Arizona; the Comanches of Texas; and the Cawios, Netelas, and other small bands in the peninsula of Lower California. Of this stock the Shoshonees and Comanches are the most conspicuous members. The former have held the same area, substantially, since their discovery, but a portion of them, according to a tradition of the Crow Indians, occupied formerly the head-waters of the Yellowstone, from which the Crows displaced them. The Comanches, called at different times Paducas and Hietans, have been known from an early period, but became prominent only within a century through possession of the horse. If they were met with at all at the time of Coronado's expedition, which is uncertain, they were then a feeble tribe. When first known to Americans they ranged northward to the Kansas River, and southward through Western Texas and towards the Gulf of Mexico. In some respects the Shoshonee migration is more significant than that of any other stock of the Ganowanian family. It was the last in time, and its entire course is manifest, as well as the region in which it took its rise. The greater part of the area overspread is still held by tribes speaking dialects of this language. It extends from the principal branch of the Columbia southward to the Colorado, where it divides into two streams: one, turning south-easterly, and migrating apparently by way of the Arkansas, reached

Texas; while the other, keeping W. of the Colorado, flowed south-westerly until its most advanced bands penetrated Lower California, the two extremes being a thousand miles apart from E. to W.

It will not be necessary to notice the aboriginal tribes of the valley of the Columbia and Fraser's River, except to remark that the unusual number of stock-languages in this area, some ten or twelve, is sufficient evidence of its long-continued occupation.

VII. *Migrations of the Village Indians.*—1. *Of the Village Indians of New Mexico and Arizona.*—The valleys of New Mexico, without doubt, have been the seats of the village Indians from a very early date. This view is sustained by the number and position of the present pueblos, by the ruins of deserted pueblos, and by the number of stock-languages, five or six, spoken in these limited areas. There are reasons for supposing, from the number of pueblos in ruins in New Mexico and Arizona and in the southern part of Utah, that village Indian life in these regions was in a state of decadence at the time of their discovery. It seems probable that the Indians who occupied the deserted pueblos had been overpowered and forced southward by the more barbarous tribes falling down upon them from the valley of the Columbia. For upwards of three centuries the Pueblo Indians, as they are called, have been known to us, and have remained substantially in the same condition. Of their previous history and movements no direct knowledge remains, but the probability is strong, if not conclusive, that their remote ancestors were immigrants from the valley of the Columbia.

2. *Migrations of the Mound-builders.*—Among the tribes without recognized descendants are the Mound-builders, who lived mainly in the valley of the Ohio and upon its tributaries. It is evident that they were village Indians, depending chiefly upon horticulture for subsistence, from the implements and utensils found in the mounds, and from the areas selected by them, which were poor in fish and game. It is probable that they were village Indians from New Mexico, the nearest point from which they could have been derived. From the absence of all traditionary knowledge concerning them among the present Indian tribes, the experiment to transplant their type of village life from a dry and temperate climate into colder northern areas had been made and failed before the arrival of the ancestors of the present tribes E. of the Mississippi. The probability that they withdrew from the country is at least stronger than that they destroyed each other. (See AMERICAN ANTIQUITIES.)

3. *Migrations of the Village Indians of Mexico and Central America.*—The evidence of the occupation of these areas from a very ancient date is conclusive, both from architectural remains and from the number of stock-languages. It is not probable that the number of these languages could be reduced below eight or ten if the materials for their comparison were ample. There are supposed to be eighteen. "We can safely affirm," says Clavigero, "that there are no living or dead languages which can differ more among each other than the languages of the Mexicans, Otomies, Tarascas, Mayas, and Mixtecas." (*Hist. of Mexico*, Cullen's trans., Philadelphia ed., 1817, iii. 100.) To these should be added the Zapotecan, Totonacan, Huaxtecan, Mixe, Popolucan, and some others to make the list complete. The higher development of architecture in Yucatan and Chiapas suggests a longer occupation of these countries by village Indians than of Mexico. It is a singular as well as an instructive fact that the principal historical tribes of Mexico found in possession at the time of the Spanish conquest had resided there but a few hundred years. Their respective migrations were so recent in point of time that knowledge of the event and of the quarter from whence they came had been preserved by tradition. Acosta, whose work was first published at Seville in 1589, and who visited Mexico in 1585, gives the principal tradition quite fully. He remarks: "These second peoples, Navatalcas [the first he calls Chichemecas], came from other far countries which lie towards the N., where now they have discovered a kingdom which they call New Mexico. There are two provinces in this country—the one called Aztlan, which is to say, a place of herons; the other Teaculhuacan, which signifies a land of such whose grandfathers were divine. . . . The Navatalcas paint their beginning and first territory in the figure of a cave, and say they came forth of seven caves to come and people the land of Mexico." (*Natural and Moral Hist. of the E. and W. Indies*, London ed., 1604, Grimstone's trans., pp. 497–504.) He places the time of the migration of the first of the seven tribes at 720 A. D., which of course is an approximate date only, and the time consumed in the movement at eighty years. The migration of the Aztecs, the last of the seven in the order of time, was commenced in 1022 A. D. Herrera adopts this tradition, remarking that "they came from remote parts northward, where New Mexico was afterwards found." (*Hist. of America*, Lond. ed., 1725, Stevens's trans., iii. 188, 189.) Clavigero remarks that the name Nahuatlacas (the Navatalcas of Acosta) "was principally given to those seven nations, or rather those seven tribes of one nation, who arrived in that country after the Chichemecas, and peopled the little islands, banks, and boundaries of the Mexican lakes. These tribes are the Sochimilcas, the Chalcese, the Tepanecans, the Colhuas, the Tlahuicas, the Tlascalans, and the Mexicans. The origin of all these tribes was the province of Aztlan. . . . All historians represent them as originally of one and the same country; all of them spoke the same language." (*Hist. of Mexico*, l. c. i. 141.) Elsewhere (ii. 119) he remarks that "the Chichemecas, like the Toltecs who preceded them, and other nations which came after them, were originally from the N. countries, as we may call the N. of America, like the N. of Europe, the seminary of the human race."

Besides this general tradition of the migration of the Nahuatlacs in several tribes, there is a special tradition of the migration of the Aztecs. They left Aztlan, according to the arithmetic of Clavigero, in 1160 A. D., arrived at Tulla, N. of the valley, in 1196, at Chapultepec in 1245, at Acoloco in 1262; were enslaved by the Cholulans in 1314, freed themselves in 1325, and that year founded Mexico. (*Ib.*, i. 150.) The last date in all probability is near the truth, the remaining chronology being merely approximate. These traditions strike the writer as unquestionable in their authority as to the principal facts. They ascribe to them a northern origin, which was antecedently probable, and which leads to the final inference that their remote ancestors originated in the valley of the Columbia.

With respect to the migrations of the village Indians of Yucatan and Central America, the Chiapanese had a tradition of the northern origin of their ancestors; and there still remained in San Salvador and Nicaragua tribes speaking the Aztec language, as they did in the time of Oviedo. With these clear and specific evidences of a northern origin of the principal historical tribe in Mexico and Central America, it is difficult to arrive at any other conclusion than that the remote ancestors of all the tribes found in these countries were emigrants from the valley of the Columbia.

VIII. *Probable Asiatic Origin of the Ganowanian Family.*—A brief reference to the facts which suggest this hypothesis will conclude this article. In the first place, the number of distinct types of mankind in Asia, against a single type in America, aside from the Esquimaux, shows conclusively that the Asiatic continent has been occupied by man much the longest. Secondly, the striking affinities in physical characteristics between the Mongolians and Tungusians of North-eastern Asia and the aborigines of America warrant the assumption of the Asiatic origin of the latter, unless the independent creation of man in America is claimed. Thirdly, there are two existing lines of communication between the two continents within the power of savage tribes—one of which, across the Straits of Behring, has been proved to be practicable by the Esquimaux migration; and the other, by the Aleutian chain of islands, is rendered a probable route by the fact that most of these islands are now inhabited by a people of common descent. They are so near together as to be visible from each other, with the exception of two intervals of 60 miles each, one of 50 miles, one of 330, and one of 100, the last two near the Asiatic coast. Fourthly, these islands are gradually sinking, as has been inferred by navigators from the fact that trees are now to be seen standing under water between some of them. These islands are the peaks of a submarine chain of mountains, and it is not an improbable supposition that some thousands of years ago they may have stood higher above the sea-level than at present, and consequently nearer together. The widest gap is on the Asiatic side. From Attou Island, the westernmost of the Aleutian chain, to Behring Island, it is about 400 miles, with Copper Island between; and from Behring Island it is about 100 miles to Kamtchatka. From Attou Island the American coast is accessible by means of canoe navigation from island to island—not readily, but possibly, through the vicissitudes of the ages. Fifthly, in the Ocean Stream of the North Pacific, the counterpart of the Gulf Stream of the North Atlantic, an instrumentality is provided so remarkable in character that it would have been extraordinary if America had remained without inhabitants of Asiatic origin. This stream rises in the South Pacific, and flows northward along the Japanese and Kurilian Islands to the Cape of Kamtchatka, where it is deflected to the eastward, and divides into two streams. One of these, following the coast, enters Behring Strait, but the other, the main stream, crosses the Pacific eastward along the S. shores of the Aleutian chain to Alaska, where it turns down the Pacific coast. It is not entirely lost until it reaches the shores of California. Trunks of camphor trees and Japanese junks have been brought to our coasts by this ocean river in our times. Lastly, it is not to be supposed that a deliberate migration brought the aborigines to America, if they came in fact from Asia. The natural obstacles to such a transit to an unknown land preclude the supposition. When it occurred it must have been purely accidental, and limited to a small number of persons, although it may have been repeated under similar circumstances a number of times in the course of the ages. The Amoor, one of the great rivers of Asia, stands nearly in the same physical relations to the north-eastern section of that continent that the Columbia does to the north-western section of the American. This river, although unequal to the Columbia in its fisheries, must have attracted inhabitants to its banks in the early ages of the existence of the human family. Its occupation would have led to boat-craft and familiarity with the sea. The Ocean Stream might easily bear off canoe-men, once thrown upon its current by the accidents of the sea, from the coast of Asia or from the Japanese or Kurilian to the Aleutian Islands. After Attou Island, the first in the series, was gained, the problem of reaching Alaska and America would be substantially solved.

The Arctic regions were undoubtedly last occupied by man. It requires the gradual adoption of hyperborean habits before human existence could be maintained in an arctic climate. For this reason, and from the great antiquity of the Ganowanian family in America, the Aleutian route is far more probable if the question is confined to Behring Straits on the one hand, or the Aleutian chain on the other. Finally, it is a striking fact, in the great chain of facts which point to the Asiatic origin of the American aborigines, that the Tungusian and Mongolian tribes, who, of all existing Asiatics, are nearest to them in type, still hold the Amoor River, upon which they have lived from time immemorial. LEWIS H. MORGAN.

Miguel′ (JOHANN), b. in the province of Hanover Feb. 21, 1828; studied law at Heidelberg and Göttingen 1846–49, and settled at Göttingen as an advocate. Enthusiastic for the unity of Germany, he worked with great energy for the national idea, but thereby, and by some papers on the financial condition of Hanover, incurred the emnity of the government. He gained the confidence of the people, however. In 1864 he was elected a deputy from three different places, and in the second chamber of the Hanoverian diet he occupied an influential position. He espoused the policy of Benningsen. In 1865 the city of Osnabrück elected him burgomaster. After the annexation of Hanover to Prussia in 1866, he exerted himself zealously in order to strengthen the newly-established connection, and it was in no slight degree due to his influence as a member of the North German diet and the Prussian house of deputies that the policy became liberal and the South German states entered into intimate relations with the North German confederation. His office of burgomaster he resigned in 1870, to accept that of director of the discounting bank of Berlin, but in the German Diet he still continued one of the most active members of the national liberal party. AUGUST NIEMANN.

Miguel (Dom MARIA EVARISTO), b. at Lisbon Oct. 26, 1802, the third son of John VI., king of Portugal, by the Spanish princess Carlotta Joachima; went in 1807 to Brazil with his parents, fleeing from the French armies. Here he grew up entirely neglected. When he returned to Europe in 1821 he could neither read nor write. When he was ten years old he was a drunkard; when he was fifteen his debaucheries and atrocities amazed the people. He was, nevertheless, his mother's favorite, and seems to have returned this love, while he hated his father and brother, and considered them as strangers. Soon after the return of the royal family to Portugal he began to form conspiracies against his father; open revolt followed. The plan was to depose the king, and, if necessary, to kill him. He escaped on board an English man-of-war, and by his escape Dom Miguel's plan was foiled. The prince was banished from Portugal May 12, 1824. On May 10, 1826, John VI. died, and in order to prevent a civil war the eldest son, Dom Pedro, emperor of Brazil, resigned the Portuguese throne in favor of his daughter, Maria da Gloria, and offered her hand to Dom Miguel. He assented, made oath on the constitution, and entered on his regency during the minority of Maria. But he soon broke his oath, subverted the constitution by the aid of the clerical party, dissolved the constitutional Cortes, assumed absolute power, filled all the dungeons of the country with the liberals, and ruled Portugal for several years by terror, while he gave up himself to the wildest dissipation. But in 1832, Dom Pedro arrived at Oporto with a Brazilian fleet. In 1833 he conquered Lisbon, and on May 26, 1834, Dom Miguel was brought to Genoa by a Portuguese man-of-war, having agreed never to re-enter Portugal. As soon as he arrived at Genoa, however, he protested against the agreement, but the only result of the protest was that he lost his pension from Portugal, and all his property was confiscated. He afterwards married a German princess, and d. at Brombach, Baden, Nov. 15, 1866.

Mika′do, the titular name of the Japanese emperor. The present mikado was b. in 1852, or, according to the Japanese calendar, in the year 2512. His name is MŬTSHITO, the son and rightful heir of Osa-hito, whose posthumous name was Komei Tenno, and whose reign lasted twenty years. Soon after the death of the father, in 1867, many circumstances conspired to force the late "tycoon" to abdicate the ruling position which he and his predecessors had held as usurpers for several hundred years, and which event was the pivot upon which the late revolution in Japan rested. On attaining the requisite age of sixteen, Mūtshito was crowned in the city of Osaka. One of his first acts after that event was to grant an audience to the representatives of foreign powers then in Japan, which was the first time that such an audience had ever taken place. Soon afterwards, and before the close of 1868, he removed his residence to Yedo, which he decreed should be called *Tokio*, or the "Eastern Capital." Early in Jan., 1869, he granted his first audience to the ministers of foreign powers in Tokio, and received their credentials; not long afterwards he visited Kioto, the western capital, took unto himself a wife, and returned to Tokio, to which city all the great daimios of the empire had been ordered to resort by His Imperial Majesty. That the rule of the new emperor has been fraught with wonderful results is known to all the world, and it is to be regretted that we cannot in this place go into particulars. We may notice, however, that he has won the affection of his people by his high character and unselfish patriotism. He has sent ambassadors abroad for the purpose of informing themselves in regard to affairs of state; established legations in America, Germany, England, France, Italy, Russia, Austria, and China; he has sanctioned the building of railways and the establishment of steamship lines; connected his empire with the whole world by means of the telegraph; established many modern lighthouses all along his coasts; organized an army and a navy on the models of the Western World; sent young men abroad by the hundred to be educated; revised old laws and made new ones to conform with the modern spirit of civilization; abolished many barbarous usages; given his decided approval to a free press; and in these as well as many other important measures he has proved himself the very head and front of his marvellous empire. And we have authentic news that the mikado has issued an imperial proclamation or decree which has for its object the establishment of a deliberative body allied to a parliament, in which, to some extent, the will of his subjects may be expressed and recogized.

In his personal appearance the mikado is rather taller than the average of his countrymen; he has had three children, one of whom alone survives; he is not addicted to self-indulgence, but takes delight in cultivating his mind and is a hard student; although now only twenty-three years of age, he frequently presides at the meetings of his privy councillors; he frequently visits the executive departments to see that all is going on properly; he has surrounded himself with the wisest statesmen in his empire. With such a worthy ruler, and such a progressive people as the Japanese have already proved themselves to be, the empire of Japan may well count upon a great future of prosperity and happiness. F. A. P. BARNARD.

Mikhailov′ka, town of Russia, government of Koorsk, on the Khorok, has large manufactures of leather, boots, and shoes, and some important fairs at which the products of the vicinity—corn, cattle, wool, and furs—are exchanged for manufactured and grocery wares. Pop. about 6000.

Mik′losich, von (FRANZ), b. at Luttenberg, Styria, Nov. 20, 1813; educated at the gymnasium of Warasdin, Croatia; studied jurisprudence at the University of Gratz; received in 1844 an appointment at the imperial library at Vienna, and was made professor of Slavic languages at the university of the same city in 1849. His principal work is a comparative grammar of the Slavic languages (1852–70), a comprehensive and ingenious work. He also published *Lexicon linguæ palæoslowenicæ* (1850), and a great number of minor works on the Slavic language, literature, archæology, and history: *Formenlehre der altslaw. Sprache* (1850), *Lantlehre der altslaw. Sprache* (1850), *Bildung der slaw. Personen namen* (1860), *Bildung der Ortsnamen im Slawischen* (1865), etc. In connection with I. Müller he edited *Acta et Diplomata Græca Medii Ævi* (3 vols., Vienna, 1860–64).

Mik′nas, Mequinez, or **Meknaza,** town of Morocco, in lat. 33° 58′ N. and lon. 5° 35′ W. It is situated on a fertile plain watered by the Bet River and covered with olive-groves. It is fortified, neatly built, and contains a magnificent palace built of marble and surrounded by beautiful gardens. The sultan resides here during the summer. A considerable trade and manufactures of leather and earthenware are carried on. Most of its inhabitants are more or less directly connected with the court of the sultan. The town was formerly called Tákarat. Pop. estimated at 50,000.

Mil′an, large town of Northern Italy, in lat. 45° 28′ N., lon. 9° 11′ E., lying in the centre of the great fertile plain of the Po, between the Alps and the Apennines, the Adriatic and the Ligurian seas. (For climate see ITALY.) The Olona, a small stream, washes its southern wall, and the town is connected by navigable canals with the Adda, and, through the Ticino, with the Po. Railways centring in a most imposing station unite Milan with all the large towns of Italy. The circumference of the city, following the ramparts, is about 8 miles; it has twelve gates, the most striking being the Porta Sempione on the N. W., at the entrance of the great Simplon road, whose construction is here commemorated by a magnificent triumphal arch begun in 1807 and finished in 1836. The streets of Milan are generally broad and very clean; the palaces, though sometimes of immense size, lack the mediæval grandeur of those of Florence. Of the 240 churches existing in the middle of the last century, Maria Theresa and Joseph II. suppressed 117; others have been abandoned since, so that the actual number is about 80. The cathedral of Milan, an Italian Gothic structure, is one of the most splendid temples in the world, being exceeded in size only by St. Peter's and the cathedral of Seville. It was begun in 1366 (Heinrich Arler of Gmunden being the architect, according to some—Matteo da Campione, according to others), and was in great part completed by 1500. Under Napoleon the work was actively resumed in 1805, and further decorations and repairs are constantly going on. The interior of this cathedral is 477 feet in length, 186 feet in breadth; height of nave, 158 feet, of dome, 214 feet, of tower, 360 feet. The nave is supported by 52 columns, the four sustaining the dome being 10 feet and the others 8¼ feet in diameter, canopied niches with statues taking the place of capitals; the pavement is of mosaic; the vaulting, painted to imitate carved stone, has been injured by dampness, and is unworthy the rest of this wonderful edifice. The roof is a forest of Gothic turrets, 98 in number, decorated with exquisite carvings; the exterior of the cathedral is adorned with 2000 statues, the interior with 700. Handbooks of travel usually state the whole number of statues at 4500, but the above figures are from the best Milanese authorities. The Piazza del Duomo, an open space around the cathedral, has recently been enlarged, but still does not afford a satisfactory view of this marvellous building. Passing over other very noteworthy churches, that of St. Ambrose, founded in 387 by the illustrious archbishop himself, is of the greatest interest to the architect, the antiquarian, and especially to the lover of early Christian art. Near Santa Maria della Grazie, in which are very interesting frescoes, etc., is the convent containing that ruined masterpiece of art, Da Vinci's *Last Supper.* It would be impossible here even to hint at the endless artistic and literary treasures existing in Milan. The Brera Gallery alone contains more than 400 oil paintings, many of great excellence, besides admirable frescoes, etc. In the same building is the National Library, founded by Maria Theresa in 1764, and recently enlarged by private donations, libraries from suppressed monasteries, etc., until it now counts 250,000 volumes. The famous Ambrosian Library, founded by Cardinal Borromeo, has also lately risen from 60,000 to 164,400 volumes, among which are above 15,000 manuscripts, some of the greatest rarity. The adjoining Gallery of Art contains, among its countless treasures, invaluable original drawings and manuscripts by L. da Vinci. In addition to public collections, Milan boasts 26 private picture-galleries of more or less interest. There are 15 museums of natural history, 14 of medals and antiquarian objects generally. The charitable and educational institutions of Milan are on a most liberal scale, and admirably managed; the former own a capital of more than $40,000,000. The schools, academies, musical conservatories, etc. of Milan have a high reputation. There is also ample provision for public amusements. The theatre La Scala is one of the largest in Europe. The old and new public gardens furnish charming promenades, and the drive through the Corso and around the walls is most agreeable. Among the recent improvements in the city should be mentioned the Victor Emmanuel Gallery, or arcade, which has completely eclipsed the old Cristoforis. It represents a Latin cross, 640 feet long, 48 broad, 85 in height, with a cupola 165 feet high. The roof consists of two glass vaults, one 6 feet above the other. This gallery is entered from the Piazza della Scala through a superb Corinthian arch of granite, and contains about 100 brilliant shops. The municipality has recently spent 1,000,000 francs, besides the cost of the ground, on the new cemetery outside the Porta Garibaldi. The geographical position of Milan secures it an immense inland trade, chiefly in grain, rice, cheese, silk, etc.; in the suburbs there are numerous and important manufactories.

At the time of its conquest by the Romans (220 B. C.) Milan was the largest town of Cisalpine Gaul. Cicero and Marcus Brutus were afterwards among its governors, and in the third century it almost rivalled Rome. It was Christianized very early—tradition says by St. Barnabas—and was made illustrious in the fourth century by the good and great St. Ambrose. It suffered severely from the barbarians in 452, and in 558 was destroyed by a nephew of Vitiges, who, according to Procopius, slew 300,000 of its inhabitants. After many vicissitudes we find Milan in the eleventh century once more independent and with a population of 300,000. Its moral and intellectual prosperity rose with its material wealth. The celebrated archbishop Aribert offered every encouragement for the education of the young, and from her schools of philosophy, medicine, etc. Milan sent forth her professors to Burgundy, to France, and to Germany. After this followed a series of disastrous wars, ending with the destruction of the city by Frederick Barbarossa in 1162. It was, however, rebuilt with marvellous rapidity, and in 1176 the Milanese, aided by the neighboring towns, defeated Frederick at Legnano. In 1227 they were once more crushed by Frederick II. In 1259 an attempt was made by the terrible Ezzelino to get possession of the city, which failed, and from that time till 1447 Milan was governed by the ducal house of the Visconti. The so-called Golden Ambrosian republic, of three years' duration, was followed in 1450 by the dukedom of the Sforza, which lasted till 1500. From that time Milan continued for the most part under a foreign yoke, French, Spanish, or German, until 1796, when the French entered Milan and Napoleon made it the capital of the Cisalpine republic. In 1814 the Austrians took possession of the city, promised a liberal government, but pursued an entirely opposite policy. Insurrection after insurrection broke out (1815, 1821, 1833), each followed by arrests, imprisonments, executions; and a state of chronic conspiracy existed until the "Glorious Five Days' Revolution," which began on Mar. 18, 1848, and terminated in the expulsion of the Austrians. This is one of the brightest pages in the history of Milan, but after four months the enemy returned victorious. A new but disastrous insurrection was attempted in 1853. On June 8, 1859, Milan had the happiness to welcome the Franco-Italian army within her gates, and Victor Emmanuel as the sovereign of her choice. The town is at present highly prosperous. Pop. in 1881, 321,839. CAROLINE C. MARSH.

Milan, Ill. See APPENDIX.

Milan, R. R. junction, cap. of Sullivan co., Mo. (see map of Missouri, ref. 1–F, for location of county), 250 miles N. W. of St. Louis, has good educational advantages, steam saw- and flouring-mills, woollen-mill, and cooperage. Principal business, farming. It has deposits of coal, fireclay, mineral paint, and building-stone. Pop. in 1870, 319; in 1880, 1117.

Milan, R. R. junction, Erie co., O. (see map of Ohio, ref. 2–F, for location of county), 66 miles W. of Cleveland, has the Western Reserve Normal School, large paint manufactory, shipyard, carriage-shops, etc. Pop. of v. in 1870, 774; in 1880, 797.

Milan, R. R. junction, Gibson co., Tenn. (see map of Tennessee, ref. 6–B, for location of county), 90 miles N. E. of Memphis, has a college, a free high school, and steam cotton- and planing-mills. Pop. in 1880, 1600.

Milan Obrenovitch I., king of Servia, b. at Jassy Aug. 10, 1854, a grandson of Ephraim Obrenovitch, was adopted by Prince Michael, and by him sent to Paris to be educated in the Lycée Louis-le-Grand under François Huet. The assassination of Prince Michael in 1868 and the violent disturbances caused thereby induced him immediately to return home, and on June 23, 1868, he was proclaimed prince of Servia by the Skuptchina, and a regency was organized during his minority. On Aug. 22, 1872, he personally assumed the reins of the government, and, induced, or perhaps compelled, by the Bosnian revolution, he declared war against Turkey in 1876. The Servian army was placed under the command of the Russian general Tschernayeff, but was ignominiously beaten time after time, and it was only by the intervention of England that peace was established in 1877 without any serious loss to Servia. Nevertheless, twelve days later the peace was broken, and, by his participation in the war between Russia and Turkey, Prince Milan succeeded in having the independence of Servia recognized by the Treaty of Berlin, July 13, 1878. On Mar. 6, 1882, Servia was proclaimed a kingdom, and the prince assumed the title of King Milan I. In the same year, on Oct. 23, an attempt was made to assassinate him by Madame Markovitch, the widow of a lieutenant-colonel who had been shot five years previously as a conspirator; she fired at the king just as he entered the cathedral of Belgrade, but missed him.

Milaz'zo, large seaport town of Sicily, in the province of Messina, situated on the Gulf of Milazzo, about 27 miles W. of the city of Messina. This town stands partly on the shore and partly on a high promontory, which gradually slopes seaward till its rocky extremity is lost in the waves. The lower town is undefended, but the upper town is walled and strongly fortified. There are some buildings of interest here, and the convent of the Capuchins commands a magnificent view of the sea and of the town below. The harbor is sufficiently large and deep to receive ships of war, and about 1000 vessels, including those engaged in the coasting-trade, annually enter this port. The exports consist chiefly of oil, wine, salt fish, linseed, dried fruits, etc. Fish of excellent quality abound in the neighboring waters. Milazzo (anc. *Mile*) was founded by the Zanclei more than 700 years before our era, and has shared the general vicissitudes of the island. It has been the theatre of many battles, the last in 1860, when Garibaldi, July 20, obtained a brilliant victory over the Neapolitan troops, followed by the surrender of the fortress of Milazzo and the city of Messina. Pop. in 1881, 13,565.

Milburn (William Henry), b. at Philadelphia Sept. 26, 1823; removed in childhood to Jacksonville, Ill.; studied at Illinois College, notwithstanding a partial loss of sight; became a Methodist itinerant preacher at the age of twenty, chiefly in the Southern States; was settled for a time at Montgomery, and afterwards at Mobile, Ala.; became a popular and eloquent lecturer and chaplain to Congress; went to England in 1859, and lectured with success in the principal cities. On his return he was ordained in the Protestant Episcopal Church, but returned in 1872 to Methodism. He is widely known as "the blind preacher," and has published *Rifle, Axe, and Saddle-Bags* (1857), *Ten Years of Preacher Life* (1859), and *Pioneers and People of the Mississippi Valley* (1860).

Mil'dew [Ang.-Sax. *mildeaw*; Ger. *Mehlthau*, "meal-dew"], the popular name of certain minute parasitic fungi in which agriculturists and horticulturists find one of their most dangerous enemies. The name was originally restricted to the white moulds of the genus *Botrytis*, but is now commonly applied also to other genera, even to the dark-colored fungi which attack our fruit trees. The most important of these parasitic fungi are those which infest the cereals and often injure the grain-crops very materially, such as the wheat mildew (*Puccinia graminis*), the red rust (*Trichobasis rubigo* and *lineare*), the smut (*Ustilago segetum*), and the bunt (*Tilletia caries*). As a preventive against this disease the seed-wheat is treated to a bath of a solution of sulphate of copper, which kills the spores carried along with the grain. Another very injurious and widely disseminated mildew (*Oidium Tuckeri*) is that which attacks the grapevine, destroying the foliage, and thereby preventing the fruit from ripening. It appears as grayish spots on the young shoots, the under surface of the leaves, and the stems of the fruit, and has often caused great destruction and desolation in the wine-growing regions of Europe. As a remedy against this disease the vines and trellises are sprinkled in early spring, when the buds first appear, with a solution of 8½ ounces of common salt and 4 ounces of saltpetre, with 36 ounces of water, to which are added 10 drops of oil of rosemary and 10 drops of oil of lavender, 1 part of this solution being mixed with 100 parts of water. The solution is applied by the aid of a syringe. Afterwards, when the leaves have expanded, they are well dusted with flowers of sulphur by the aid of a bellows especially contrived for the purpose. Also roses, lettuce, cucumbers, and peas are liable to be attacked by mildew when sudden changes in the atmosphere take place after a long interval of close, damp air. Some kinds of fungi, also known under the name of mildew, attack even linen and cotton fabrics and paper when kept in a damp place, and appear on the surface as dark spots.

Mile [Lat. *mille passuum*, a "thousand paces," of five Roman feet each], the name for a great number of linear measures, each remotely derived from the Roman mile. Among the principal miles are the following:

English and U. S. statute mile.......................... = 1.
Roman mile.. = .9193
English nautical or geographical mile............ = 1.153
German " " .... = 4.611
Scotch mile, ancient... = 1.127
Irish mile, ancient.. = 1.273
German short mile.. = 3.897
" long " .... = 5.753
Prussian mile... = 4.680
Danish " .... = 4.684
Swedish " .... = 6.648

The geographical mile is one minute of the earth's equator; the German geographical mile is four times as long as ours. Our statute mile was fixed in Queen Elizabeth's time at 5280 feet, and has not since been changed.

Miles (James Browning), D. D. See Appendix.

Miles (James Warley), b. 1819 at Charleston, S. C.; graduated at South Carolina College; entered the ministry of the Protestant Episcopal Church; became a foreign missionary; was assistant rector of St. Michael's, Charleston; was afterwards professor of Greek and history in Charleston College. His writings have vigor and merit. Among them is *Philosophic Theology* (1849).

Miles (Gen. Nelson A.), b. at Wachusettville, Mass., Aug. 8, 1839; entered the volunteer service as lieutenant in the 22d Massachusetts Vols. Oct., 1861; was distinguished at Fair Oaks and at Malvern; became adjutant-general of a brigade; was appointed colonel 61st New York Vols. Sept. 30, 1862, which he commanded at Fredericksburg; was severely wounded at Chancellorsville; was appointed brigadier-general May 12, 1864; was distinguished in the Richmond campaign of 1864; appointed brevet major-general Dec., 1864; colonel of 40th Infantry U. S. A. July 28, 1866; transferred to the 5th Infantry Mar. 15, 1869, and commissioned brevet brigadier and brevet major-general U. S. A. Mar. 2, 1867, brigadier-general U. S. A. Dec., 1880.

Miles (Pliny), b. at Watertown, N. Y., in 1818; was in early life a school-teacher; was afterwards engaged in mercantile pursuits and studied law; travelled extensively in Europe, and narrated his experiences in several newspapers over the signature of "Communipaw." He published several volumes—*Sentiments of Flowers*, *Statistical Register* (1848), *Elements of Mnemotechny, or Art of Memory* (1848), *Northurfari, or Rambles in Iceland* (1854), *Ocean Steam Navigation* (1857), and *Postal Reform* (1855). To the subject of postal reform he devoted his later years with eminent success. D. in Malta Apr. 6, 1865.

Miles (Richard Pius), b. in Maryland May 17, 1791; was consecrated Roman Catholic bishop of Nashville, Tenn., in 1838. D. Feb. 1, 1860.

Miles (W. Porcher), b. July, 1828, in Charleston, S. C.; graduated at Charleston College, and studied law; was assistant professor of mathematics in Charleston College; mayor of Charleston 1856 and 1857, and introduced improved police and drainage systems; was distinguished for gallant and humane labors during the yellow-fever season at Norfolk, Va., 1855; member of Congress 1857–61; and afterward a Confederate colonel and Congressman; was president of the University of S. C., but resigned in 1882.

Miles City, cap. of Custer co., Mon. (see map of Montana, ref. 3–F, for location of county), is on Northern Pacific R. R. and the Yellowstone River at the junction of Tongue River. Pop. in 1880, 629.

Milet de Mureau (Louis Marie Antoine Destouff), Baron, b. at Toulon June 26, 1756, of a noble family from Lorraine, entered the army in 1771, and was made a captain in 1779. As a member of the states-general he usually voted with the right side, but returned soon to active service as commander of the artillery of the army of Italy. In 1792 he was called to Paris to edit the journals of Perouse, which task he performed with great ability (*Voyage de La Perouse autour du monde pendent les années 1785–88*, Paris, 1797–98, 4 vols.), though it presented peculiar difficulties, as the revolutionary government wanted the text changed in favor of the Revolution. In 1799 he was for a short time minister of war, during the empire prefect of the department of Corrèze, and under the restoration president of the board of administration of the Hôtel des Invalides. Napoleon refused to give him any command, but made him a baron. D. in Paris May 6, 1825.

Mile'tus, one of the most flourishing cities of Ionia, was on the Sinus Latmicus, opposite to the mouth of the Meander, and existed as a town at the time when the Greeks planted their first colonies in Asia Minor; but on the arrival of the Ionians under Neleus all the male citizens of the ancient population (Carians or Leleges) were massacred. Miletus soon became one of the most powerful maritime and commercial places of the Mediterranean. It monopolized the trade of the Euxine; it sent its vessels into the Atlantic; it formed a great number of prosperous colonies, such as Abydos and Lampsacus on the Hellespont, Cyzicus on the Propontis, Sinope and Amisus on the Euxine, and others in Thrace, the Crimea, and on the Borysthenes. It continued to flourish under the Lydian and Persian rule, but after its unsuccessful revolt against Persia in 500 B. C. under HISTIÆUS (which see), its strength was broken. Darius treated it with great severity. Most of the inhabitants were massacred and the rest were transported to Ampe, at the mouth of the Tigris. The place was then given up to the Carians; and when the Persians were compelled, 479 B. C., to retire from the coast of Asia Minor, it actually revived. It gave some signs of life during the Peloponnesian war by throwing off the Athenian yoke; it afterward attempted to resist Alexander the Great, and continued a place of commercial consequence until destroyed by the Turks. Its site is now occupied by Palattia, which is described as "a fever-stricken place."

Mil'ford, New Haven co., Conn. (see map of Connecticut, ref. 6–D, for location of county), on Long Island Sound, at the mouth of the Wepowaug River, and on the New York New Haven and Hartford R. R., has a manufactory of straw goods. Pop. of tp. in 1870, 3405; in 1880, 3347.

Milford, Kent co., Del. (see map of Delaware, ref. 3–H, for location of county), on Mispillion River and on the Junction and Breakwater R. R., is a shipping-point for produce. Pop. in 1870, 1150; in 1880, 1240.

Milford, Iroquois co., Ill. (see map of Illinois, ref. 4–G, for location of county), on Sugar Creek and on the Chicago and East Illinois R. R., 10 miles S. of Watseca. Pop. of v. in 1870, 230; in 1880, 612.

Milford, R. R. centre, Worcester co., Mass. (see map of Massachusetts, ref. 3–F, for location of county), 30 miles S. W. from Boston, on branches of the Boston and Albany Providence and Worcester R. R., is one of the largest boot-and-shoe-manufacturing centres in the country. Pop. in 1870, 9890; in 1880, 9310: in 1885, 9343.

Milford, Mich. See APPENDIX.

Milford, on R. R., Hillsborough co., N. H. (see map of New Hampshire, ref. 10–E, for location of county), 50 miles N. W. of Boston, was incorporated 1794, has a free library, a good high school, sends 220,000 gallons of milk to Boston annually, and large quantities of knitting-cotton, men's boots and shoes, tassels, picture and mirror frames, and furniture of all kinds. Granite-quarrying forms an important branch of industry. Pop. of tp. in 1870, 2606; in 1880, 2398.

Milford, cap. of Pike co., Pa. (see map of Pennsylvania, ref. 3–I, for location of county), on Delaware River, 97 miles from New York City, is a popular summer resort for tourists. Pop. in 1870, 746; in 1880, 983.

Milfort' (Gen. LE CLERC), b. at Mézières, France, about 1750; came to America shortly before the Revolution, and after travelling through the British colonies settled among the Creeks about 1776; married a sister of Alexander MacGillivray; became a chief and took part in the war against the Southern colonists. In 1796, after the death of his wife, he returned to France: became a brigadier-general in the wars of Napoleon; published a work upon his American adventures and his residence in the Creek Nation (1802), and d. at Mézières in 1817.

Milhau', or **Millau,** town of France, in the department of Aveyron, on the Tarn, half a mile below the influx of the Dourbie. It is beautifully situated, surrounded with picturesque hills covered with vineyards and forests. It has large tanneries and manufactures of gloves, and carries on a considerable trade in leather, wool, and timber. During the religious wars it was one of the chief strongholds of the Calvinists, but its castle was demolished by Louis XIII. Its industries suffered severely by the revocation of the Edict of Nantes. Pop. in 1881, 16,628.

Milicz of Kremsier, one of the most influential, and also one of the most strongly pronounced, precursors of Huss, b. at Kremsier, a village near Olmütz, in Moravia, in the beginning of the fourteenth century, probably in 1325. In 1350 he took holy orders; in 1360 he was made canon of the cathedral of St. Vitus, in Prague, and in the same year he was appointed secretary to the emperor Charles IV., whom he accompanied to Germany. In 1363 he resigned all his positions, retired to some lonesome place in the Bohemian Forest, and then returned to Prague, where he began to preach to the poor people in the streets—not in Latin, but in Bohemian. He caused a great sensation, as a sermon in the native tongue was at that time something altogether unheard of, but he also made a deep impression: and he actually succeeded in cleaning out one of the most obnoxious streets of Prague, the "Benatki," and transforming it into a charitable institution for fallen women, the "Jerusalem." It soon began, however, to dawn upon him that the root of the evil was in the Church herself—in her corruption, in her vices—and it gradually became clear to him that Antichrist had come, and that radical and sweeping reforms were indispensable. In 1367 he repaired to Rome to confer with the pope; but when he announced, by a placard on the gate of St. Peter's, that he was going to preach on the presence of Antichrist, he was arrested by the Inquisition. He was, however, soon after released and allowed to return to Prague by Urban V., who treated him with great kindness. From 1369 to 1372 he again preached in Prague, but in the latter year dissensions arose between him and his brother-priests in Prague, and they formally accused him of heresy before the pope. He was summoned to Avignon to defend himself, but he d. before his case could be heard, 1374. His *Libellus de Antichristo* is still extant.

Military Academies, as they now exist, are of quite modern origin. In modern times many circumstances have combined to make war far more a matter of science and skill, and less a matter of brute force and courage, than formerly. Hence the great necessity for a thorough preparation of officers, upon whose character and ability the results of war, with all its momentous consequences, must very greatly depend. As the peculiar instruction and training required cannot be furnished by the ordinary educational institutions, special schools have been judged necessary, and have been carefully organized by the most enlightened nations of the globe. Only the principal military schools of some of the great military powers are here noticed.

GREAT BRITAIN. 1. *The Royal Military Academy* at Woolwich, instituted in 1741, for the instruction of officers of the artillery and engineers. Admission is by open competitive examinations, conducted by the civil service commissioners, and held twice a year. The subjects are mathematics, English language, literature, and history, Latin and Greek, French, German, Italian, Russian, Spanish or Hindustani, chemistry, general and physical geography, free-hand and geometrical drawing. Of these subjects, the candidate is examined in only four, exclusive of drawing, one being mathematics. Age of admission, sixteen to eighteen years. The course of instruction lasts two and a half years, and embraces mathematics, fortification, artillery, military drawing and reconnoissance, military history and geography, French or German, elementary chemistry and physics, drills, and exercises; certain voluntary subjects being allowed to be taken up at the option of the student. The cadets pay an annual contribution, which, however, is not the same for all, being greatest for sons of civilians, less for sons of military and naval officers, and least for sons of deceased officers whose families are in pecuniary distress. The queen's cadets pay nothing. In Feb., 1875, there were 198 cadets and about 20 professors and instructors, besides the staff of government and administration. The academy prepares candidates for the royal engineers and the royal artillery, the best scholars being allowed to choose the engineer corps.

2. *The Royal Military College* at Sandhurst, instituted in 1799. It is for the instruction of those intended for officers of cavalry or infantry. Its object is to afford a special military education to sub-lieutenants recently commissioned and to successful candidates in the competitive examinations for commissions. The number of students varies according to the requirements of the service: it is now 250, with about 24 professors and instructors, in addition to the staff of government and administration, consisting of 6 officers. Admission is by competitive examination before the civil service commission. The course lasts one year, divided into two terms. The course of instruction embraces the regulations and orders for the army, regimental interior economy, accounts and correspondence, military law, elements of tactics, field fortification and the elements of permanent fortification, military topography and reconnoissance, infantry and field artillery drill, riding, gymnastics. The sub-lieutenants have the pay of their grade; the other students receive no pay; all students pay for messing and washing.

3. The *Staff College* at Sandhurst is for the instruction of staff officers. Formerly the senior department of the Royal Military College, it is now a distinct institution. Admission is wholly by competitive examination, open to officers of all arms of the service, including artillery and engineers. Candidates must have served five years, and also have certain certificates from their superiors. The subjects of the competitive examination are mathematics, military history and geography, French, German, and Hindustani, fortification, military drawing, geology, and chemistry; mathematics, one of the three languages, and elementary field fortification are obligatory; the remaining subjects are at the option of the candidate. The course lasts two years, and embraces fortification and field engineering, artillery, topography, etc., reconnoissance, military art, history and geography, military administration and law, French, German, or Hindustani, military telegraphy and signalling, riding. These are obligatory, and geology,

two of the three languages, and experimental sciences are voluntary. The number of students is 40, with 10 professors and instructors, exclusive of the staff of government and instruction.

4. Great Britain has also the *Royal School of Military Engineering* at Chatham, the *Advanced Class of Artillery Officers* at Woolwich, the *School of Gunnery* at Shoeburyness, the *Survey Class* at Aldershott, the *School of Musketry* at Hythe, the *Army Medical School* at Netley, the *Royal Hibernian Military School* at Dublin, *schools* and *asylums for soldiers and soldiers' children.*

FRANCE. 1. *The Polytechnic School at Paris.*—This celebrated school was commenced in 1794, but received its organic law in 1799 from La Place, then minister of the interior under Napoleon. It is a scientific school, giving a preparatory education for several branches of the public service—viz. the engineers, artillery, and staff, the department of powder and saltpetre, the navy and marine artillery, the naval architects, the hydrographical engineers, the corps of roads and bridges (*ponts et chaussées*), the corps of mines, the telegraph department, the tobacco department, and for other branches requiring an extensive knowledge of mathematics, physics, and chemistry. Admission is wholly by competitive examination. Age of admission, sixteen to twenty years, or, if in the army, not over twenty-five years. The candidate must have the degree of bachelor of science or of bachelor of literature, and is examined in arithmetic, problems in descriptive geometry, French, resolution of triangles, figure and color drawings, algebra and analytical geometry, elementary and descriptive geometry, physics and chemistry, and German language. The course lasts two years, and embraces analysis, descriptive geometry and stereotomy, mechanics and machines, physics, chemistry, astronomy, geodesy, architecture and public works, topography, military art and fortification, composition and French literature, German language, history, figure, landscape, and color drawing. The number of pupils is about 500, with about 32 professors and instructors, exclusive of the staff of government and administration. Pupils pay a certain amount annually, but aid is given by the state to those needing it. As a scientific, and especially as a mathematical, school this institution is probably not surpassed, if equalled. Among its early professors are such names as Lagrange, La Place, and Monge; among its pupils, Malus, Hauy, Biot, Poisson, De Barante, Arago, Cauchy, Cavaignac, Lamoricière, and Elie de Beaumont.

2. The *Special Military School* at St. Cyr is intended for the instruction of those destined to become officers of infantry, cavalry, and marine corps. A certain number of the highest graduates compete for admission to the Staff School at Paris. The course of study lasts two years, embracing topography, fortification, legislation and administration, artillery, military art and history, geography, hygiene, literature, German, drawing, and military exercises. There are now (Feb., 1875) about 700 pupils, with about 42 professors and instructors, and about 26 military officers of instruction in drill, etc., exclusive of the staff of government and administration. Age of admission, seventeen to twenty, or, if already in the army, not over twenty-five years. Admission is wholly by competitive examination in the following subjects—viz. French composition, Latin version, mathematical composition and use of logarithms, mechanical and imitation drawing, drawing with india ink, arithmetic, algebra and plane trigonometry, geometry, descriptive geometry, mechanics, physics, chemistry, history, geography, German. The school is more military and practical, and less theoretical and scientific, than the Polytechnic School.

3. France has also the *School of Artillery and Engineers* at Fontainebleau, the *Cavalry School* at Saumur, the *Staff School* at Paris, the *Military Orphan School* at La Flèche, the *Medical School* at Paris, the *School of Musketry* and the *Gymnastic School* at Vincennes, the *Music School* and *regimental schools.*

PRUSSIA. 1. The *War Schools.*—These schools are eight in number, situated at Erfurt, Potsdam, Neisse, Engers, Cassel, Hanover, Anclam, and Metz, and are designed for the instruction of those intended for officers of infantry and cavalry, and as preparatory to the Artillery and Engineers' School. To become an officer in the Prussian army a young man obtains a nomination from the colonel of some regiment, which he then enters as a private soldier, with a recognition of being a candidate for the rank of officer; before attaining which he must pass an examination in the subjects of a good general education, serve six to nine months with the troops, attend a war school nine months, and pass an examination in professional subjects. Officers of artillery and engineers must also pass through the Artillery and Engineers' School. The course of instruction embraces tactics, fortification, science of arms, military surveying and drawing, drill in infantry exercises, manual of the piece in artillery, gymnastics, fencing, riding, and musketry practice. There is about six weeks' exercise in the field in surveying, reconnoissance, and applied tactics. The course lasts about nine months. There are in the war school at Anclam 100 pupils, with 1 major commanding, 1 adjutant, 6 instructors of tactics, etc., and 8 professors.

2. The *Cadet Schools.*—There are seven of these schools—viz. a senior cadet school at Berlin, and six junior cadet schools, preparatory to the senior, situated at Potsdam, Culm, Wahlstatt, Bensberg, Ploen, and Oranienstein. Usually, four years are passed in the junior school, two years in the senior school, and then the usual term at a war school; but some of the best pupils pass an additional year at the senior school, and do not pass through the war school. There is an examination for admission to the junior schools, not competitive; from the junior schools pupils are transferred to the senior school without special examination, or a pupil may be admitted to the senior school on examination without having passed through the junior school. Age of admission to the junior schools, about ten years; to the senior, about fifteen years. The course at the senior school embraces religious instruction, Latin, German, French, mathematics, history, geography, physics, military drawing, imitation drawing, drill, fencing, riding, and gymnastics. For the additional year, science of arms, tactics, fortification, military surveying and drawing, topography, military service and correspondence, French and military exercises, etc. At the senior school in Jan., 1875, there were 700 cadets (a number to be soon increased to 800), with 3 officers for superintendence, 28 officers of companies, 10 military instructors, 27 civilian professors and instructors, 5 surgeons and chaplains. Total for superintendence and instruction, 73. In the junior schools the course embraces Bible history, Latin, German grammar and composition, French, arithmetic, elementary algebra and geometry, history, natural philosophy, drawing, writing, drill, gymnastics, fencing, and dancing. In each junior school there are about 200 pupils, with 15 military officers and instructors, and 9 civilian instructors. Cadets in all the schools pay a certain sum, but state aid is given as circumstances require it.

3. The *War Academy* at Berlin. This is properly a military university, designed to raise the scientific spirit of the army, with the special object of giving to the most able officers of all arms, after a certain number of years' service, such an education as will fit them for posts of high command—for the staff, as instructors in military schools, and for other duties demanding superior ability and attainments. The course lasts three years, and embraces tactics, science of arms, mathematics, general, physical, and military geography, fortification, history, history of the art of war, military administration, surveying, geodesy, staff duty, history of literature, military hygiene, military law, physics, chemistry, art of sieges, French, and Russian. Part of the course is voluntary. Practical instruction in the field is also given in surveying, field-sketching, staff duty, etc. In Jan., 1875, there were 278 pupils, 22 military professors and instructors, 13 civilian professors and instructors, and 4 officers of government and administration, besides a number of civilian employés. Admission is by competitive examination, open to officers of all arms of the service who have seen three years' actual service, and who can obtain from their superiors certificates of character, ability, practical skill as regimental officers, good health, freedom from pecuniary difficulties. The subjects of this examination are usually mathematics, history, geography, fortification, science of arms, tactics, and French.

4. Prussia has also an *Artillery and Engineer School* at Berlin, a *Military Riding School* at Hanover, a *School of Musketry* at Spandau, a *School of Gunnery* at Berlin, a *Gymnastic School* at Berlin, two *medical schools* and a *veterinary school* at Berlin, besides *schools for soldiers* and their children.

Austria, Russia, Italy, Spain, and other powers have their systems of military schools, of which those of Austria and Russia would be especially noticeable, but those described may be considered *typical* of all the rest.

The UNITED STATES. The *Military Academy* at West Point. (See WEST POINT.) The conception of a military academy in this country dates back to 1776, when the lack of competent officers for the army led to the appointment of a committee by the Continental Congress to "prepare and bring in a plan of a military academy at the army," but no further action appears to have been taken. Washington invited the attention of Congress to the subject in 1793, and in 1796 recommended the institution of a military academy. The same thing was strongly urged by Mr. McHenry, secretary of war, in 1800, and a statement furnished in 1801 in answer to a call by resolution of Congress. The results were, a provision in 1794 for a corps of artillerists and engineers of four battalions, to each of which 8 cadets were to be attached, with some provision for instruction; an additional regiment of artillerists and engineers was authorized in 1798, the number of cadets being increased to 56, with provision for books, etc., and authority to appoint 4 teachers; finally, the act of Mar. 16, 1802, founding the Military Academy. The artillerists and engineers were made distinct corps, the corps of engineers to be stationed at West Point and to constitute a military academy. Forty cadets were attached to one regiment of artillery, and 10 cadets to the corps of engineers. The senior engineer officer present was to be superintendent. In 1803 a teacher of French and a teacher of drawing were authorized. The Military Academy was thus formally established, but these provisions were far from sufficient. Between 1802 and 1812 there were in all but 6 instructors at West Point, of whom only from 2 to 4 were present at the same time. By the act of Apr. 29, 1812, it is declared that the Military Academy shall consist of the corps of engineers, and, in addition to the teachers of French and drawing, a professor of natural and experimental philosophy, a professor of mathematics, and a professor of engineering, with an assistant for each. The number of cadets was limited to 250. The age of admission was from fourteen to twenty-one years, the candidate to be well versed in reading, writing, and arithmetic, and to engage, with the consent of his parent or guardian, to serve five years, unless sooner discharged. By this and preceding acts, the *personnel* of the Academy was made a military body subject to the Rules and Articles of War. At this early period seems to have been established the policy, since adhered to, not to maintain any considerable standing army in time of peace, but to educate thoroughly officers who should be competent to organize and instruct the new levies which must form the great mass of the army in time of war. During the first ten years of its existence the Academy furnished only 89 graduates. In 1815 a change was made by an order of the war department, requiring a permanent superintendent, and making the chief of the corps of engineers inspector of the Academy, with the direction that no officer of the army of whatever rank should exercise command at West Point unless subordinate to the inspector or to the superintendent. Rules and regulations for the Academy were made, and those of 1816 provided for a board of visitors. Semi-annual examinations were ordered, and a course of study was drawn up and approved. The uniform of the cadets, nearly the same as now worn, was prescribed by a general order in 1816.

With all that had been done up to 1817, the results were very unsatisfactory. There was a great lack of system and subordination; cadets were admitted without regard to age or qualification; many of them were unfit for their positions, and they were under no proper control. Although owing much to the efforts of its two first superintendents, and especially to Col. Jonathan Williams, the real initiation of the Academy, as it has since been, dates from the appointment of Brevet Major (afterward General) Sylvanus Thayer of the corps of engineers, who assumed command July 28, 1817. Major Thayer was a graduate of Dartmouth College, as well as of the Academy, had served with distinction in the war of 1812, had studied the military schools of France, and by both character and attainments possessed rare qualifications for the position of superintendent. The Academy is to-day substantially what it was made by Major Thayer during the sixteen years of his administration, with the aid of able officers and professors under him. He established the office of commandant of cadets and instructor of tactics, since recognized by Congress; arranged a course of studies; introduced the division of classes into sections, and transfers between the sections; introduced weekly class reports showing weekly progress, and by a system of daily marks indicating the individual progress of cadets. The check-book controlling the expenses of cadets, the extensive use of the blackboard, and the essential parts of the regulations now governing the Academy, are due to him. Ten months of the year were allotted to academic duties, and two months to those of camp. He inculcated by precept and example that spirit of devotion to duty and unquestioning, prompt obedience to lawful authority which still distinguish the graduate of West Point. Under the able superintendents who have succeeded him the system has been steadily maintained, the course of instruction has been improved, new textbooks, instruments, and apparatus introduced, and most of the important buildings and improvements have been constructed. Besides the departments already mentioned, the professorship of geography, history, and ethics was created by act of April 14, 1818, with the chaplain as professor; the professorship of chemistry, mineralogy, and geology by act of July 5, 1838; the professorships of French and of drawing by act of Aug. 8, 1846; the professorship of Spanish by act of Feb. 16, 1857; the department of law, with an officer detailed from the judge-advocates of the army as professor, was authorized in 1874. The professorships of French and of Spanish were merged in a single professorship of modern languages June 30, 1882. In 1840, by an act of Congress, the commandant of cadets was to be the instructor of artillery, cavalry, or infantry tactics, or of practical engineering, and by act of June 12, 1858, he was made instructor of artillery, infantry, and cavalry tactics. In 1838 an act of Congress required cadets to bind themselves to serve eight years instead of five. Instruction in light artillery and riding was introduced in 1839.

In the appointment of cadets it has been admitted as a principle that the sons of those who have lost their lives in the defence of the country should have preference. The custom of appointing cadets from districts naturally arose in accordance with the tendency to distribute all appointments under the general government in proportion to representation, and was converted into a law in 1843. In like manner became established the custom of giving decisive weight to the recommendation of the Representative or delegate from the district or Territory. This has perhaps the effect of interesting members of Congress in the Academy, but it too frequently happens that merely political or personal considerations govern the selection. Hence, the large proportion of those appointed that fail to complete the course, hitherto fully one-half. Nor is the average ability of the graduates so great as would result from admission under a better system of selection. The monthly pay of cadets was $28 in 1802, $24 in 1845, $30 in 1857, in 1864 about $50; the pay in 1885 was $540 a year. A "board of visitors," to attend the annual examinations and report on the condition of the Academy, provided for in 1816 by regulation from the war department, was first assembled after Major Thayer became superintendent. Discontinued by the act of 1843, it was again authorized by act of Aug. 8, 1846, the members to be selected by the President from one-half the number of States annually, alternating with the other half; the number of members was reduced to seven in 1868; and to this number were added in 1870 two Senators and three members of the House of Representatives, to be designated respectively by the president of the Senate and the Speaker of the House. The local rank and pay of colonel of engineers were given to the superintendent,[*] and the local rank and pay of lieutenant-colonel of engineers to the commandant of cadets in 1858. The course of study was in 1854, by direction of the secretary of war, extended to five years, in accordance with recommendations of boards of visitors, in order to give more time for English studies, history, and military law. By the same authority the course was suddenly reduced to four years in Oct., 1858, and again extended to five years in Apr., 1859. Again, in 1861 the course was changed to four years, and so remains at the present time.

On the breaking out of the civil war in 1861 a number of cadets as well as graduates of the Academy from Southern States resigned and joined the secession movement of their States. In Nov., 1860, the number of cadets was 278, of whom 86 were appointed from the Southern States; 65 of this number left the Academy on account of the civil war, leaving 21 from the Southern States at the Academy. The charge, hastily and ignorantly made, that the majority of the graduates of the Academy joined the Southern States, is groundless; fully three-fourths remained loyal to the U. S. government, of whom many were from Southern States. Those who went with the South were at once placed in prominent positions, which was far from being so generally the case at the North in the early part of the war. Considering that the doctrine of paramount allegiance due to the State, rather than to the U. S., had prevailed for many years at the South, and that accordingly whole delegations in Congress, judges of the Supreme Court, and numbers of civil officers went with their respective States, it was certainly difficult for Southern graduates of the Academy to remain wholly unaffected by the action of their States.

The following is a list of superintendents of the Academy, all but the first being graduates: Jonathan Williams, Joseph G. Swift, Alden Partridge, Sylvanus Thayer, René E. De Russy, Richard Delafield, Henry Brewerton, Robert E. Lee, John G. Barnard, Peter G. T. Beauregard, Alexander H. Bowman, Zealous B. Tower, George W. Cullum,

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[*] Up to July 13, 1866, the superintendent was an officer of engineers, of which corps the Academy itself formed part. By the act of that date the superintendency was thrown open to all branches of the service. (See ENGINEERS, CORPS OF.)

Thomas G. Pitcher, Thomas H. Ruger, John M. Schofield, Oliver O. Howard, Wesley Merritt (present, 1885). Among the professors, past and present, may be mentioned Crozet, Douglass, Mahan, Mansfield, Courtenay, Bartlett, Hassler, Ellicott, Davies, Church, Bailey, Weir, Berard, and (chaplains) McIlvaine and Warner. Of the services of the graduates in the war with Mexico, Gen. Winfield Scott has thus spoken: "I give it as my fixed opinion that but for our graduated cadets the war between the U. S. and Mexico might, and probably would, have lasted some four or five years, with, in its first half, more defeats than victories falling to our share; whereas in less than two campaigns we conquered a great country and a peace without the loss of a single battle or skirmish." A great influence has been exercised by the Academy upon scientific education in this country. Prof. Mahan, through his long career of instruction and through his textbooks, has left an ineffaceable impression upon its engineering development. The textbooks in mathematics of Davies and Church are most widely and favorably known. Many of our most distinguished civil engineers, and many of our ablest college professors, have been graduates, and especially in its early days the Academy exerted a powerful stimulus upon college education. The whole number of graduates from 1802 to 1884, inclusive, was 3057, of whom 1537 were living and 1480 deceased, including 204 killed in battle. Of those living, of 40 the fate is not known, 1088, including 128 retired, were still in the army, and 449 out of service, many of whom are filling prominent positions of usefulness in the civil service and in our educational institutions. According to Maj. Boynton, the aggregate amount of money appropriated by the U. S. for the Academy from 1802 to 1864, sixty-two years, was $7,133,235.70, the largest annual appropriation being $202,535.30; the average being about $115,000 annually. The aggregate amount appropriated from 1864 to 1884 was $6,180,331.07.

Present Organization, Course of Study, Mode of Admission, and Discipline.—The general commanding the army has, under the war department, supervision and charge of the Academy (1885). The staff of government and instruction consists of (1) The superintendent, directing the studies and exercises, and exercising command over all persons belonging to the Academy, and commanding the military post. The military staff includes an adjutant, quartermaster, commissary of subsistence, treasurer, surgeon, and assistant surgeon. (2) The commandant of cadets, an officer of the army, who is the instructor of artillery, infantry, and cavalry tactics, and is charged with the discipline and administration, and commands the battalion of cadets. He has usually seven assistants, likewise army officers. (3) Seven commissioned professors, one professor detailed from the judge-advocates of the army, an instructor of practical military engineering, and an instructor of ordnance and gunnery, taken respectively from the engineer and ordnance corps. These (the superintendent and commandant included) constitute the academic board. There are about thirty-five assistant professors and instructors, including those in tactics, and one sword-master. Except seven professors, all officers and instructors of the Academy are officers of the army detailed for the duty, usually for a period of four years. The academic board examines candidates for admission and cadets, recommends textbooks, maps, models, etc., draws up programmes of instruction, etc., grants diplomas, etc. For the purpose of discipline and tactical instruction the cadets are organized as a battalion of four companies, each under the supervision of an instructor of tactics, with officers and non-commissioned officers selected from the cadets themselves. Usually cadet-officers are selected from the first class,[*] sergeants from the second class, and corporals from the third class. There are also a cadet adjutant, quartermaster, sergeant-major, and quartermaster-sergeant. The position of cadet officers affects their relation to other cadets only when on duty as officers.

For academic instruction, each of the four classes is divided into sections in each study, consisting of seven to fifteen cadets each, with an instructor for each section, who, however, has charge usually of more than one section. The professor exercises a supervision over the whole, instructing different sections in turn or assembling the whole class for lecture.

Admission.—Each Congressional district and Territory and the District of Columbia is entitled to have one cadet at the Academy. The appointments are made by the secretary of war at the request of the Representative or delegate in Congress from the district or Territory, of which the person appointed must be an actual resident. The President also appoints ten cadets at large. Candidates must be between seventeen and twenty-two years of age, at least five feet in height, and free from any infectious or immoral disorder, and from anything which may render them unfit for military service. They must be well versed in reading, writing, and orthography, arithmetic, elements of English grammar, descriptive geography, particularly of our own country, and history of the U. S. Those admitted are required to sign articles binding themselves to serve the U. S. eight years from date of admission, unless sooner discharged. An oath of allegiance to the U. S. is also required.

The Course of Study occupies four years, and is largely mathematical and professional, embracing the following subjects: (1) Infantry, artillery, and cavalry tactics and military police and discipline; (2) mathematics, including algebra, geometry, trigonometry, mensuration and surveying, descriptive geometry, analytical geometry, differential and integral calculus; (3, 4, and 5) English, French, and Spanish languages; (6) drawing, comprising topography, with pencil, ink, and colors, etc.; (7) chemistry, chemical physics, mineralogy, and geology; (8) natural and experimental philosophy, comprising mechanics with applications, acoustics, optics, and astronomy; (9) ordnance and gunnery; (10) history, geography, and ethics; (11) law, including general principles, international law, Constitution of the U. S., etc., Rules and Articles of War, courts-martial; (12) practical military engineering, etc., (13) military and civil engineering and the science of war. The number of studies is not large, the design being to secure thorough instruction in a few subjects rather than superficial instruction in many. By a system of numerical marks the proficiency of a cadet's daily recitations is measured; and these are taken into account in making up the "merit rolls" in each branch, as well as in the general class "standing."

Discipline is very strict—more so than in the army, and probably than in any other similar institution. The aim is to inculcate habits of prompt and cheerful obedience to lawful authority, of neatness, order, and regularity, of thoughtfulness and attention in the discharge of duty. A scrupulous regard for one's word is also required. The system of punishment for offences is remarkable for inflexible enforcement rather than for severity. Besides "demerit" marks, which count in making up the class standing, cadets are further liable to three classes of punishment: (1) privation of recreation, etc., extra duty, reprimands, arrests, or confinement to room or tent or in the light prison, reduction to ranks of officers and non-commissioned officers; (2) confinement in dark prison; (3) suspension, dismission with the privilege of resigning, public dismission. Punishments of the first class are inflicted by the superintendent or with his approval; that of the second class only by sentence of a court-martial, except in case of mutinous conduct or breach of arrest. Monthly statements of conduct and progress in studies are sent to parents or guardians.

Upon graduating the class is divided by the academic board into three sections of varying and unequal numbers, according to class-rank; the highest, usually very small and sometimes wanting, is recommended for promotion in any corps in the army; the second, in any corps except the engineers; the third, in any corps except the engineers and the artillery. Commissions for the rank of second lieutenant are then usually conferred by the President in accordance with these recommendations. (See ENGINEERS, CORPS OF; and for further information on military schools see *Report of the English Commission on Systems of Military Education;* Barnard's (Henry) *Military Schools and Courses of Instruction;* D'Ocagne's *Grandes Ecoles de France.* For VIRGINIA MILITARY INSTITUTE see that head.)

GEORGE L. ANDREWS.

Military Frontier, The, was formerly a crown-land of the Austrian empire, and formed a peculiar institution in the Austrian state. It consisted of a belt of land stretching along the Turkish frontier from the Adriatic Sea to Transylvania, bounded N. by Croatia, Slavonia, and Hungary, S. by Bosnia, Servia, and Wallachia, and comprised an area of 12,800 square miles, with 1,064,922 inhabitants. Its organization was thoroughly military. The estates formed fiefs, which the state gave, not to individuals, but to families, on the condition that all male members of the family should do military service from their twentieth year, by which means it became possible for the Austrian emperor to have an army of from 40,000 to 50,000 men always ready on the frontier. In the sixteenth century, when this organization was first established, and also in the next two centuries, it rendered great service to Austria, but in our time, after the Turks ceased to be dangerous in a military point of view, the whole institution appeared to be rather an anomaly, and derived its chief importance from being a sort of quarantine and a guard against smugglers. All along the boundary-line were erected posts, some for four men, some for twelve and an officer, and every one who passed the frontier had to announce himself at one of these posts, and after being allowed to pass the frontier he had to stop for some time at the quarantine-house. The inhabitants are Croats, Slavonians, Magyars, Germans, Wallachians, Greeks, and Jews, and their language and religion are as different as is their descent. In 1873 the organization was abolished and the district incorporated with the adjoining provinces.

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[*] The classes are numbered in inverse order of the years of their service at the Academy—that most recently entered being the fourth, etc.

Military Law. See COURT-MARTIAL; MARTIAL LAW.

Military Mining. See MINES, MILITARY.

Military Orders. See KNIGHT.

Mili'tia, a derivative from the Latin *miles*, which in its original signification designated the foot soldier ("thousandth walker") furnished from each household under the earlier military system of Rome. Originally synonymous with the cognate derivative "military," as embracing the whole body of national troops, whether embodied for actual service or relegated to industrial pursuits, the term "militia" is now accepted as indicating that portion of the military strength of a nation enrolled for discipline and instruction, but local in its organization, and engaged in active service only in cases of emergency. It is the organized national reserve in contradistinction to the regular army and the *levee en masse* of the country, and therefore comprehends the "volunteer" organizations of Great Britain and the U. S., the National Guards of France, the Landwehr and Landsturm of Germany, and similar organizations in the other European states.

The state has an unqualified right to exact military service from its subjects, but the problem of so exercising this right as to reconcile the productive, preservative, and destructive resources of a country presents difficulties to modern statecraft that never perplexed the lawgivers of antiquity. When all able-bodied men were warriors military systems were exceedingly simple. The earliest armies of history were the people assembled in haste, with weapons familiar from infancy, to try the issue of brute force upon some neighboring community; and while wars were limited to brief campaigns, and all nations were alike barbarous, the necessity of permanently mobilized armies had not arisen. But the extension of national boundaries and the advancement of civilization essentially modified the primitive system; with the expansion of national domination arose the necessity for more prolonged periods of military service. Instead of by days and weeks, the soldier's service with the colors was now measured by years, and the superior military efficiency thus developed rendered still further conquest possible. It certainly was not with militia, in its modern acceptation, that the Macedonian and Roman empires extended over the classic world. A no less potent cause for abandoning the older system existed in that general enlightenment of the world which gradually pervaded civil as well as military affairs till peace offered triumphs no longer despised. Communities became engrossed in productive industries that in their development became more and more incompatible with the profession of arms, which, advancing *pari passu* with the peaceful arts and sciences, is ever exacting a higher degree of technical training from its successful votaries. The impromptu armies of a barbarous people naturally prove more formidable than like congregations of the more civilized communities, and just, therefore, in proportion as a body politic became devoted to peaceable pursuits was there necessity for its securing protection against domestic violence and foreign interference by devoting a portion of the community to special training for that purpose.

Standing armies marked the acme of ancient civilization, disappeared in the chaos succeeding its extinction, and signalized the reformation of society and downfall of the feudal system; but while the superiority, for war purposes, of well-trained and disciplined troops over multitudes deficient in these qualities must be acknowledged by all students of history, it is obvious to a much larger class, the taxpayers, that the maintenance of considerable bodies of such troops is both directly and indirectly burdensome upon the resources of the country, and hence the prevailing system of standing armies supported by national reserves. By such arrangement, when judicious in details, the state secures in its peace establishment an efficient national police, so organized as to be capable of great expansion under thoroughly trained commanders in time of war, but not over-burdensome, while its military value remains latent; and at the same time disseminates a reasonable amount of military knowledge and habit of discipline among the great mass of the people. Eminent political economists hold that in modern states the proportion of regular soldiers cannot exceed 1 per cent. of the population without material detriment to national prosperity; but an efficient militia system might readily supply a military reserve embracing 10 per cent. of actual population.

The systems of Europe, as a rule, exact military service from the subject, in person or by substitution more or less direct, even in time of peace; volunteers are of course accepted, but the armies are kept on foot by annual drafts. In most of the continental states standing armies have reached the maximum sustainable proportion to population, and greater military strength has to be sought in perfecting the reserve organizations. The Prussian system of personal service in the regular army preliminary to enrolment in the reserves literally makes every citizen a soldier, and has so enhanced the war-power of Germany as to compel a self-preservative imitation in contiguous nations. In these imitations effort is naturally made to improve upon the model, and this international strife for gladiatorial preeminence has developed systems designed to furnish before the end of the nineteenth century a combatant force estimated at—for Russia, 3,000,000; Germany, 2,800,000; and France, 2,500,000. It is proposed to maintain these troops in a condition of discipline and instruction hardly inferior to that obtaining in the regular armies, and, in recognition of the persistence of habit, all of these methods make the citizen first a soldier. From parental control he passes under military discipline; serves first in an active corps, and then in the reserve of the army; then, passing into the militia, he is gradually withdrawn from the contingency of actual service in proportion as he becomes unfitted for useful participation therein.

In Great Britain alone, of the European states, is reliance placed upon voluntary enlistment for maintaining the various militia organizations in time of peace, and for recruiting the regular army both in peace and war. The British militia system originated in the Anglo-Saxon *fyrd*, and in the warlike feature of the ancient *posse comitatus*. The fyrd was overshadowed by the feudal system, was revived in the struggle between the Crown and the barons, and was superseded by the "trained bands" created by James I. These were in turn suppressed, and at the Restoration the existing system, in its essential features, was established. Under it the government appoints lords lieutenant of counties, empowered to call out, embody, and command the "regular militia" and to appoint its officers. The quota for each county is established by government, and in the failure of voluntary enlistment a levy by ballot would be made upon all non-exempted inhabitants of the county; but practically these quotas are kept up in time of peace by volunteers. This force assembles at stated periods for military exercise, and can be "embodied" in any national crisis. Most of the regiments were embodied in the Crimean war, and many of them during the Indian mutiny. They may not be sent out of the kingdom unless they volunteer, and then only by provision of Parliament. The quota of the United Kingdom is about 120,000 men. Besides this organization, there was established in 1808, and suspended in 1816, a "local militia" embracing many classes not eligible to the regular force, and therefore more numerous. They, however, could be marched from their respective counties only in the event of actual invasion. But, as in the U. S., the "volunteers" constitute the great national reserve. First organized in 1804, they in 1813 numbered over 400,000 effectives, but diminishing in numbers as danger became less imminent, they were absorbed in the local militia. A revival of military spirit was, however, initiated in 1859, and the present effective strength of this force, including the yeomanry cavalry, is not less than 180,000. By furnishing paid adjutants and drill-masters to these corps, granting them certain pecuniary allowances, arming the men, and employing a staff of inspectors under the immediate direction of the war-office, the government maintains this force in a very creditable condition of efficiency; but, excepting the yeomanry cavalry, it "may not be employed in time of civil disturbance." All of it, however, may be embodied for active service anywhere in Great Britain in case of invasion, actual or impending. In the "enrolled pensioners" is another efficient but more purely local force of about 15,000 men. The permanent peace establishment numbers about 120,000 effectives.

In Switzerland there is, nominally, at least, no standing army, but a corps of educated officers is maintained: every citizen is held to military service, and is taught its exercises in the schools; and the war-strength of the country is divided into a "regular force" of about 80,000, a reserve of about 50,000, and a landwehr organization.

In the U. S. the militia becomes national only when called into the actual service of the Federal government. The armies of the Revolution consisted of State troops adopted by Congress, and this system of maintaining a military force prevailed till after the present Union was adopted. Although our forefathers were eminently qualified by the experiences of the French and Indian wars for military service, Continental militia, as such, played no prominent part in the Revolutionary struggle. Available only for brief periods, it was deficient in discipline, and therefore uncertain under fire; and it was mainly to the regular troops, or "Continental line," that we are indebted for national independence. The following table, compiled from records of the New Hampshire Historical Society, exhibits the number of troops, Continental and militia, furnished by the thirteen original States during the Revolutionary war, 1775–83:

States.	Continentals or regulars.	Militia.
Massachusetts	67,907	15,155
Connecticut	31,939	7,792
Virginia	26,678	5,620
Pennsylvania	25,678	7,357
New York	17,781	3,304
Maryland	13,912	4,127
New Hampshire	12,497	2,093
New Jersey	10,726	6,055
North Carolina	7,263	(?)
South Carolina	6,417	(?)
Rhode Island	5,908	4,284
Georgia	2,679	(?)
Delaware	2,386	376
Total	231,971	56,163

Under the Constitution, Congress has power to provide for the organization, equipment, and discipline of the militia, and for its government while in the service of the U. S.; and the States are prohibited from keeping troops in time of peace except under Congressional consent; but the appointment of the officers and the authority for training the militia according to the discipline prescribed by Congress is expressly reserved to the respective States. Congressional enactments for maintaining a uniform system of militia throughout the Union require the enrolment in each State of all non-exempted able-bodied male citizens, resident, between the ages of eighteen and forty-five; establish the manner of organization; prescribe as the system for its discipline and field exercises that obtaining for the time being in the regular army; and make suitable provision for arms, pay, pensions, etc. Unfortunately, the subject of national defence receives little deliberate consideration from the national legislature. Though the necessity of a "*well-regulated*" militia to the security of a free State is recognized in the Constitution, the arguments of statesmen and the logic of facts have alike failed to secure that attention demanded by the gravity of the subject. Temporary expedients are as numerous as past emergencies, but since 1795 there has been no general revision of our system. The militia code is obsolete in many particulars, and has never received effective construction. Perhaps too much has been yielded to "States' rights," but, at any rate, in some of the States general enrolments are unknown, and in others the stated musters for exercise are mere burlesques upon military discipline. A judicious system would secure to the country an effective military reserve of over 3,000,000 men; but as a matter of fact the only existing militia worthy of the name is found in the uniformed volunteer organizations maintained in many of the States as "National or State Guards," and these forces probably do not aggregate an effective force of over 25,000.

The President is commander-in-chief of the militia of the several States when called into the actual service of the U. S., and is empowered to call out these forces, by orders to such officers of the militia as he may choose to address, in event of invasion, actual or imminent, and in cases of insurrection or rebellion against the authority of the U. S. or any one of the States thereof; and he may continue the militia in service for a period not exceeding nine months. While so employed the troops receive the pay, rations, etc. of regular soldiers, are subject to the Rules and Articles of War, and their officers take precedence in rank next after officers of like grade in the regular service or in such volunteer organizations as may also be in the service of the U. S. The efficiency of our system was first tested in the war of 1812–15, in which some of the militia rendered most valuable service, particularly in defence of positions, but much embarrassment was caused to the national government by pretensions in some of the States—1st, that the State executive could decide whether or not to furnish quotas called for; 2d, that the militia could not be sent out of the U. S., or even beyond its own State; and 3d, that it was exclusively under the command of its own officers, and subject only to the *personal* command of the President. These pretensions arose of course only in localities where the war was unpopular, but they have never been quieted by statute. States that were lavish of men in 1861 had refused them in 1812, and some that furnished their quotas cheerfully in 1812 refused to honor the national requisitions of 1861; and the tendency has been for Congress to evade such difficulties by calling out volunteers, and as a final expedient resorting to conscription. Certainly, no people are better fitted for the development of a perfect militia system, and yet in no civilized country has its organization been more neglected. The troops of our late war, both Union and Confederate, demonstrated that our citizens made thorough soldiers, but the lesson of that and all other modern wars has been that civilians are not so transformed by prestidigitation. The armies that closed the war of the "great rebellion" were veteran troops, regulars in all but name; and the time that has been required for the drill and discipline of our militia and volunteer forces after pressing necessity for their immediate employment had arisen would all have been saved if these men could have been drawn from an efficient military reserve. The war of 1812 repeatedly exhibited the melancholy spectacle of large bodies of American troops marching to the battle-field without understanding a single principle of elementary tactics; and the first draft of national militia (call of Apr. 15, 1861) in the late war was practically worthless; before they could be fully organized and reasonably disciplined their terms of service began to expire, and their only actual service fittingly terminated in the disaster of the first Bull Run, where they were confronted with troops all older in service, and many fully organized prior to the organization of the "provisional Confederacy," Feb. 8, 1861. Our standing army musters but 1 soldier to every 2000 of population; and surely argument is not necessary to demonstrate that just in proportion as this force is small is there necessity for pushing the instruction and discipline of our militia to the utmost extent that circumstances will admit.

From the *Final Report of the Provost-Marshal-General U. S. Army* it appears that the total number of militia, volunteers, and drafted men received into the service of the U. S. during the late war was 2,690,401; that there were actually 1,000,516 men in the field when hostilities ceased, of whom about 978,000 were volunteers or conscripts; and that the national enrolment exhibited, at the same time, an available reserve of 2,254,063 men. From the same authority is compiled the following exhibit of *militia*, called for and accepted as such, from the loyal States during the war:

States.	Call of Apr. 15, 1861, for 75,000 militia for three months' service.		Call of Aug. 4, 1862, for 300,000 militia for nine months' service.		Militia for 100 days, mustered into service between Apr. 23 and July 18, 1864.	
	Quota.	Men furnished.	Quota.	Men furnished.	Quota.	Men furnished.
Maine	780	771	9,609	7,620		
New Hampshire	780	779	5,053	1,736	....	167*
Vermont	780	782	4,898	4,781		
Massachusetts	1,560	3,736	19,080	16,685	4,000	6,809
Rhode Island	780	3,147	2,712	2,059		
Connecticut	780	2,402	7,145	5,602		
New York	13,280	13,906	59,705	1,781	12,000	5,640
New Jersey	3,123	3,123	10,478	10,787	....	769
Pennsylvania	12,500	20,175	45,321	32,215	12,000	7,675
Delaware	780	775	1,720	1,799		
Maryland	3,123	....	8,532	....	....	1,297
West Virginia	2,340	900	4,650			
Dist. of Columbia	....	4,720	890			
Ohio	10,153	12,357	36,858	....	30,000	36,254
Indiana	4,683	4,686	21,250	337	20,000	7,197
Illinois	4,683	4,820	26,148	....	20,000	11,328
Michigan	780	781	11,686			
Wisconsin	780	817	11,904	958	5,000	2,134
Minnesota	780	930	2,681			
Iowa	780	968	10,570	....	10,000	3,901
Missouri	3,123	10,591	17,269			
Kentucky	3,123	....	14,905			
Kansas	....	650	1,771	....	....	441
Tennessee	1,560					
Arkansas	780					
North Carolina	1,560					
Nebraska Territ'y	....	....	....	1,228		
	73,391	91,816	334,835	87,588	113,000	83,612

According to returns in the war department (Jan. 1, 1884), the *organized* militia force of the U. S. consists of 103 general officers, 791 general staff officers, 1316 regimental, field, and staff officers, 4373 company officers, and 81,031 non-commissioned officers, musicians, and privates; aggregate, 87,614. ROBERT N. SCOTT.

Milk [Sax. *melce;* Ger. *Milch;* Fr. *lait;* Lat. *lac*], the liquid secreted by the mammary glands of female Mammalia for the nourishment of their young. Milk is generally a white, often bluish, rarely yellowish liquid; opaque, possessing a slight but pleasant odor, and an agreeable sweetish taste. Its specific gravity varies from 1.018 to 1.045. The reaction of fresh milk has long been a subject of discussion among chemists, the majority of whom assert that it is generally faintly alkaline. Elsässer examined 385 different specimens of human milk, and found 45 neutral, the rest alkaline. Rattenmann, out of 272 specimens, found only 2 acid. Rueff, out of 94 specimens of cow's milk, found 44 acid; out of 46 specimens of mare's milk, 19 acid; ewe's milk as often acid as alkaline or neutral; and the milk of carnivorous dogs and cats always acid. Peligot found 15 samples of ass's milk acid. D'Arat and Petit found the milk of stall-fed cows to be always acid, and to become alkaline when they were turned out to grass. Peligot and Quevenne examined 75 samples, finding 45 acid, 6 feebly acid, 17 neutral, 7 alkaline. Saxhlet (*J. pr. Chem.*, 2d ser. vi. 1; *Chem. Soc. J.*, 2d ser. xi. 187) believes that milk possesses what he calls an *amphigenic* reaction—*i. e.* that it simultaneously reddens blue litmus paper and blues red paper, owing to the fact that it contains both acid and neutral phosphates of the alkali metals. A. Vogel (*J. pr. Chem.*, 2d ser. viii. 137) has examined this question further, using a very neutral tincture of litmus instead of paper. He states that he has never found fresh cow's milk to exhibit a decided alkaline reaction. Out of the milk of 30 cows examined by Bischoff at Schleisheim, only 2 specimens showed the double reaction with certainty. In most cases the reaction was either neutral or transiently acid. Some specimens gave, at first, a weak alkaline reaction, which quickly passed into an acid reaction. Milk becomes acid on keeping, owing to the conversion of a portion of the lactine (lactose or sugar of milk) into lactic acid.

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* Accepted for three months.

The Composition of Milk.—Milk is an emulsion; it consists of water, holding in solution caseine or cheese, lactine or sugar of milk, and various alkaline and earthy salts; and in suspension in this solution, or serum, fatty matter, butter, in the form of colorless transparent globules from $\frac{1}{800}$th to $\frac{1}{250}$th of a line in diameter. These globules of fat were formerly believed to be encased in an albuminous envelope, which is ruptured during churning, thus allowing the globules to agglutinate into masses of butter. This has been disproved by Von Baumhauer and F. Knapp. Schwaller still claims the existence of a membrane. (*Arch. f. Micr. Anat.*, vii. 269.) On account of the lenticular action of the fat-globules the light is dispersed in all directions, and the milk appears white and opaque. Dr. C. A. Cameron (*Chem. News*, Feb. 5, 1875, p. 54) claims that the opacity of milk is due to suspended caseous matter.

(1) The fat contained in milk constitutes usually from 2.50 to 6. per cent. of the entire weight, the extremes noticed being 0.666 in a poor sample of human milk and 13.3 in the milk of a bitch. It is a mixture of several neutral fats or glycerides, chiefly the liquid oleine and the solid palmitine and stearine, with small quantities of myristine, butyrine, caproine, capryline, and caprine. To these latter bodies are due the peculiar taste and odor which distinguish butter from other natural fats. Butter does not contain margarine, as is generally stated in older works. (See Margaric Acid.) When milk is allowed to stand the fat-globules rise to the top and form a layer of cream. This separation of fat and serum is never complete: each retains a portion of the other.

(2) The caseine is an albuminoid body, containing, deducting ash, carbon, 53.5 to 54; hydrogen, 7.1 to 7.4; nitrogen, 15.6 to 16; sulphur, 0.9 to 1.0; oxygen, 22.1 to 22.6. It is present in milk to the extent of from 2 to 6 per cent. Pure caseine is scarcely soluble in water, while its compounds with alkalies are very soluble. In milk it exists in combination with soda. Acids, even in minute quantities, withdraw the alkali and precipitate caseine. The spontaneous coagulation of milk is due to the formation of lactic acid. Caseine precipitated by an acid retains an acid reaction, no matter how thoroughly it is washed. Earthy and metallic salts precipitate caseine. It is also coagulated by rennet. Coagulated caseine is soluble in caustic alkalies; in common sodic phosphate, neutralizing it; in alkaline carbonates, common salt, ammonic chloride, potassic nitrate, and borax. Moist, well-washed caseine dissolves completely in water containing 0.0005 per cent. of hydrochloric acid, and the solution, when filtered from a trace of fat, has all the characteristics of a solution of albumen. Ordinary solutions of caseine are not precipitated by heat, but form films when heated in the air which are not soluble in dilute acids or alkalies. The same film is found when milk is heated in the air. The compound of caseine and lime prepared from clotted milk is imputrescible, and is employed in distemper painting. Artificial coral jewelry is now made from caseine colored with vermilion. Soluble caseine is coagulated by the gastric juice, and then gradually digested.

(3) Albumen and other nitrogenous bodies are said by some chemists to exist in milk, and it would be very remarkable were caseine to be the only nitrogenous body present in an animal fluid. An albuminous body, not coagulated by rennet, but precipitated by boiling, has been noticed in milk, and especially in colostrum, which is supposed to be albumen. Vernois and Becquerel found in the milk of the buffalo cow and of the goat 1.3 per cent. of albumen. Heynsius found 0.5 per cent. of albumen in cow's milk previously coagulated by acetic acid; it was precipitated by boiling. On the other hand, Scherer prepared a kind of caseine from milk, which coagulated by heat. Lehmann considers albumen an abnormal constituent of milk. Payen, Gorup-Bezanez, Dieulafait, and others report from 0.58 to 1.20 of albumen. Lactalbumen and lactoproteine are two albuminous substances which, according to Commaille, occur in milk. (*J. Pharm.*, 4, ser. iv. 108; *Compt. Rend.*, lix. 301; lx. 118, 859.) Galactine is a nitrogenous body obtained, according to Morin (*J. Pharm.*, 4, ser. xiv. 11), from milk by precipitating the caseine by acetic acid, the albumen by boiling, separating fat by ether, concentrating, filtering out the phosphates, crystallizing out the sugar, and finally adding alcohol, by which the galactine is precipitated. Thus prepared, it contains a little gelatine. Thirty-five parts of dried milk yield 1 part of galactine, which would be about 0.35 per cent. on the original milk. Galactine is soluble in water, insoluble in alcohol and in ether. It is precipitated by tannin, but the precipitate differs from that of gelatine in redissolving at 60° C. Galactine emulsionizes fats. It is also found in blood, gastric juice, animal membranes, eggs, many morbid animal fluids, the juices of edible plants, and in the fluid of embryonal cotyledons.

(4) Lactine, lactose, or milk-sugar ($C_{12}H_{22}O_{11}.2H_2O$) is an important constituent of milk. It varies in quantity from 1.5 to 9. per cent. It is readily prepared from whey by evaporating it to a syrup, filtering over animal charcoal, and crystallizing, when it is obtained in very hard crystals. It is manufactured in considerable quantities in Switzerland, Silesia, and elsewhere. It is slow and difficult of solution in cold water, requiring six times its weight; it is soluble in 2 parts of hot water. It has a faint sweet taste, but in the solid state feels gritty between the teeth. In contact with caseine or gluten it undergoes lactic fermentation; but some alcohol is always produced, especially when nothing is added to neutralize the acid as it forms.

(5) The salts of milk vary in quantity from 0.10 to 2 per cent. They consist of (*a*) sodic and potassic chlorides, phosphates, carbonates, and caseine compounds, soluble in water, and (*b*) calcic, magnesic, and ferric phosphates, and calcic fluoride, insoluble in water. In the ash the soluble salts are about equal in quantity to the insoluble. Weber found in the ash of cow's milk 14.18 per cent. of potassic chloride, 4.74 of sodic chloride, 23.46 of potassa, 6.96 of soda, 17.34 of lime, 2.20 of magnesia, and 28.4 of phosphoric acid, with a little carbonic and sulphuric acid (?).

Colostrum is the milk secreted during the first two or three days after parturition. It is generally a turbid, yellowish liquid, of sticky consistence and strong alkaline reaction. It contains the usual constituents of milk, though in much larger quantities—often 40 per cent. of solids; that from cows, asses, and goats contains an excessive proportion of caseine, while lactine is found in excess in human colostrum. It also contains albumen and peculiar granular bodies. The secretion of normal milk begins on the fourth day at the earliest, usually between the sixth and the tenth day.

I. Cow's Milk.—Cow's milk has generally a pure white or yellowish-white color. Its specific gravity is variously stated from 1.025 to 1.0396. Dr. Stevenson Macadam of Edinburgh, Scotland, examined 44 samples of pure milk and found the specific gravity to range from 1.0284 to 1.0357, averaging 1.0322. W. Fleishmann tested 124 cows in Germany, and found the milk to vary from 1.0295 to 1.0343, averaging 1.0317, only 3 samples being below 1.030. Officers Jepson and Gardner of the sanitary police of New York tested 44 cows on the Harlem R. R. and 65 in Orange co., N. Y., and E. Waller, Ph. D., tested 86 cows in Orange co., 7 of which were Alderneys. They found the extremes to be 1.02958 and 1.03538 at 60° F., or 102 and 122 on the lactometer, which has the 100-mark at 1.029 and the 0 at 1.000. The solids in cow's milk vary from 11.64 to 19.34 per cent., averaging 13 to 14 per cent.

The quantity of milk furnished by a cow varies with the breed, the age of the cow, the age of the calf, the food, and the treatment and housing. Boussingault observed the yield of milk of 7 cows at Bechelbronn. Each cow received daily 33 pounds of hay or a proportionate quantity of roots. The yield during 303½ days was 3966.8 gallons of milk, equivalent to 7.2 quarts per day each. During July and August the average was over 11 quarts—during February and March, only 4.2 quarts. Another cow averaged 6.4 quarts daily during the time she gave milk.

4.2 quarts milk = 11 pounds, 11 quarts = 29 pounds, containing—

Butter	5. oz.	to	13.9 oz.
Sugar and soluble salts	7.5 "	"	21.35 "
Caseine and insoluble salts	8.4 "	"	23.65 "
Total solids	1 lb. 5 oz.	to	3 lbs. 11 oz.

The yield of milk diminishes as the calf grows older. An observer tested the daily yield of a cow, dividing the ten months after the calf was born into six periods of 50 days each, obtaining the following results: The average daily yield during the first 50 days was 24 quarts: second, 20 quarts; third, 14 quarts; fourth, 8 quarts; fifth, 8 quarts; sixth, 6 quarts. The average yield for the ten months was 13.66 quarts. The total yield for the first 50 days was 1200 quarts; second, 1000 quarts; third, 700 quarts; fourth, 400 quarts; fifth, 400 quarts; sixth, 300 quarts. Total yield for ten months, 4000 quarts. O. C. Wiggin, the milk inspector of Providence, estimates the average yield of each cow, good, bad, and indifferent, throughout the State of Rhode Island, to be 1856 quarts per annum. Some yielded as little as 1000 quarts. He thinks the yield should be brought up to 2200 quarts at least. Dr. Voelcker, chemist to the Royal Agricultural Society of England, reports that 65 cows (short-horns) averaged 642 U. S. gallons = 2568 quarts per annum, the food being grass and hay, with roots and straw in winter. As each cow is estimated to have eaten 28 tons of 2240 pounds of this food per annum, we have 1 pound of milk for every 11 or 12 pounds of grass.

The composition of cow's milk varies within certain limits; it is affected by a variety of circumstances, as the breed of the cow, her age, the age of her calf, nature of her food, time of milking, frequency of milking; and it is even found that the last milk which comes down at a milking is richer in butter than that which is first drawn. This last-mentioned fact shows that the custom which prevails in some localities of driving the cow from house to house, and supplying the consumer with milk fresh from the udders, is not quite equitable, as the last person supplied receives a richer milk than is given to the first customer. The following analyses illustrate these statements:

The Composition of Cow's Milk.

	Fat.	Caseine and albumen.	Sugar.	Salts.	Water.	Total solids.	Solids not fat.
Vernois and Becquerel, 46 analyses	4.51	4.86	4.15	0.65	85.76	14.17	9.66
Henri and Chevalier, average	3.13	4.48	4.77	0.60	87.02	12.98	9.85
Payen, average	3.20	4.20	4.30	0.70	87.60	12.40	9.20
Boussingault, average	4.10	3.20	5.10	0.20	87.40	12.60	8.50
Poggiale, 10 analyses	4.38	3.80	5.27	0.27	86.28	13.72	9.34
Muspratt, average	4.43	3.74	4.83	0.57	86.43	13.27	8.84
Dieulafait, several analyses.	3.11	4.18	4.22	0.85	87.64	12.36	9.25
Haidlen, average	3.00	4.82	4.39	0.49	87.30	12.70	9.70
Gorup-Bezanez, average	4.31	5.40	4.04	0.55	85.70	14.30	9.99
Dr. Letheby, "	3.90	4.10	5.20	0.80	86.00	14.00	10.10
W. Brinton, "	4.50	5.50	3.50	0.70	86.00	14.00	9.50
Jagielski, "	3.60	5.10	4.60	0.60	86.10	13.90	10.30
J. König, "	3.00	4.00	5.00	0.70	87.30	12.70	9.70
C. A. Cameron, 40 analyses.	4.00	4.10	4.28	0.62	87.00	13.00	9.00
S. Macadam, 44 "	2.42	8.91		0.69	87.96	12.04	9.62
Alex. Müller, 59 "	4.05	3.33	4.70	0.73	87.19	12.81	8.76
W. L. Scott, average	3.57	4.55	4.90	0.74	86.24	13.76	10.19
O. C. Wiggin, 58 cows	4.01	4.99	4.29	0.79	85.92	14.08	10.07
H. W. Vaughan, 30 analyses.	4.96	4.29	4.23	0.82	85.71	14.29	9.33
Average	3.799	4.369	4.543	0.695	[illegible]	13.32	9.52

Morin has published (*J. Pharm.*, xxv. 71) this still more elaborate analysis:

Fat	1.378
Caseine	3.614
Albumen	0.390
Galactine, a gelatinous body	0.382
Alcoholic extractive matter	0.542
Sugar	3.600
Soda combined with caseine	0.048
Phosphate of lime	0.256
Chloride of sodium	0.056
Water	89.734
	100.

Complete Analysis of Milk by Haidlen.

Water	87.300
Butter	3.000
Caseine	4.820
Sugar	4.390
Phosphate of lime	0.230
Phosphate of magnesia	0.042
Phosphate of iron	0.007
Chloride of potassium	0.144
Chloride of sodium	0.024
Soda, combined with caseine	0.042
	100.

Maxima and Minima.—Dr. Stevenson Macadam (*Am. Chemist*, May, 1875, p. 419) gives the results of 44 analyses, as follows:

	Max.	Min.	Average.
Specific gravity	1.0357	1.0284	1.0322
Cream	11.25	5.00	7.8
Fat	3.32	1.56	2.42
Salts	0.76	0.62	0.69
Total solids	14.54	10.57	12.04
Solids not fat	11.23	8.74	9.62
Water	89.43	85.46	87.96

The British Society of Public Analysts have fixed the following minimum:

Fat	2.50
Solids not fat	9.00
Total solids	11.50
Water	88.50
	100.

Country Milk as compared with Town Milk.—Dr. Cameron (*Chem. News*, Feb. 5, 1875, p. 54) and Dr. Voelcker (*Am. Chemist*, May, 1875, p. 414) state that the milk of town-fed cows is generally richer than that of country cows. The latter attributes this to the fact that it pays better to feed cows nourishing food, and that the cow-keepers in towns, being business-men, have become convinced of this fact.

Difference in the Milk of the same Milking.—Schübler found that on fractioning the milk at a milking the

	Specific gravity.	Cream.
First portion showed	1.0340	5.0 per cent.
Second " "	1.0334	8.0 "
Third " "	1.0327	11.5 "
Fourth " "	1.0315	13.5 "
Fifth " "	1.0290	17.5 "
Average	1.0321	11.0 per cent.

The last milk drawn is called "the strippings;" this is the richest in fat. Jebson and Gardner, milk inspectors for New York, found the milk and strippings of two cows to be as follows:

	Entire milk.	Strippings.
1st cow	Sp. gr. 1.0348; lact. 120	Sp. gr. 1.02610; lact. 90
2d cow	" 1.0319; " 110	" 1.02668; " 92

Difference in Morning and Evening Milk.—This has often been noticed, but the conditions to which it is due have not always been stated. Alexander Müller (*Jahresb. Ag. Ch.*, 1864, 388) made 59 analyses, extending over the entire year, and found the evening milk to be invariably richer than the morning milk. Dr. Voelcker (*Am. Chemist*, May, 1875, 416) examined the milk on the farm of the Royal Agricultural College at Cirenchester for an entire year, and found the morning milk the richest. He attributed this to the poor pasturage and the rich evening food, which consisted of roots, hay, and meal. Stefanelli found the evening milk of asses and ewes to be the richest.

The effect of breed on both the quantity and quality of the milk is very marked, as is shown in the following analyses:

Milk from Different Breeds of Cows—Analyses by Vernois and Becquerel.

Breed.	Water.	Butter.	Caseine.	Sugar.	Salts.
Angus	80.32	9.88	5.28	3.73	0.72
Belgian—Durham	85.77	6.22	4.06	3.29	0.67
Bohemian	84.18	6.34	3.87	4.96	0.64
Bretonne	83.74	5.70	5.37	4.55	0.62
Charollais	85.28	6.42	4.12	3.49	0.68
Durham, 2 analyses	84.56	6.41	4.37	3.97	0.68
Flamande	88.30	3.72	3.37	4.03	0.54
Dutch, 3 analyses	83.97	6.84	4.21	4.35	0.61
Murzthal	85.31	6.28	3.14	4.62	0.64
Normandy	87.18	3.24	4.76	4.21	0.60
Paris, 30 analyses	86.40	3.61	5.21	4.10	0.66
Swiss	85.19	7.08	2.55	4.59	0.56
Tyrol	81.74	7.96	4.95	4.82	0.50
Voigtland	84.99	5.14	4.56	4.62	0.68
Average, 46 analyses	85.76	4.51	4.86	4.15	0.65

The following table is from the report of O. C. Wiggin, milk inspector of Providence, R. I., for 1870–71:

Cows.	Sp. gravity.	PERCENTAGES.							Season.
		Cream by vol.	Fat.	Caseine	Sugar.	Salts.	Water.	Solid matter.	
Alderney	1030	24.	8.07	5.02	3.05	.79	83.04	16.96	Jan.
Alderney	1029	29.	8.28	3.14	4.02	.63	83.93	16.07	June.
Durham	1033	18.	6.41	4.35	3.97	.68	84.56	15.44	June.
Ayrshire	1031	10.	3.70	4.76	4.35	.59	86.60	13.40	June.
Ayrshire	1030	10.	3.80	4.69	3.58	.78	87.15	12.85	July.
Polled cow	1032	5.	3.37	5.18	4.25	.73	86.47	13.53	July.
Devon	1033	13.	3.96	5.29	4.23	.81	84.71	14.29	June.
Native	1032	12.	3.62	4.86	4.48	.78	86.26	13.74	June.
Grades, 16 cows	1033	12.	3.93	5.74	4.60	.80	84.93	15.07	Jan.
Grades, 15 cows	1031	16.	4.92	4.11	4.07	.76	86.14	13.86	Jan.
Grades, 13 cows	1033	13.	3.72	5.30	4.20	.80	85.98	14.02	June.
Grades, 14 cows	1032	14.	3.48	4.80	4.28	.80	86.64	13.36	May.
Average, 58 cows.	1032	14.	4.01	4.99	4.29	.79	85.92	14.08	6 mos

The results obtained by J. Lehmann (*Jahresb. Ag. Ch.*, xi., xii. 576) are of especial value, as he fed 9 cows of each breed on the same food, and determined both the quality and the quantity of the milk:

Yield of Milk per Cow, yearly.

	Short-horns.	Hollanders.
Maximum	6949 lbs.	8556 lbs.
Minimum	5262 "	5972 "
Average	6172 "	7308 "

Composition of the Milk.

	Percentages.		Pounds per annum.	
	Short-horns.	Hollanders.	Short-horns.	Hollanders.
Fat	3.85	3.21	240	235
Caseine	3.47	3.27	222	230
Sugar	4.91	4.62	304	343
Salts	0.75	0.73	46	52
Water	87.02	88.17	5360	6448
Total	100.	100.	6172	7308
Solids	12.98	11.83	812	860

The Effect of Food on the Milk.—Feeding.—The kind of food has a decided influence on the quantity and quality of the milk. The following remarks by Dr. Voelcker, chemist to the Royal Agricultural Society, contain much valuable information on this point (*Am. Chemist*, v. 414, May, 1875): "*Food appropriate for producing much and good Milk.*—The influence of food on the quality of milk is very striking. A half-starved cow yields but little milk and poor milk. On the other hand, the liberal supply of pea or bean meal or oil-cake, and other food rich in nitrogenous and phosphatic elements of nutrition, tells directly, both on the quality and quantity of the milk. The finest-flavored milk and butter are produced by cows fed in summer entirely on grass and rich permanent pastures, and in winter on nothing else but hay made of fine sweet grass. Turnips yield a watery milk, and are objectionable on account of the turnipy flavor which they give to the milk. Mangolds are less objectionable, but should not be given to milk cows without an allowance of 3 to 4 pounds of meal per head. Of all kinds of meal, none is equal in milk-producing properties to bean or pea meal—a fact which finds a ready explanation in the circumstance that bean or pea meal contains on an average from 25 to 28 per cent. of nitrogenous constituents, or the same class of compounds to which the curd of milk belongs, and that it is likewise rich in phosphates or bone-earths, in which milk abounds. Egyptian lentils answer equally well with bean-meal, for they resemble intimately in composition beans or peas. Linseed-cake produces much and rich milk, but unless it is pure and fresh cake of the finest description it seriously injures the quality of the milk. Fine decorticated cotton-cake is both rich in fat and in nitrogenous constituents, and, like all food rich in nitrogen, it also contains a large proportion of phosphates, and is thus admirably well adapted for milk cows. Rape-cake is likewise an excellent food for milk cows, provided it is free from an undue admixture of wild-mustard seed, which frequently occurs in rape-cake made from Indian seed to an extent which renders it perilous to stock. The best rape-cake is green German rape or Rubsen cake, one of the cheapest and best concentrated kinds of food that can be given to milk cows. Bran or pollard, as is well known, produces good and rich milk. Nothing can be better as an auxiliary winter food for milk cows than 4 pounds of bran made into a thin mash, to which about 3 to 4 pounds of bean-meal is added. Along with this about 25 pounds of mangolds and a due proportion of hay or hay and straw chaff will supply a food-mixture which produces much and first-quality milk. Brewers' grains are the staple food in town dairies, and they are much more nutritious than their appearance seems to warrant. Even in the wet condition in which they are obtained from the breweries, and holding from 75 to 77 per cent. of water, they contain a fair proportion of ready-made fat and flesh forming matters. Desiccated grains contain from 7 to 8 per cent. of oil and about 18 per cent. of nitrogenous compounds. Dried brewers' grains make good milk, and are fully as valuable as a food for milk cows as barley-meal. Another useful and, comparatively speaking, cheap food for milk cows is palm-nut meal, but its quality and value differ greatly. The best palm-nut meal contains 19 to 20 per cent. of oil and fat, and is made from the partially-expressed kernels of the palm-nut; its value as a food for fattening stock or for milk cows depends principally upon the proportion of fatty matter which is left in the meal. The fatty matter in palm-kernels is a white, agreeably-tasting fat, of almost the same consistency as butter. A good deal has been said and written for and against feeding milk cows upon sewage grass. On the one hand, sewage grass has been praised as the most nutritious kind of grass for milk cows; and on the other, the adversaries to all schemes of applying sewage to land have endeavored to prejudice the public mind by denouncing the produce from grass-land irrigated by sewage as innutritious and a highly dangerous food for milk cows. Like all very succulent produce, the grass from sewaged land is more watery, and, in consequence, not so nutritious as the produce from rich permanent pastures. It is nevertheless a most acceptable food to the dairy farmer, who usually gives along with it to his cows some bean or other descriptions of meal or auxiliary concentrated food, and under proper management there is not the slightest ground for suspecting that sewage grass when given to milk cows will render the milk they yield unwholesome or dangerous to the youngest child. If sewage could not be usefully applied to Italian rye-grass to be turned into milk and butcher's meat, all sewage-irrigation schemes would long ago have fallen to the ground. Convinced as I am that the produce from a properly managed sewage farm supplies an increased amount of good and wholesome food, the greater part of which is especially useful to cow-keepers, I can only express the hope that all town authorities who at present allow large quantities of plant-food to run to waste, polluting our rivers and water-courses, will ere long set apart a portion of land, if such can be found appropriate for sewage irrigation, on which Italian rye-grass, cabbages, and mangolds can be raised in large quantities by means of sewage, for the special advantage of cow-keepers and the benefit of the community at large."

Very full instructions for the feeding of cows are given by Charles L. Flint in his *Milch Cows and Dairy Farming.* Important investigations have been made in Germany on the effect of different kinds of food on the quantity and quality of the milk. (For some of the results see Watts's *Dict. of Chem.*, 2d Supplement, p. 809.) "It appears from these results that it is not possible by variations in the food to produce a 'butter cow' or a 'cheese cow.' Differences in this respect are differences of stock and individuals."

Much discussion has arisen with regard to the propriety of feeding cows on the exhausted barley of breweries, *brewers' grains*, and on the swill of distillers, *still slops.* To the former, used in moderate quantities, there appears to be no objection whatever. Even the latter, "properly fed in limited quantities, in combination with more bulky food, may be a valuable article for the dairyman; but if given, as it too often is, without the addition of other kinds of food, it soon affects the health and constitution of the animals fed on it. . . . When this forms the principal food of milch cows the milk is of a very poor quality. . . . Its effect on the systems of young children is therefore very destructive, causing diseases of various kinds, and, if continued, certain death. . . . The adulteration of pure milk from the healthy cow by water, though dishonest and objectionable in the highest degree, is far less iniquitous in its consequences than the nefarious traffic in 'swill milk,' or milk produced from cows fed entirely on 'still slops,' from which they soon become diseased, after which the milk contains a subtle poison which is as difficult of detection by any known process as the miasma of an atmosphere tainted with yellow fever or the cholera. The simple fact is sufficiently palpable that no pure and healthy milk can be produced by an unhealthy and diseased animal, and that no animal can long remain healthy that is fed on an unnatural food, and treated in the manner too common around the distilleries of many large cities." (*C. L. Flint.*) By the laws of the State of New York the milk of cows fed on distillery swill is declared to be unwholesome, and its sale is forbidden.

Influence of the Age of the Calf.—Dr. Eisenstuck has published numerous analyses bearing on this point. (*Jahresb. Ag. Chem.*, vii. 1864, 395.)

The Effect of Spaying.—This operation increases the quantity and improves the quality of the milk. (See analyses by Dieulafait (*Jahresb. Ag. Chem.*, vii. 1864, 388).)

The treatment of cows exerts an important influence on both the quantity and quality of the milk. The judicious dairyman finds it to his advantage to "treat the cows gently, to provide warm, clean, and well-ventilated barns, with ample, dry, well-drained yards, abundantly supplied with pure water—to feed them liberally, without forcing. Milking should not be prolonged to the time of calving, but the cows should be allowed eight or ten weeks for recruiting, when they will begin the new season with renewed vigor and the promise of a more abundant yield of milk." (*O. C. Wiggin.*)

The souring of milk is due to lactous fermentation (see FERMENTATION), by which the lactose or sugar of milk is transformed into lactic acid, which precipitates the caseine as curd by withdrawing from it the soda which holds it in solution.

$$\underset{\text{Milk-sugar.}}{C_{12}H_{22}O_{11}.H_2O} = \underset{\text{Lactic acid.}}{4HC_3H_5O_3}.$$

Bechamp attributes the souring of milk to microzymes which are present in the milk when it comes from the cow. (*Compt. rend.*, 76, 654.) The effect of rennet in coagulating milk is not fully understood. It has been supposed to be due to the conversion of a little lactose into lactic acid. Milk is coagulated by acids, alum, various other salts, tannin, alcohol, wood-naphtha, etc. The souring of milk during thunderstorms has been explained by attributing it to the *ozone* or active oxygen which is produced in the air by electrical discharges. It is said that the addition to the milk of a small quantity of boric acid retards the separation of cream and prevents souring for several days. (A. Hirschberg, *Chem. Centr.*, 1872, 496.) Schwalbe (*Deut. Chem. Ges. Ber.*, v. 286) states that the addition of mustard oil, 20 drops to the pint, prevents coagulation for weeks, even in summer. Coagulation is retarded by boiling and by the addition of small quantities of carbonate of soda, or potassa, borax, nitrate of potassa, chloride of sodium (common salt), etc. The following process for preserving milk is said to be in use in the vicinity of Paris: To each quart of milk, before the cream has risen, 6 grains of bicarbonate of soda are added, it is then placed in bottles, which are tightly corked and are then placed in a water-bath and heated to 190° F., no higher, and maintained at this temperature for four hours. They are then made perfectly tight with wax, and the milk will keep a long time.

The proper management of milk is a matter of the greatest importance. The pails, pans, cans, and other vessels destined to receive the milk should be scrupulously clean; they should always be cleansed with boiling water (scalded). The greatest neatness should be observed in milking. The milk should be strained through wire-cloth into a large tin vat, to render it of uniform quality. It should be at once, while still warm, drawn into cans, and these should be placed in the coolers. Milk which has been thoroughly cooled will keep much longer than that which is sent warm to market. Cans of milk should never be left open in a barn, where the exhalations from the breath and excrements pervade the air. Dr. Voelcker makes the following judicious remarks on this subject (*Am. Chem.*, v. 413): "However, by observing the following simple rules, country milk may be sent by rail on long journeys without spoiling even in very hot weather: (1) The milk should be drawn from the cow in the most cleanly manner, and strained through wire-cloth strainers. (2) The milk should be thoroughly cooled immediately after it is drawn from the cow. This may be done by a milk-cooling apparatus specially constructed for rapidly cooling milk, or by simply placing the can in which it is contained in a vat of cold water deep enough to come up to the height of the milk in the can containing it, and by using at least three times as much cold water as the milk to be cooled; the milk should be occasionally stirred until the animal heat is expelled. The milk should be cooled down as rapidly as possible to a temperature of about 55°. (3) The evening's and morning's milk should be cooled down separately, and be sent in separate cans, and not mixed together if it can be avoided. (4) No milk should be kept over to deliver at a subsequent time. (5) The pails and strainers employed on the farm should be thoroughly cleaned, scalded in boiling water, and dried morning and night. (6) Immediately before the milk is placed in the cans they should be thoroughly rinsed with clean cold water, and great care be taken to keep the cans and milk free from dirt or impurities of any kind. When the cans are not in use they should be turned down on a rack with the tops off. (7) Before the cans are returned to the country they should be thoroughly rinsed out with clean water and scalded with boiling water. (8) In very warm weather it is well to put the cooled milk in cans covered over with a coarse flannel casing, which may be kept wet for a considerable time."

Artificial milk was made at Paris during the siege by the following process (Dubrunfaut, *Comp. rend.*, 1871–72, pp. 84, 109):

1. Cane-sugar, glucose, or milk-sugar....	40–50 grammes.
2. Albumen (dry)................................	20–30 "
3. Sodic carbonate..............................	1–2 "
4. Olive oil or horse fat.......................	50–60 "
5. Water..	500 "

Heat the whole to 122° F., and dilute to 1 litre. A. Gaudin (*Comp. rend.*, 1871–72, p. 108) recommended the use of sugar and the fat and gelatine of fresh bones.

Condensed Milk.—Within a few years a very important industry has been established with the object of condensing and preserving milk. The first efforts were directed to the preparation of "desiccated milk." The milk was evaporated at a low temperature, and a little sugar added when the process of evaporation was nearly completed; the residue was pulverized, and constituted a yellowish-white powder, which dissolved for the greater part in hot water. The solution resembled milk, and answered very well when fresh milk could not be obtained, as on shipboard. It could be preserved with care in closed bottles for several months. It was found necessary to remove a portion of the cream before evaporation, as otherwise the product soon acquired a taste and smell of rancid butter. Its imperfect solubility in water, and its deficiency in the agreeable taste of fresh milk, prevented its extensive introduction. The following analyses show its composition (No. 1 was made from skimmed milk—Nos. 2 and 3 from whole milk):

	No. 1, Voelcker.	No. 2, Voelcker.	No. 3, Werner.
Fat...........................	8.70	16.32	16.29
Caseine.....................	20.25	20.37	11.36
Albumen....................			4.09
Milk-sugar..................	62.14	56.29	61.21
Cane-sugar.................			
Phosphates of lime and magnesia........	2.34	2.33	1.73
Alkaline salts............	2.48	2.91	3.77
Water........................	4.09	1.78	1.55
	100.	100.	100.

The condensation of milk did not become a success till the introduction of the vacuum-pan, which makes it possible to boil it down very rapidly at a very low temperature—below 160° F.—thus preserving its flavor unimpaired. This is an American industry, and has been introduced into Europe by American companies. Condensed milk is now extensively manufactured in the U. S., Switzerland, Germany, England, and Ireland. The milk is strained, heated in cans or pails placed in a vat of water kept hot by a steam-coil, then brought to a boil in an open vessel by the aid of steam, strained, and introduced into the vacuum-pan, where it is rapidly concentrated to any desired degree. The vacuum-pan is a close vessel of copper, egg-shaped, about 6 feet high and 4½ feet in diameter. It is heated by a steam jacket and coil. In the dome on one side is a small window, through which gas illuminates the interior, while on the opposite side is an eye-glass through which all the movements of the seething milk can be observed, and the boiling by this means regulated. A vacuum is maintained by a powerful air-pump. The preliminary boiling has for its object the expulsion of the gases of the milk, which would cause it to foam in the pan, and also perhaps to add to the keeping quality of the milk by destroying the mould-germs (see FERMENTATION)—not, probably, as many think, to coagulate albumen. Much of the milk is simply concentrated for immediate use without any addition of sugar. Such milk is extensively used in New York, being by many preferred to fresh milk. It is served fresh every day, but will keep for two or three days if necessary. The writer had occasion to investigate this subject at Purdy's Station on the Harlem R. R., at the works of the American Condensed Milk Co., for the Department of Public Charities and Correction. (*Am. Chemist*, ii. 25.) When 1700 quarts of milk were condensed in the ratio of 430 quarts to 100, the following results were obtained on analyzing samples of the milk before and after condensation:

Fat..	3.83	13.12
Caseine...	3.88	14.44
Sugar..	4.08	16.30
Salts..	0.76	2.60
Water..	87.45	53.54
	100.	100.

Some of the companies formerly skimmed the milk before condensing it, and sold the cream separately. The following analyses have been recently made by E. Waller, Ph. D.; the above-mentioned fraud is no longer practised to any great extent:

	American.	Eagle.	New York.	National.
Fat.....................	16.29	14.36	14.28	13.97
Caseine...............	17.26	15.07	13.96	14.02
Sugar..................	10.64	11.64	13.90	10.44
Salts....................	2.77	2.10	2.00	2.33
Water..................	53.04	56.83	55.86	59.24
	100.	100.	100.	100.

In addition to this milk, which is condensed for immediate use, another variety is made for keeping which is known as "preserved" or "canned" milk. It receives an addition of cane-sugar, and is hermetically sealed in cans. When properly prepared it keeps for years. The following analyses indicate the character of this "preserved" milk:

	Borden's, U. S.	Aylesbury, English.	Cham., Swiss.	Kempten, Bavarian.	Sassin, Hungarian.
Fat.........	9.55	11.73	8.67	13.14	17.89
Caseine.....	10.26	15.17	13.67	12.21	13.27
Albumen...				7.93	7.46
Milk-sugar	53.34	16.24	10.82	17.93	22.70
Cane-sugar		29.46	40.48	24.11	18.44
Salts........	1.91	2.30	2.23	3.87	5.10
Water.......	25.94	25.10	24.13	20.81	15.14
	100.	100.	100.	100.	100.

Cream is a distinct layer which forms on the surface of milk when it is allowed to stand a few hours. It consists of milk with an increased percentage of fat, produced by the rising of a considerable portion of the fat-globules from the milk below. The quantity of cream does not indicate the absolute proportion of fat, as of two samples of milk containing the same percentage of fat, one may throw up a layer of cream twice as bulky as that on the other. The specific gravity of cream is less than that of milk—about 1.012 to 1.019.

Skimmed milk is the portion left after the cream has been removed. It is poor in fat, and necessarily heavier than the milk which yielded it—from 1.031 to 1.036.

Buttermilk is the milk which is left when the greater portion of the fat-globules of cream have been agglomerated into butter by churning. It has the composition of milk deprived of most of its fat, and does not differ therefore from skimmed milk.

Curd is the coagulated caseine of milk; if made from whole milk, it contains the fat; from skimmed milk, it is nearly free from fat; from cream, it is very rich in fat.

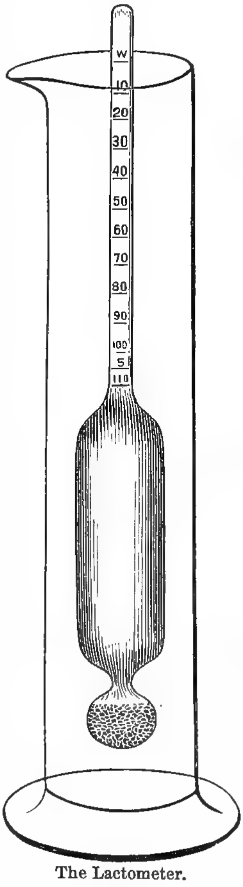
Cheese is curd which has been salted, often colored artificially, and flavored, and then allowed to undergo a kind of fermentation by keeping. (See articles Butter and Cheese.)

The following analyses by Alex. Müller show the composition of these preparations and their relation to milk (*Jahresb. Ag. Ch.*, 1864, vii. 393):

	Whole milk.	Skim milk.	Cream.	Butter-milk.	Butter.	Salt water.
Whole product........	100.	90.	10.	6.	4.	0.1
Fat.........................	4.00	0.55	35.00	1.67	85.00	
Caseine, etc............	3.25	3.77	2.20	3.33	0.51	3.40
Sugar......................	4.50	4.66	3.05	4.61	0.70	4.70
Salts.......................	0.75	0.78	0.50	0.77	0.12	0.79
Water......................	87.50	90.64	59.25	89.62	13.67	91.11
	100.	100.	100.	100.	100.	100.

The butter was analyzed unsalted, the salt water worked out of the salted butter, and the analysis calculated without the salt.

Fig. 1.



The Lactometer.

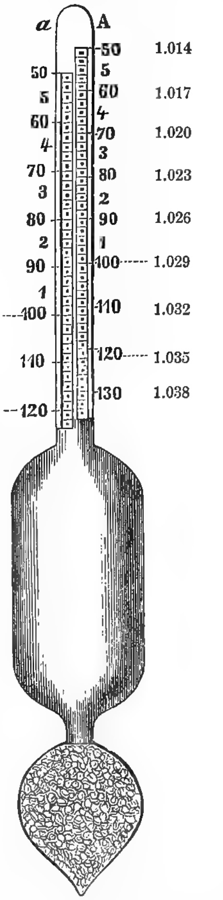
The milk of diseased cows is always dangerous, and should never be used. The effect of distillery swill on cows has been already alluded to.

The alcoholic fermentation of milk for the preparation of alcoholic beverages has been mentioned in the article Koumiss.

The Adulteration of Milk.—Numerous substances are mentioned by writers as used to adulterate milk, such as the following: (1) water; (2) chalk and carbonates of soda and potassa and borax, to neutralize acidity, the first mentioned to hide watering as well; (3) turmeric, annotto, and caramel (burnt sugar), to conceal the blue color of skimmed or watered milk; (4) flour, starch, emulsions of almonds or hempseed, and cerebral matter (sheeps' brains), to thicken watered milk and conceal blue color; (5) sugar, gum, dextrine, and salt, to increase the specific gravity and conceal watering. The writer is satisfied that the only substances used at present are water, and possibly carbonate of soda and burned sugar. All these adulterants, save water, are so readily detected that their use would be too dangerous for even the most abandoned milkmen. Hundreds of analyses made by the health authorities of New York and by the milk inspectors of Boston and Providence have failed to show the presence of any adulterants save those last mentioned. The adulteration with water and the skimming off of the cream are the common frauds practised in this country. A careful investigation of the milk-supply of New York forced the writer to the conclusion that the average milk sold here consisted of three-fourths milk and one-fourth added water. The 120,000,000 quarts of milk sent annually to New York receive an addition of 40,000,000 quarts of water, which, sold at 10 cents per quart, brings $4,000,000 per annum or $12,000 per day. This fraud, besides being expensive, exerts a most unfavorable influence on the health of young children, especially as it is aggravated by the previous skimming of the milk and consequent impoverishment of the fatty constituent. In some cases diseases have been introduced by the use of foul water, as in London, where an outbreak of typhoid fever was traced to the water added to the milk, which was poisoned with sewage.

The detection of adulteration in the case of water is not always possible. As the percentage of water in genuine milk varies, it is only possible to prove adulteration when the percentage of water exceeds the maximum quantity in pure milk. Three methods are in use for testing the quality of milk: (1) determining the specific gravity; (2) determining the percentage of cream; (3) analyzing the milk.

Fig. 2.



Dinocourt's Galactometer. The scale A is for whole milk; the scale *a* for skimmed milk. Unwatered and unskimmed milk ranges from 100 to 120 on Scale A, unwatered skimmed milk from 105 to 130 on Scale *a*.

(1) *Determining the specific gravity* by the hydrometer (see Hydrometer), called when graduated for this purpose a *galactometer* or *lactometer*. As milk is heavier than water, any dilution will reduce the specific gravity. The lactometer merely determines the specific gravity. In using the lactometer a certain specific gravity must be selected as a minimum below which no genuine milk ever goes. The specific gravity 1.029 has been fixed by Dinocourt, who originated the lactometer, as the proper minimum. This standard has been adopted by the Health department of New York. The old standard adopted by the milk-dealers was 1.030; this was changed by Dr. Chilton to 1.034, and has gradually dropped to 1.033. So the standard of the milk-dealers is 0.004 higher than that of the Health department! In graduating the lactometer, 100 is placed at the standard of 1.029, and 0 at 1.000, the gravity of water, the intervening space being divided into 100 divisions. The point to which the lactometer sinks in the milk under examination indicates the percentage of milk in 100 parts. Thus, if the lactometer sinks to 80, the milk must consist of at least 20 parts or per cent. of water and 80 of milk. But this assumes the original milk to have had a gravity of only 1.029, which is lower than any genuine milk. Good milk of a gravity of 1.034 requires an addition of 16.67 per cent. of water to bring it down to 1.029. After this dilution, 20 per cent. of water must be added to this watered milk to bring it down to 80 on the lactometer. The lactometer errs, therefore, in not showing the dilution of good milk down to our low standard, and consequently in reporting only a portion of the dilution. With regard to the propriety of the standard (1.029) for genuine milk, something has been already said in this article under *Specific Gravity*. The writer caused the milk of over 1000 cows at dairies in N. Y. and N. J. to be tested; several of the cows were Alderneys, whose milk is rich in cream, and the specific gravity was almost invariably about 1.029, or 100 on the lactometer. In the 4 or 5 cases in which it fell below 100, the cows were sick or under very abnormal conditions. As milk expands when warmed, it becomes lighter; it should always be tested at 60° F., or at least the temperature should be noted. A

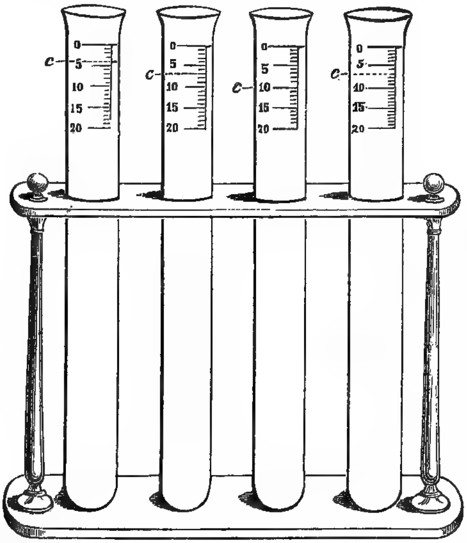
sample of milk which stood at 100 by the lactometer at 60° F. was found by the writer to stand at 106 at 44° F., at 98 at 66° F., at 90 at 80° F., and at 74 at 100° F. As a general rule, the milk, being kept cool to preserve it, is below 60° F.; consequently, it stands better by the lactometer than it would at the standard temperature. Skimming increases the gravity of the milk, and makes it stand better by the lactometer. From these statements it is seen that the lactometer is only an imperfect test for frauds of the milkmen: (1) It does not show moderate watering of good milk; (2) the watering which it records is only a fraction of that actually practised; (3) if the milk is skimmed before it is watered, the lactometer does not detect the frauds, which neutralize each other as far as specific gravity is concerned. In the face of these defects, if the lactometer shows the milk to be below 100, there then is no doubt as to its having been watered. Numerous convictions for watering have been secured in New York by the use of the lactometer, the milk inspected having stood as low as 80, 70, and even 50, by this test. The only error the lactometer can make against the milk-dealer would be in case he has adulterated his milk with cream; the lactometer does not distinguish the difference between cream and water when added to milk, except that it requires twice as much cream as water to reduce the gravity of milk to any given degree. The following table, from Dr. Voelcker's experiments, illustrates the effect of watering and skimming; the lactometer degrees are added by the writer:

	Unskimmed.		Skimmed.	
	Sp. gr.	Lactometer.	Sp. gr.	Lactometer.
Pure milk	1.0314	108	1.0337	117
10 per cent. water added	1.0295	102	1.0308	106
20 " " "	1.0257	88	1.0265	91
30 " " "	1.0233	80	1.0248	86
40 " " "	1.0190	66	1.0208	72
50 " " "	1.0163	56	1.0175	60

Thus it is seen that with a sample of fair milk more than 10 per cent. of water could be added before the gravity was reduced to 1.029, or 100 on the lactometer, and after skimming considerably more.

(2) *Determining the Percentage of Cream.*—This is accomplished in a tube which is graduated into 100 parts, and which measures the cream. This has been called a lactometer or creamometer.

FIG. 3.



Creamometer. Fill with milk to the 0-mark; after standing, read the amount of cream—for example, as indicated by *c*.

This is a very imperfect method for testing milk, as the percentage of cream is not an accurate measure of the fat contained in the milk. H. Schroeder tested this point with the following results in several samples of milk:

Samples	No. 1.	2.	3.	4.	5.	6.
Fat	3.54	4.87	4.09	5.38	3.13	4.09
Cream	21	16	10	10	12	13

(3) *Partial or complete analysis* is undoubtedly the most certain method of detecting adulteration, either determining the percentage of fat, and of solids besides fat, or making a separate determination of each constituent. In either case we are compelled to do exactly what we did in applying the lactometer—establish an arbitrary standard which shall represent the poorest genuine milk, and bear the same relation to good milk that our sp. gr. 1.029 does to the 1.030, 1.031, or 1.034 of milk of average quality. The English Society of Public Analysts have fixed the following minimum quality for unadulterated milk (*Chem. News*, Feb., 1875, p. 59):

Fat	2.5
Caseine Sugar Salts	9.
Water	88.5
	100.

Milk of average quality can be watered and skimmed very seriously before it falls below this standard.

The analysis of milk is not difficult if we simply determine the percentages of fat, caseine, sugar, salts, and water. Water is determined by evaporating a weighed portion of milk in a flat platinum dish (about half an inch deep and 1½ inches in diameter) at 212° F. The loss in weight is the water. The salts are determined by carefully incinerating the solid residue left after the evaporation of the water. For the determination of the other constituents a platinum dish is nearly filled with pure quartz sand; the whole weighed; a small quantity of the milk is added, which is at once soaked up by the sand, and the whole again weighed to find the weight of milk taken. The whole is then dried at 212° F., the contents of the dish extracted with anhydrous ether, and again dried; the loss in the weight of the sand, etc. indicates the percentage of butter. The butter may be weighed directly by evaporating the ethereal solution in a weighed beaker. The residue after removing the butter is washed with warm water, to the first of which a few drops of acetic acid is added, to remove the sugar. After drying the residue the loss in weight indicates the sugar. The difference between the original weight of the sand and of the sand and caseine indicates the percentage of caseine. A correction must be made in the weights of the sugar and caseine on account of the salts, which are washed out with the sugar. By evaporating and igniting the sugar solution the salts washed out will be determined; they must be deducted from the percentage of sugar; the remainder of the salts (ash) must be deducted from the caseine.

Wanklyn, Chapman, and Smith's ammonia process has been recommended for the determination of caseine in milk. The milk is first diluted with water till 1 cubic centimètre of the diluted milk contains 10 milligrammes of the original milk. About 5 cubic centimètres of the diluted milk is boiled with alkaline permanganate in a retort as long as the water which distils over contains ammonia. The amount of ammonia is estimated by Nessler's test: 100 parts of caseine yield 6.5 parts of ammonia.

(4) *Optical methods* have been proposed for the examination of milk, but they are rarely used.

II. HUMAN MILK.—Human milk is more bluish than cow's milk, and has a sweeter taste. It is strongly alkaline, and is remarkable for the difficulty with which it coagulates. It is less easily and completely coagulated by rennet; the coagulum is not so gelatinous nor so firm and solid as that of cow's milk; it is also more digestible. Its specific gravity varies from 1.02561 to 1.04648 (Vernois and Becquerel), from 1.030 to 1.034 (Watts's *Dict.*). The milk of women confined for the first time contains more water than the milk of women who have had several children. According to Vernois and Becquerel, the percentage of fat varies with age: the milk of women from 15–20 contains 3.738 per cent.; 20–25, 2.821 per cent.; 25–30, 2.348 per cent.; 30–35, 2.864 per cent.; and from 35–40, 2.233 per cent. It increases by nearly 0.3 per cent. during the period of menstruation. The percentage of butter varies inversely as the quantity of milk produced. It decreases with imperfect nutrition. The following analyses have been published by different chemists:

Woman's Milk.

	Vernois and Becquerel, 89 analyses.	Simon, 14 analyses from one woman.	Clemm, 3 analyses from one woman.	Chevalier and Henry.	D'Héritier.	Jagielski.
Fat	2.67	2.53	3.71	3.55	5.20	2.90
Caseine	3.92	3.43	3.26	1.52	0.95	2.90
Sugar	4.36	4.82	3.84	6.50	6.34	4.80
Salts	0.14	0.23	0.19	0.45	0.45	0.20
Water	88.91	88.37	89.00	87.98	87.06	89.20
Total	100.	99.38	100.	100.	100.	100.
Solids.	11.09	11.63	11.00	12.02	12.94	10.80

According to Vernois and Becquerel, the amount of fat in human milk increases during the first two months after delivery, but decreases between the fifth and sixth, as well as between the tenth and eleventh month.

Simon gives the following analysis of human colostrum:

Fat	5.00
Caseine	4.00
Sugar	7.00
Salts	0.31
Water	82.80
	99.11

Von Tolmatscheff examined the milk of healthy women at different periods after delivery (*Jahresb. Ag. Ch.*, xi., xii. 1868–69, 548); his average results were as follows:

	Days after delivery.	Fat.	Caseine and albumen.	Sugar.
1	4	2.471	4.188	4.33
2	6	3.177	2.050	5.76
[illegible]	15	2.939	2.077	5.90
4	36	1.713	1.104	6.26
5	30	1.621	4.649	3.56

He also found cholesterine 0.0385 and 0.0252, and protagon 0.146 and 0.068. D'Héritier claims to have found a persistent difference in the milk of blondes and brunettes, the milk of the former containing less fat, caseine, and sugar than that of the latter. Jourdat (*Compt. rend.*, 1870, 71, 87) examined the milk of the two breasts of a woman separately. He reports that the right breast was much more developed than the left—that the milk of this breast appeared better to the eye, and was decidedly preferred by the child. He found the composition of the milk of the two breasts to vary considerably, a temporary fatigue or slight change of diet being sufficient to produce the variation. The right breast yielded about twice as much milk as the left. The milk of the right breast was richer in fat and caseine, while the sugar and salts were alike in both. "Healthy children of both sexes discharge from the seventh to the twelfth day of their birth a white secretion from the breast (*Hexenmilch*), either alkaline or neutral, and containing milk, but no colostrum-globules. According to Guillot, this secretion has pretty much the composition of human milk." (*Watts's Dict.*)

III. Milk of Other Animals.—*Mare's milk* is rich in sugar and poor in fat and caseine. It readily ferments (see article Koumiss); sp. gr. = 1.034 to 1.045. C. A. Cameron gives the following results of the analyses of 14 samples from 14 mares (*Chem. News*, Feb. 5, 1875, 54):

	Average.	Maximum.	Minimum.
Fat	1.055	2.120	0.600
Caseine, etc.	1.953	2.400	1.460
Sugar	6.285	6.870	5.670
Salts	0.397	0.440	0.330
Water	90.310		
	100.		
Solids	9.690		

Ass's milk resembles mare's milk, being rich in sugar and poor in the other constituents; sp. gr. 1.023 to 1.035. It readily sours, and easily undergoes fermentation. Composition:

	Stefanelli, 3 analyses.	Voelcker.	Cameron.	Gorup-Bezanez.	Jagielski.
Fat	0.84	0.11	1.85	1.26	1.30
Caseine, etc.	1.89	1.82	3.56	2.02	1.90
Sugar	6.04	6.08	5.05	5.70	6.40
Salts	0.37	0.34	0.52		
Water	90.86	91.95	89.02	91.02	90.40
	100.	100.	100.	100.	100.
Solids	9.14	8.05	10.98	8.98	9.60

Camel's milk, Dragendorff (*Jabresb. Ag. Ch.*, ix. 1866, 435):

Specific gravity	1.035
Fat	2.90
Caseine	3.67
Sugar	5.78
Salts	.66
Water	86.94
	99.95
Solids	13.06

Ewe's milk is thickish, white, of agreeable taste and smell, and very rich in fat and caseine; sp. gr. 1.032 to 1.044. Analyses:

	Stefanelli, 3 analyses.	Filhol and Joly, Southdown.	Filhol and Joly, Merino.	Filhol and Joly, Jauragagio.	Voelcker.	Macadam, 4 ewes.
Fat	6.97	3.70	7.60	10.40	1.20	5.72
Caseine, etc.	5.49	7.90	9.02	8.30	4.58	11.12
Sugar	3.63	5.35	4.37	4.16	5.00	
Salts	0.97	0.55	0.61	0.16	0.68	0.94
Water	82.94	82.50	78.40	76.98	88.54	82.22
	100.	100.	100.	100.	100.	100.
Solids	17.06	17.50	21.60	23.02	11.46	17.78

Goat's milk is white, of insipid sweetness, and peculiar odor; sp. gr. 1.034 to 1.036. On coagulation its caseine forms thick clots. It is very similar to cow's milk in composition. Analyses:

	Gorup-Bezanez.	Cameron.	Jagielski.	Voelcker.	Stohmann, 32 analyses.	Macadam, 4 analyses.
Fat	4.36	5.69	3.40	3.32	4.20	5.14
Caseine	3.36	3.51	4.40	4.02	3.76	10.79
Albumen	1.30					
Sugar	4.00	3.69	4.30	5.28	4.72	
Salts	0.62	0.62	0.80	0.58	0.92	0.89
Water	86.36	84.49	87.10	86.80	86.40	83.18
	100.	100.	100.	100.	100.	100.
Solids	13.64	15.51	12.90	13.20	13.60	16.82

(See Stohmann, *Experiments on Feeding Milk-producing Animals, Jahresb. Ag. Chem.*, xiii.–xiv. 1870–72, p. 161.)

The milk of sows is thickish and stringy. The taste is cool and rich, but not sweet. It is alkaline. Sp. gr. 1.0298 to 1.041. Few analyses have been made, as the sows generally refuse to yield a drop to even the most skilful dairymaids. Analyses:

	Von Gohren.			Sintner.	Cameron.
	Colostrum.	Six days after birth of litter.	Nineteen days after birth of litter.	Five weeks after birth of litter.	
Fat	9.53	3.14	2.82	6.88	6.00
Caseine, etc.	15.56	12.89	5.68	6.89	5.30
Sugar	3.84	2.80	1.60	2.01	6.07
Salts	0.85	0.71	0.87	1.29	0.83
Water	70.13	80.43	89.26	82.93	81.80
	99.91	99.97	100.23	100.	100.
Solids	29.86	19.57	10.74	17.07	18.20

(Von Gohren, *Jahresb. Ag. Chem.*, viii. 1865, 377; Sintner, *Jahresb. Ag. Chem.*, viii. 1865, 378; Cameron, *Chem. News*, xix. 1869, 217.)

Canine milk is rather thick, and becomes thicker on warming, when it does not coagulate; sp. gr. 1.033 to 1.036. Analyses:

	Von Tolmatscheff.		Szbotin.		
	Five weeks after birth of pups.		Food, lean meat.	Food, potatoes.	Food, fat.
Fat	10.77	12.84	10.64	4.98	10.11
Caseine	5.52	3.94	5.20	4.25	5.92
Albumen	2.99	2.97	3.97	3.92	4.26
Sugar	3.05	3.38	2.49	3.42	2.15
Salts, Extractive	......	......	0.44	0.48	0.39
Water	......	......	77.26	82.95	77.37
			100.	100.	100.
Solids	......	......	22.74	17.05	22.63

(Von Tolmatscheff, *Jahresb. Ag. Ch.*, 1868–69, xi., xii. 548.) Szbotin (*Jahresb. Ag. Ch.*, x. 1867, 296) fed his dogs on lean meat, potatoes, and fat alternately. He found the milk to be always sour. The yield of milk was greatest when the food was meat. It fell off rapidly on potatoes, and still more on fat; two dogs stopped furnishing milk, but began again when fed on meat. A considerable addition of fat to the meat-diet, 3 of fat to 1 of meat, reduced the milk-yield to a minimum. Thin dogs grew fat on a meat-diet.

Literature.—In addition to authorities already mentioned: *The Milk Journal; Milch-Zeitung; Milch Cows and Dairy Farming*, C. L. Flint (1874); *Du Lait et de l'Allaitement*, C. Marchand (1874); *Milk Analysis*, J. A. Wanklyn (1873); *Lectures on Food*, Dr. Letheby (1870); *U. S. Patent-Office Report* (1861); *Food and its Adulterations*, Hassall (1855); Gmelin's *Chemie*, Bd. viii. 246; Watts's *Dict.* and Suppls.; *Du Lait*, Bouchardat et Quevenne (1857); *Anleitung zur Prüfung du Kuhmilch*, C. Müller (1857); *Memoir sur le Lait*, Quevenne (1841); *Du Lait chez la Femme*, Vernois et Becquerel (1852); *Analyse du Lait*, V. et B. (1856); Chevalier and Henry, *Dingler Pol. J.*, 74, 159; Quevenne, *Dingl.*, 84, 55; Dumas, *J. f. pr. Ch.*, 37, 14; Poggiale, *Compt. rend.*, 28, 584; Vernois et Becquerel, *Compt. rend.*, 36, 187: Baumhauer, *J. f. pr. Ch.*, 84, pp. 145, 157, 167; Müller, *J. f. pr. Ch.*, 86, 380; Liebig, *Künstliche Milch, Compt. rend.*, 64, 997; *Jahresb. Ag. Chem.; Jahresb. Thier. Chemie; Jahresb. der Chemie; Jahresb. der Chem. Technologie.*

C. F. Chandler.

Milk Fever, a name applied by midwives to a short febrile attack which sometimes attends the beginning of the milk-secreting process, a few days after childbirth. It is sometimes ushered in by profound and rather alarming chills, but is unimportant except as sometimes simulating the onset of puerperal fever, for which it is occasionally mistaken. Farmers and veterinarians apply the name to puerperal peritonitis of the lower animals, and to a severe form of cerebro-spinal meningitis which sometimes attacks cows after calving. The last-mentioned disease is treated by cathartics, mercury, aconite, and heat to the spine; the former, by opium, aconite, mercury, and hot abdominal fomentations.

Milk Quartz, a quartz of milk-white color, occurring chiefly in Greenland. (See Quartz.)

Milk Sugar. See Milk, by C. F. Chandler, M. D., Ph. D., LL.D.

Milk Tree, applied to trees whose trunks yield a milky fluid fit for food when incised. Such are the cow tree (see Artocarpaceæ), found in the Caraccas Islands; the kiriaguma, or *Gymnema lactiferum*, of Ceylon, used for domestic purposes; and the tabayba dolce, or *Euphorbia balsamifera* (see Euphorbia) of the Canary Islands, yielding a wholesome juice resembling sweet milk.

Milk Weed. See Asclepiadaceæ and Asclepias.

Milky Way. See Galaxy, by Prof. S. Newcomb, M. N. A. S.

Mill. See Grinding and Crushing Machinery, by Prof. R. H. Thurston, C. E.

Mill (James), b. at Logie Pert, Forfarshire, Scotland, Apr. 6, 1773; was educated at the University of Edinburgh, and was licensed as a preacher in the Scottish National Church 1798, but abandoned that career in consequence of a change of religious opinions; became a tutor in the family of Sir John Stuart, whom he accompanied to London in 1800, and settled in that capital as an author. He edited the *Literary Journal;* became intimately connected with Jeremy Bentham, residing in his house and expounding his opinions to the English public; wrote an elaborate *History of British India* (3 vols., 1817–18), which procured him an important post in the office of the East India Company; was one of the chief contributors to the *Westminster Review* (1824); published a treatise on *Political Economy* (1821–22); wrote largely for the *Encyclopædia Britannica* on political and social subjects, and was author of a remarkable work on the sensational philosophy, *An Analysis of the Phenomena of the Human Mind* (2 vols., 1829). He was an intensely active man, and that quality, in connection with his great logical power and ample knowledge, gave him great influence. He forms the true transition from the radicalism of the French Revolution to the radicalism of modern liberalism. D. June 3, 1836.

Mill (John), D. D., b. at Shap, Westmoreland, England, about 1645; was educated at Queen's College, Oxford, where he became fellow 1669; was chaplain to Charles II. 1681; principal of St. Edmund's Hall 1685; became prebendary of Canterbury and rector of Bletchington, Oxfordshire, where he d. June 23, 1707. A learned edition of the *Greek Testament, with Various Readings*, by which he is still remembered, cost him thirty years' labor, and was published only a few days before his death.

Mill (John Stuart), son of James Mill, b. in London May 20, 1806. His father took sole charge of his education, and conducted it in a way to secure a precocious development. Mill says of himself: "I have no remembrance of the time when I began to learn Greek; I have been told that it was when I was three years old." At eight he was reading Herodotus, Xenophon, and Plato; and during the next four years he read the works of the leading Latin authors and the Greek poets, dramatists, orators, and philosophers, even to Aristotle's *Rhetoric*. In the same period he was grappling with the problems of the calculus and higher mathematics, and finding his recreation in reading history and books of experimental science, interspersed with earnest conversations with his father as they took long walks together. In his fourteenth year he was taken through a complete course of political economy, with the help of such books as were then published and of discussions with his father. Up to this time he had been excluded from participation in the ordinary sports of children and from association with other boys. When about fourteen he left England for a year, spent mostly in the S. of France. There he imbibed a taste for mountain-scenery, took lessons in fencing and other forms of bodily exercise, attended lectures on science, and studied the higher mathematics under private tuition. He carried home with him a strong and permanent interest in continental liberalism, which qualified his subsequent political views. He received the impress of his father's religious skepticism to such a degree that he confesses, "I am one of the very few examples in this country of one who has not thrown off religious belief, but never had it. I looked upon the modern exactly as I did upon the ancient religion, as something which in no way concerned me." On his return from France he assisted his father in preparing for the press a work on political economy. Soon after he studied law with John Austin, a devoted disciple of Bentham. All his associations identified him with Bentham's school of philosophy, to which he claims to have given the title "*utilitarian*." When seventeen years old his father secured for him an appointment from the East India Company, in whose service he remained for thirty-five years, rising steadily from the lowest grade of clerk to the highest post in his department, that of examiner of India correspondence. The same year (1823) the *Westminster Review* was established by Bentham and his followers as a radical organ in politics and religion. Young Mill commenced at once contributing to its pages, and made it for many years the chief medium for publishing his literary efforts. From 1835 to 1840 he was its principal conductor. When only twenty-one he edited Bentham's great work *On Evidence*, adding notes and supplemental chapters of his own. With the bringing out of his *System of Logic, Ratiocinative and Inductive*, in 1843, he became prominent as a strong, bold radical writer on philosophical subjects. This work embodied the chief peculiarities of the utilitarian school of philosophy. After having previously treated parts of the subject in a series of essays, he published in 1848 his full treatise, entitled *Principles of Political Economy, with some of their Applications to Social Philosophy*. This work has passed through several editions in England and America, and has a place among the standard works on the subject. On the dissolution of the East India Company in 1856, Mill, thrown out of his office, turned his attention altogether to literary labors. He published in 1859 a work *On Liberty*, which strikes at the despotism of public opinion over individual freedom of thought. In the same year was issued a collection of his *Dissertations and Discussions, Political, Philosophical, and Historical*, which had previously appeared in the *Westminster* and *Edinburgh Reviews;* also an essay entitled *Thoughts on Parliamentary Reform*, in which he advocated the extension of suffrage without distinction of sex on the basis of educational qualifications. In 1865, Mr. Mill was returned to Parliament, but his career in that body disappointed his constituents and the public generally. His chief prominence was in advocating the measure to admit women to the suffrage, which failed. In the new election he was rejected, and retired from public life. During his remaining years his residence was in the S. of Europe, near Avignon, varied by spending some time twice a year in the neighborhood of London. He devoted his time to miscellaneous literary work, the fruits of which were in part presented to the public under his own eye and in part reserved for posthumous publication. Of the latter, his *Autobiography* and *Essays on Theism* are worthy of special notice. In his domestic relations Mr. Mill was quite peculiar. In 1830, when in his twenty-fifth year, he formed the acquaintance of Mrs. Taylor, and was drawn into an almost idolatrous devotion towards her. Though they passed many hours of every day in each other's society, their personal intercourse was held under due restraint until after the death of Mr. Taylor, for whom both cherished high respect. She shared in his literary work, and he says, rather extravagantly, "What I owe, even intellectually, to her is in its detail almost infinite." In 1851, after twenty years of such intimacy, that "most valued friendship of his life" was consummated by a formal marriage. His wife died at Avignon in 1859, after which he fixed his residence near her grave. There, with her eldest daughter, he cherished her memory as a "religion," and endeavored still to regulate his life with supreme regard to her approbation till his own death, on May 8, 1873. Besides the works above noticed, Mr. Mill gave to the public the following—viz. *Considerations on Representative Government* (1861), *Utilitarianism* (1862), *Auguste Comte and Positivism* and *Examination of Sir William Hamilton's Philosophy* (1865), *England and Ireland* (1868), *The Subjection of Women* (1869), *Chapters and Speeches on the Irish Land Question* (1870). His *Autobiography* appeared soon after his death, in 1873, and the *Three Essays—Nature, The Utility of Religion*, and *Theism*, in 1874. A clear and candid presentation of Mill's views and character is given in a little memorial published in 1873, which is made up of twelve distinct sketches by H. R. Fox Bourne, Herbert Spencer, J. E. Cairns, Henry Fawcett, and others well acquainted with the man and familiar with his writings.

A. L. Chapin.

Millais' (John Everett), b. at Southampton June 8, 1829. He is of French extraction, and spent his early years in France and Jersey; was sent to London to study art at the Royal Academy. Before he was eighteen years old he had gained prizes for drawing and had borne off medals of silver and gold. His first exhibition was in 1846—*Pizarro seizing the Inca of Peru.* This was followed in 1847 by *Queen Elgiva delivered to the Emissaries of Dunstan* and *The Widow's Mite,* a colossal cartoon; in 1848, *The Tribe of Benjamin seizing the Women of Shiloh.* These pictures bore the marks of academic training, and were more or less conventional in manner. But in 1849, Millais, in concert with William Holman Hunt and D. G. Rossetti, threw off the academic tradition, and, starting with the purpose to paint nature and life as they really appeared, inaugurated what soon became celebrated as the "pre-Raphaelite school" of art. The doctrines of the new school were set forth in a short-lived periodical, called *The Germ,* the few numbers of which appeared in 1850. The philosophy and rationale of the painters found an eloquent champion in John Ruskin (*Modern Painters*), but the painters relied for their justification on their work. Mr. Millais produced in 1849 *Isabella;* in 1850, *Ferdinand lured by Ariel* and *Our Saviour;* in 1851, *The Woodman's Daughter* and *Mariana in the Moated Grange;* in 1852, *The Huguenot* and *Ophelia;* in 1853, *The Proscribed Royalist* opened to him the doors of the Royal Academy, not without opposition; *The Order of Release* was produced the same year; later came *The Rescue, Peace Concluded, Autumn Leaves, The Child of the Regiment, The Dove returning to the Ark, Sir Isumbrus at the Ford, The Heretic, The Black Brunswicker, Joan Darc, The Romans leaving Britain, Sleeping, Waking, Jephthah.* His picture is an object of interest at the annual exhibitions. Some of the above, *Isabella* and *The Huguenots* especially, are well known through engravings. Mr. Millais was chosen a member of the Royal Academy in 1863. He shows but slightly the mystical fervor of his friend Hunt; and Mr. Ruskin, in recent criticisms, has intimated disappointment with his latest work as lacking vigor of conception and truthfulness. O. B. FROTHINGHAM.

Millard (DAVID), b. in Ballston, N. Y., Nov. 24, 1794; became a minister of the "Christian" denomination 1815; was pastor of a church at West Bloomfield, N. Y., 1818–32, and at Portsmouth, N. H., 1837–40; published *The True Messiah in Scripture Light* (1818); edited for several years a monthly magazine called *The Gospel Luminary;* visited Palestine in 1841, and published *Travels in Egypt, Arabia Petræa, and the Holy Land* (1843); settled again at Bloomfield, and was from 1845 to 1867 professor of biblical antiquities and sacred geography at Meadville Theological Seminary. D. at Jackson, Mich., Aug. 3, 1873. (See his *Life,* by his son, Rev. D. E. Millard, 1874.)

Millau. See MILHAU.

Millbank, R. R. junction, cap. of Grant co., Dak. (see map of Dakota, ref. 5–G, for location of county). Pop. not in census.

Mill'brook, post.-v. of Cavan tp., Durham co., Ontario, Canada, on the Midland Railway, at the junction with the Peterboro' and Lakefield branch, 18 miles from Port Hope. It has important manufactures. Pop. in 1881, 1148.

Millbrook, cap. of Graham co., Kan. (see map of Kansas, ref. 4–D, for location of county), on S. Fork of Solomon River. Pop. in 1880, 72.

Mill'bury, R. R. junction, Worcester co., Mass. (see map of Massachusetts, ref. 3–F, for location of county), 6 miles S. of Worcester, has a high school, water-power furnished by the Blackstone River, 8 cotton and 5 woollen mills, and manufactures of stockings, cutlery, castings, carriages, whips, lumber, and shoes. Pop. of tp. in 1870, 4397; in 1880, 4741; in 1885, 4555.

Mil'ledge (JOHN), b. at Savannah, Ga., in 1757; became a lawyer; served in the Revolutionary war; attorney-general of Georgia 1780; governor 1802–06; was in Congress nearly ten years, 1792–1802; U. S. Senator 1806–09, and was the principal founder and a liberal benefactor of the University of Georgia. D. Feb. 9, 1818.

Mil'ledgeville, city and R. R. centre, cap. of Baldwin co., Ga. (see map of Georgia, ref. 4–H, for location of county), 32 miles N. E. of Macon, has cotton manufactory, water-power, State lunatic asylum, State penitentiary, and is the centre of a cotton-growing region. It was formerly the capital of Georgia. Pop. in 1870, 2750; in 1880, 3800.

Mil'ledoler (PHILIP), D. D., b. at Farmington, Conn., Sept. 22, 1775; studied at Edinburgh, Scotland; became pastor of the German Reformed church in New York May, 1795, of the Third Presbyterian church in Philadelphia 1800–05, of the Rutgers street Presbyterian church, New York, 1805–13, and from 1825 to 1841 was president of Rutgers College, N. J. He was one of the founders of the American Bible Society, and published numerous lectures and essays. D. on Staten Island Sept. 22, 1852.

Millenarians. See MILLENNIUM.

Millen'nium [Lat. *mille,* "thousand," and *annus,* "year"]. In theology, the term is technically applied to the thousand years' reign of the Messiah at the end of time. There are numerous theories of the millennium, but they all may be reduced to two, the literal and the spiritual.

(1) The literal notion of the millennium is said to have originated, or at least to have received its peculiar form, from Rabbi Elias, who lived about two centuries before the Christian era. According to Jewish tradition, the world is to last seven thousand years—six thousand to be years of toil and trouble, and the seventh thousand to be a grand *sabbatism.* It is to be ushered in by the advent of the Messiah, who is to establish his throne at Jerusalem. The holy city is to be rebuilt with surpassing magnificence, as described by Tobit (xiii., xiv.); the Jews are to return to Palestine; their pious ancestors are to be raised from the dead and reign in their own land, with their offspring, under the Messiah. Rabbi Saadias, on Dan. vii. 18, says: "Because the Jews rebelled against their Lord, their kingdom shall be taken from them and given to the four monarchies, that shall possess it in this world, and shall subdue and carry captive Israel till the age to come, in which the Messiah shall reign." To the same effect are the Targums in various places. They thus interpret those glowing predictions in the prophets concerning the latter-day glory of the Church. The Jews are to live in ease and splendor; all other nations are to do them homage and minister to their pleasure. The literal theory of the millennium, as held by some Christians, is very much like the rabbinical, only it recognizes Jesus as the true Messiah, and the equality of Gentile and Jewish believers in the millennial age. It is traced to Papias, bishop of Hierapolis in the second century, though Cerinthus, a heretic of the first century, is said to have held it. Papias was a man of slender intellect and prodigiously superstitious. According to Irenæus, he pretended to have received a tradition from the apostle John to this effect: "The days shall come in which there shall be vines which shall severally have ten thousand branches, and every one of these branches shall have ten thousand lesser branches, and every one of these branches shall have ten thousand twigs, and every one of these twigs shall have ten thousand clusters of grapes, and in every one of these clusters shall be ten thousand grapes, and every one of these grapes being pressed shall give twenty-five *metretas* of wine; and when a person shall take hold of one of these sacred bunches, another shall cry out, 'I am a better bunch, take me, and by me bless the Lord.'" He reports similar traditions concerning other productions of the earth during the millennial period. Justin Martyr, who endorsed the millennial fancies of Papias, says that Jerusalem shall be rebuilt, adorned, and enlarged; Gentile believers shall dwell in the holy land with the Jews, who shall acknowledge Jesus as the true Messiah, and he shall reign corporeally at Jerusalem in great magnificence. The Jews, says Irenæus, shall then be restored to the land of their fathers. The temple, says the pseudo Barnabas, shall be gloriously rebuilt. All the just, says Tertullian, shall rise during the millennium—some sooner, some later. The millennium, says Lactantius, belongs to all the righteous who have lived from the beginning of the world; and the righteous who shall be alive at the coming of Christ shall not die, but Christ shall live with them a thousand years. Papias says it shall be a reign of Christ bodily on the earth. Justin Martyr, Irenæus, Tertullian, Nepos, Lactantius, as well as Papias, say that they shall have abundance of delicious things—rich food and wines, slaves to minister to their wants; all the animals, wild as well as tame, shall be subject to them; they shall marry and be given in marriage, and have an abundant offspring. In short, like the chiliastic Jews, they interpret all the predictions of the prosperity of the Church found in the prophets in this literal manner. They very naturally pressed Rev. xx. 1–10 into their service, interpreting in this manner the thousand years' reign of the martyrs with Christ. These fanatical notions were strenuously opposed by Origen, Dionysius, bishop of Alexandria, Jerome, Augustine, and other Fathers. Origen says those who held them were some of the simpler sort, who understood Scripture *judaico sensu,* after the manner of the Jews. He represents their doctrine as wicked, a reproach to Christianity, the heathen having better sentiments. Jerome stigmatizes these notions as Jewish fables, whose advocates do not understand the Apocalypse. He says he is not one of those who have here a continuing city; he looks not for an earthly but for a heavenly Jerusalem, which is the mother of us all. They who interpret the Apocalypse according to the letter must Judaize. He commends Dionysius, who repudiated what he called "the *fable* of the thousand years, and of the *earthly Jerusalem* glittering with jewels and

gold; and the restoration of the Hiero-Solymitan temple; and the immolation of bulls and goats; and a new calendar of sabbaths; and the victorious march of armies; and the furious din of battles; and the pompous pageantry of triumphs; and the voluptuous revelry of banquets." These, he says, are the feverish dreams of fanatical enthusiasts, not the sober deductions of sound reason nor the fruits of holy meditation on the word of God. Augustine, in the twentieth book of the *City of God*, says that he once held chiliastic views, but that he had seen good reason to renounce such ridiculous fables. He explains the first resurrection, the reign of martyrs, etc. in a spiritual sense. Being thus opposed by the great doctors of the Catholic Church, these gross chiliastic views subsided. But they were revived at the time of the Reformation. The fanatical Anabaptists, Münzer and his followers, essayed to put down all temporal sovereignty and to establish the kingdom of the saints with fire and sword. They were, however, vigorously opposed by Luther, Melanchthon, Chemnitius, Gerhard, Osiander, Calvin, and the continental Reformers generally. Thus, the Augsburg Confession says: "Christ will come to judgment, and will raise all men, both bad and good; and we condemn those who are now propagating the Judaistic opinion that before the general resurrection of the dead the saints will reign on earth." Chemnitius says the opinion of the Chiliasts is a fundamental error. Calvin says, "The error of the Millenarians is too puerile to deserve or require refutation; nor does the Apocalypse give them any countenance." The Fifth-Monarchy Men in England, in the time of Cromwell, pursued a similar course to that of their congeners on the Continent. From an erroneous interpretation of Daniel's prophecies concerning the four great monarchies, to be succeeded by the kingdom of the Messiah, they fancied that the time had come when the saints of the Most High should take the kingdom, and that they were the saints. They accordingly banded together to put down all human government, assumed scriptural names, and claimed to rule as the deputies of the Messiah, whose corporeal advent and reign on the earth was soon to take place. These fanatics, however, were speedily suppressed. Yet the cardinal principle of this Judaico-Christian millennium survived, and still survives. From time to time visionaries have announced that Christ was about to descend corporeally to the earth; that the righteous dead, or at least the martyrs, were to be raised from their graves and reign with him at Jerusalem; the Jews were to be suddenly brought in with the fulness of the Gentiles; crime and oppression and all other evils were to cease; and this good time was to last a thousand years, after which the rest of the dead were to be raised, the earth was to be burnt up, the world judged, and the reign of Christ to be merged into that of the Triune God. Men holding these views have been found among all sects, even in the Church of England, though they are so severely censured by that Church. The forty-first article of the Confession set forth in the reign of Edward VI. says: "They that go about to revive the fable of heretics, called *Millenarii*, be repugnant to Holy Scripture, and cast themselves headlong into a Jewish dotage." This "fable" of the pre-millennial advent of Christ is opposed by the Collects for the first and third Sundays in Advent, in which occurs the petition, "That in the last day, when he shall come again in his glorious majesty to judge both the quick and dead, we may rise to the life immortal;" and this: "That at thy second coming to judge the world we may be found an accepted people in thy sight." So other parts of the Liturgy; so the three Creeds, especially the Athanasian, which says, "He ascended into heaven, he sitteth on the right hand of the Father, God Almighty; from whence he shall come to judge the quick and the dead. At whose coming all men shall rise again with their bodies, and shall give account for their own works. And they that have done good shall go into life everlasting, and they that have done evil into everlasting fire." So the fourth article: "He ascended into heaven, and there sitteth until he return to judge all men at the last day." The old divines opposed the Chiliastic fable in a similar way; thus, Bishop Andrewes, in a sermon on the Resurrection: "Christ riseth with *ascendo* in his mouth; no sooner risen but he makes ready for his ascending straight. This, if there were nothing but this, was of itself enough to make the idle dream of the old and new Chiliasts to vanish quite, who fancy to themselves I wot not what earthly kingdom here on earth, somewhat like Mohammed's paradise, and will not hear of *ascendo* after they have risen till a thousand years at least. This is none of Christ's rising, I am sure. So let it be none of ours." Notwithstanding all this, some learned men of the Anglican communion—Joseph Mede, Bishop Newton, and others—misled by an erroneous interpretation of Daniel and the Apocalypse, construe the thousand years of Rev. xx. in a literal sense. In later times a considerable number of the "Evangelicals" in the Church of England, and some divines of the Church of Scotland, and many Dissenters, have given countenance to the notion of the pre-millennial advent of Christ and his corporeal reign on the earth. A sect has recently arisen in the U. S., called "Second Adventists," who make these views a specialty in their creed. They have been disappointed several times in their expectations of the second advent of Christ, but they persist in asserting that he is soon to make his appearance, and they want to be found ready when he shall come.

(2) The spiritual theory of the millennium ignores all Jewish traditions and patristic fancies. The number 1000 is frequently employed in the Scriptures as denoting a great many—a definite number for an indefinite. "A thousand years" is used in three passages in this way. Thus, in Psalm xc. 4: "A thousand years in thy sight are but as yesterday when it is past." 2 Pet. iii. 8: "One day with the Lord is as a thousand years, and a thousand years as one day." So in Rev. xx. 1–7, Satan is said to be bound "a thousand years," and the martyrs reign "a thousand years." This is evidently a definite number for an indefinite, indicating a long period. The entire passage is figurative, in keeping with the enigmatical book in which it is found. The angel with the key of the abyss, a chain, and a seal to bind and confine the devil, thrones and the souls of martyrs seated upon them, and judgment given to them,—these are all pictorial representations of the circumscription of Satan's power, the revival of the martyr-spirit in the Church, and the general prevalence of truth and righteousness in the earth. This agrees with the figurative style of the Apocalypse, and corresponds with the predictions concerning the prosperity of the Church in the last days. In no other place is there any allusion to a millennium. Some, like Canon Wordsworth, think the thousand years spoken of by John is an indefinite period covering over the whole term of the Christian dispensation. They think Satan's power was so circumscribed at the coming of our Lord that he may be represented as bound with a great chain and cast into the abyss. They refer to Milton's *Hymn on the Nativity of Christ:*

——"for from this happy day
Th' old dragon underground,
In straiter limits bound,
Not half so far casts his usurpèd sway—
The oracles are dumb," etc.

But that hardly agrees with the statements of the New Testament, in which Satan is represented "as a roaring lion, walking about seeking whom he may devour," and "whom" we are to "resist, steadfast in the faith" (1 Pet. v. 8, 9). And Paul says, "We wrestle not against flesh and blood, but against principalities and powers, against the rulers of the darkness of this world, against spiritual wickedness in high places" (Eph. vi. 12). And in this book of the Revelation Satan is set forth as the prime agent in all the persecutions waged against the Church by Jewish and pagan powers. The seat or throne of Satan, as the prince of this world, is spoken of in Rev. ii. 13: it is predicted, "Behold, the devil shall cast some of you into prison, that ye may be tried, and ye shall have tribulation ten days" (Rev. ii. 10). Multitudes are put to death by his instigation: "And I saw under the altar the souls of them that were slain for the word of God, and for the testimony which they held; and they cried with a loud voice, saying, How long, O Lord, holy and true, dost thou not judge and avenge our blood on them that dwell on the earth? And white robes were given unto every one of them, and it was said unto them that they should rest for a little season, until their fellow-servants also, and their brethren that should be killed as they were, should be fulfilled" (Rev. vi. 9–11). This period of persecution lasted until the downfall of pagan Rome; and in later ages the persecution of the Church has been revived with scarcely less diabolic fury and rage, showing clearly that Satan was not very closely bound—was not confined to the abyss, but roamed the earth, and still roams it, like an infuriated beast of prey, the adversary of God and man. The millennium of Rev. xx. therefore can hardly be identical with the whole period of the Christian dispensation. It seems rather to denote an extended season of tranquillity and prosperity which the Church shall enjoy before the coming of Christ and the end of time. According to the prophecies of Scripture, during this period there will be a great augmentation of holiness in the Church; larger measures of the Holy Spirit's influence will be enjoyed; there will be a general diffusion of religious knowledge in the earth; the Jews will be brought in with the fulness of the Gentiles; there will be universal peace, and the dominancy of the great principles of truth and righteousness among all the nations of the earth. Besides the predictions which refer to the prosperity of the Jews after their return from captivity and under the Asmonean dynasty, and those which refer to the introduction and establishment of the new dispensation, there are others which have not yet had their fulfilment, and which therefore await their accomplishment in the last days of this dispensation. This is the millennium. (Cf. Isa. xi.; Rom. xi.) There is no sign by which this period can be pointed out. It will be brought to pass by the divine blessing upon the means employed by the Church for the conversion of the world. This glorious revival is called a resurrection, not because the bodies of the saints shall be raised —as that will not take place till the last day—but it is a resurrection of their "souls;" as Paul says, "What shall the receiving of them be"—that is, the bringing in of the Jews with the fulness of the Gentiles—"but life from the dead?" This is agreeable to the style of prophecy which is everywhere employed in the Revelation. (Cf. Isa. xxvi. 19; Ezek. xxxvii. 13, 14; Hos. vi. 2; Rev. xi. 7, 11.) It is marvellous that this, which is so obvious, should have ever been overlooked. "The rest of the dead, which lived not again until the thousand years were finished," are supposed to represent the enemies of the Church, the same spoken of in the preceding chapter (Rev. xix. 21), who shall have no power to injure the saints during this halcyon period. Dr. Cowles, indeed, suggests that the resurrection of the martyrs here spoken of denotes an accession of glory and bliss which they shall experience in heaven when they shall witness on earth the triumph of the cause for which they suffered (Rev. vi.), and that the rest of the dead are the other righteous souls in heaven, who will not realize such an augmentation of their felicity until after the general resurrection of the dead. But this seems rather forced. He admits that the revival of true religion is called in Scripture a resurrection, and may be so understood in this place. At the close of this period the power of the enemies of the Church will be somewhat revived, but they shall soon be suppressed. Then cometh the end, when Christ, having subdued all the rebels in this revolted province, shall deliver up the kingdom to God, even the Father, that God may be all in all. This plain, simple interpretation is consistent with itself, agrees with the figurative style of the Apocalypse, and harmonizes with the prophecies concerning the latter-day glory of the Church and the whole scheme of Christian eschatology. This teaches that there will be, before the close of this dispensation, an indefinite period of prosperity for the cause of Christ; that at its termination there will be a sharp but short and unsuccessful attack upon the Church; that immediately after this Christ will come the second time corporeally to the earth. This spiritual view agrees with the *paracletal* work of Christ—the Judaico-Christian does not. Christ is our Advocate, our *Paraclete*, with the Father (1 John ii. 1). It was "expedient" that he should "go away" (John xvi. 7–16), and it is expedient that he should stay away—that the heavens should receive him and retain him until the times of restitution of all things which God hath spoken (Acts iii. 21), ever appearing in the presence of God for us (Heb. vii. 25; ix. 24). In the economy of salvation his glorious bodily presence in heaven is a necessity; on the earth it would be an impertinence. The spiritual view also agrees with the *paracletal* work of the Holy Ghost—the literal does not. It was "expedient" for the Church that Christ should "go away," that the other *Paraclete*, the Holy Spirit, should be sent, and he is to "abide" in the Church "for ever" (John xiv. 16, 17, 25, 26; xv. 26; xvi. 7–15). His subjective work, as the *Paraclete* with us and in us, is as necessary as the objective work of the Lord Jesus Christ, as our Advocate, our *Paraclete*, with the Father. The Spirit is accessible and available under all circumstances; and there is no need, and there never will be any need, of repairing to Jerusalem or any where else to find the King of saints, for by his Spirit he dwells in the Church through all the ages, and in every true believer's heart (John vii. 39; xiv. 20–27; Rom. viii. 9–27). The spiritual view fosters no visionary and fanatical notions—the literal does. Judaizing Chiliasts are always asking the question, "Lord, wilt thou at this time restore again the kingdom to Israel?" (Acts i. 6). And despite the rebuke given to the chiliastic ambition of the mother of Zebedee's children, and shared by James and John themselves, there are not wanting those who are ready to prefer the request, "Grant that these my two sons may sit, the one on thy right hand, and the other on the left, in thy kingdom" (Matt. xx. 20, ff.; Mark x. 35, ff.). Such persons are always expecting "the kingdom of God to come with observation"—always looking for a sign from heaven, the corporeal coming of the Son of Man, whereas the coming spoken of in Matt. xxiv. took place eighteen centuries ago, when, in his retributive providence, not in his corporeal presence, he came to destroy the Jewish state. Those who entertain spiritual views of the millennium expect the second coming of Christ, but it is to be "in his glorious majesty, to judge both the quick and the dead." The spiritual view is favorable to efforts to convert the world—the literal view is not. Some who hold the latter are indeed zealous in the missionary cause, but it is in despite of their system, not because of it. Others carry out consistently their principles. They say that the world is to get worse and worse till Christ comes in person to make it better, and it is needless to attempt the conversion of either Jews or Gentiles before his advent. But those who believe that the millennium is to be ushered in by the instrumentality of the Church, laboring and praying for the universal spread of the kingdom of Christ, act consistently when they devote themselves zealously to this great undertaking. They know that the gospel must be preached to every creature, and that the Church has this great work in charge; and they expect no miraculous signs and wonders to be wrought for its accomplishment. Zealous, persevering efforts for the conversion of the world agree with their views of the millennium. This interpretation, too, corresponds with the scriptural account of the *Parousia*, or coming of Christ—the other does not. According to the Scriptures, when Christ makes his second advent it is to raise the dead, good and bad. There is to be but one literal resurrection; that is to take place "at the last day." (Cf. John v. 28, 29; vi. 39, 40, 44, 54; xi. 24; Luke xiv. 14; Acts xxiv. 16; 1 Cor. xv. 51, 52; 1 Thess. iv. 14–17, where it is said, "the dead in Christ shall rise first"—that is, not before the other dead, but before the living shall be changed.) "The dead, small and great," "just and unjust," shall be raised simultaneously, and together "stand before God" (Rev. xx. 11–15); and this is to be after the millennium. (Cf. Matt. xxv. 31–46.) When Christ makes his second advent it will not be to reign a thousand years upon the earth—or three hundred and sixty-five thousand, according to the dream of those who make a day in prophecy mean a year—but it will be to burn up the earth and the works that are therein. That will take place at "his coming," as Peter expressly says (2 Pet. iii. 1–14). When Christ "appears the second time, without sin unto salvation," it will be to "the judgment" (Heb. ix. 27, 28); not to reign a thousand years on the throne of earthly dominion, but to sit upon the throne of judgment; "and before him shall be gathered all nations" for that grand assize (Matt. xxv. 31–46. Cf. Acts xvii. 31; 2 Cor. v. 10). He will "judge the quick and the dead at his appearing and his kingdom" (2 Tim. iv. 1). We are exhorted to "abide in him, that when he shall appear we may have confidence, and not be ashamed before him at his coming" (1 John ii. 28). He will then assign the good and the bad to their eternal destinies. For it is when the Son of Man shall come in his glory, and the good and the bad shall be judged by him, that these shall go away into everlasting punishment, but the righteous into life eternal. This will take place "in that day" when "the Lord, the righteous Judge," shall reward his faithful servants and consign the unfaithful to outer darkness. This is the moral of the parables of the wheat and the tares, of the good and the bad fishes. "So shall it be at the end of the world: the angels shall come forth, and sever the wicked from among the just, and shall cast them into the furnace of fire: there shall be wailing and gnashing of teeth" (Matt. xiii. 36–50). This day of judgment is called emphatically "the day of the Lord," and it will come "as a thief in the night;" not to usher in a millennial reign upon our globe, but to burn up the earth, judge the nations at his bar, admit the righteous through the gates into the city above, and punish the wicked "with everlasting destruction from the presence of the Lord and from the glory of his power." This is to take place "when the Lord Jesus shall be revealed from heaven, with his mighty angels, in flaming fire," and "when he shall come," also, "to be glorified in his saints, and to be admired in all them that believe" (2 Thess. i. 7–10). All the promises of reward for obedience and indemnity for suffering, and all the aspirations of the saints, refer not to a thousand years' reign with Christ here on earth, but to an everlasting reign with him in heaven. (Matt. v. 12; Luke xiv. 13, 14; John xiv. 1–4; xvii. 24; 1 Cor. xv.; 2 Cor. v. 1–10; Phil. i. 21, 23; iii. 20, 21; 1 Thess. iv. 13–18; 2 Tim. ii. 10–12; iv. 6–8; Heb. xi. 8–16; 1 Pet. i. 3–9; iv. 13; v. 4; 2 Pet. i. 11; 1 John iii. 2, 3; Rev. ii. 10; xxii. 14, 15, *et al.*)

Thus, the common spiritual view of the millennium agrees —while the other does not—with the figurative style of the Revelation; is adjusted to the economical work of the Son and of the Holy Spirit; fosters no visionary or fanatical notions, but is agreeable to the principles of truth and sobriety; corresponds with the scope of prophecy concerning the conversion of the world; favors missionary exertions, and harmonizes with the scriptural account of the second advent of Christ, to raise the dead, to burn up the world, to judge the good and the bad, and to assign them their eternal destinies. It is really amazing that a subject so simple should have bewildered so many minds and occasioned so much controversy.

It would be endless and useless to refer to all the writers on the millennium. Those who are curious in regard to it may consult the works of Joseph Mede, Bush on *The Millennium,* Rupp's *Religious Denominations,* Whitby's *True Millennium,* Stuart on *The Revelation,* Cowles on *Daniel and the Revelation,* and his masterly dissertation on *The Premillennial Advent of Christ,* appended to his commentary on Jeremiah, and the articles on the "Millennium" and the "Revelation" in Kitto's *Cyclopædia,* and works there cited. T. O. Summers.

Millepede. See Myriapod and Julus.

Mil'lepore (*Millepora*), a genus of coral-producing acalephs of the order Hydroidæ and the sub-order Tabulatæ. The millepores and other Tabulatæ were formerly considered to be polyps, like the other coral-forming organisms; but Agassiz in 1858, while observing *M. alcicornia* in Florida, discovered their true character. There are at least five genera of tabulate corals, whose cells have horizontal partitions extending from wall to wall. As the animal grows these floors are formed one above another. The cells do not, as in other corals, have vertical partitions running through the floors. The millepores make a hard, stony coral, smooth, branching, and with exceedingly small cells. They appear to contain more carbonate of magnesia than the true corals.

Miller, on R. R., cap. of Hand co., Dak. (see map of Dakota, ref. 6–E, for location of county). Pop. not in census.

Miller (Andrew Jackson), b. in Camden co., Ga., Mar. 21, 1806; studied law and settled in Augusta about 1827; in 1836 was elected to the State legislature, and was continuously returned to the house or senate as long as he lived; for more than ten years was president of the senate, and thereby lieutenant-governor of the State. Georgia is greatly indebted to him, with a few others, for her present magnificent system of internal improvements. D. at Augusta Feb. 3, 1856. A. H. Stephens.

Miller (Cincinnatus Heine), known in literature as Joaquin, b. in Cincinnati, O., in 1841; in 1854 ran away from home and went to the California mining regions; was taken prisoner by the Modoc Indians, and lived with them five years, learning their language and fighting their wars with them; left them in 1858, and went to San Francisco; in 1860, after studying law a short time, was admitted to the bar in Oregon; in 1862 edited a newspaper for a short time; in 1866 was elected district judge of Oregon, and served in that position four years; settled in New York about 1874. He wrote *Pacific Poems* (1873), *Songs of the Sierras* (1873), *Songs of the Sun Lands* (1873), *Ship in the Desert* (1875), *Adrianne, a Dream of Italy* (1876), *Unwritten History* (1874), *First Families of the Sierras,* a novel (1875), *One Fair Woman,* a novel (1876), *Songs of Italy* (1878), *Shadows of Shasta* (1881), *The Gold-Seekers of the Sierras* (1884), and several successful dramas. J. B. Bishop.

Miller (Edward), M. D., brother of Rev. Samuel, b. at Dover, Del., May 9, 1760; studied medicine at the University of Pennsylvania; was surgeon's mate at the military hospital at Basking Ridge, N. J., 1780–81; went to France as surgeon on an armed ship 1782; practised for some years in Maryland and Delaware; removed to New York in 1796, and with Drs. S. L. Mitchill and E. N. Smith founded in Aug., 1797, the *Medical Repository,* the first American journal of its kind. He became city physician of New York 1803, professor of the theory and practice of physic in the College of Physicians and Surgeons 1807, and clinical lecturer in the New York Hospital 1809. Dr. Miller aided his brother Samuel in the composition of his *Brief Retrospect;* wrote a *Report on the Yellow Fever in New York in 1805,* maintaining that the disease is not contagious; was a noted advocate of temperance and opponent of tobacco, and was one of the most distinguished physicians of his day. D. at New York Mar. 17, 1812. His medical writings were edited by his brother Samuel (1814), with a biographical sketch. (See also Thacher's *American Medical Biography,* the *Monthly Recorder* for Apr., 1818, and the *American Medical and Philosophical Register,* which contains a biographical notice by Dr. J. W. Francis.)

Miller (Elihu Spencer), b. at Princeton, N. J., in 1817, a son of Rev. Dr. Samuel Miller; graduated in 1836 at Princeton; became a leading lawyer of Philadelphia and a law-professor in the University of Pennsylvania; author of valuable legal treatises and of a volume of poems, *Caprices* (1849). D. at Philadelphia, Pa., Mar. 6, 1879.

Miller (Gen. Henry), b. near Lancaster, Pa., Feb. 13, 1751; studied law, and had begun to practise when, at the outbreak of the Revolutionary war, he entered the army as a lieutenant; rendered important services in the New Jersey and other campaigns; was quartermaster-general in the Western expedition; rose to the rank of colonel; became afterwards a merchant at Baltimore, where he was commissioned as brigadier-general when that city was threatened by the British (1813). He was subsequently appointed superintendent of revenue for the district of Pennsylvania, and d. at Carlisle, Pa., Apr. 5, 1824.

Miller (Henry), M. D., b. in Kentucky Nov. 1, 1800; took the degree of M. D. under Dudley, Caldwell, Brown, etc., in Lexington; practised a short time in Glasgow, then in Harrodsburg; and on the organization of a school of medicine in Louisville (1835) removed to that place, and became professor of obstetrics and diseases of women and children; was the author of two excellent works in his department—the first, published in 1849, *Theoretical and Practical Treatise on Human Parturition;* the other, on the *Principles and Practice of Obstetrics;* besides contributions to several medical journals. Was made president of the American Medical Association in 1859. He was also a professor emeritus in the Louisville Medical College when he died, Feb. 8, 1874, and had received many honors. Paul F. Eve.

Miller (Homer V. M.), M. D., b. in Pendleton district (now county), S. C., Apr. 29, 1814; with his parents moved to Raburn co., Ga., where he was educated; was matriculated in the Medical College of South Carolina in 1833, graduating with the highest honors in 1835, and completed his medical studies in Paris in 1838; returned to the U. S., and practised at Cassville, Ga., his fame soon extending throughout the State. Became connected with the Methodist Episcopal Church; he was licensed to preach without joining the itinerancy; feeling also a deep interest in everything pertaining to the public welfare, he took an active part on the hustings in the Presidential canvasses of 1840–44, in which his eloquence won for him the title of "Demosthenes of the Mountains." In 1846 was professor in the medical college of Memphis, Tenn., and three years after became professor in a medical college in Augusta, Ga., which position he held until 1865. During four years of this latter term was also surgeon in the Confederate States army, rose to be division surgeon, and finally medical inspector of the military department of Georgia. After the war became professor in the medical college of Atlanta, Ga., which position he held until 1869. Was an active member of the constitutional State convention under the reconstruction acts of Congress. In 1869 was elected U. S. Senator from Georgia to fill an unexpired term in the 41st Congress, where he fully sustained his high reputation for talents and patriotism. Is one of the trustees of the State University, and resides in Atlanta, Ga. A. H. Stephens.

Miller (Hugh), b. Oct. 10, 1802, at Cromarty, on the N. E. coast of Scotland, in humble circumstances; lost his father when he was five years old, but received, nevertheless, a very conscientious and careful education by his two uncles; acquired an extensive and well-digested knowledge of English language, history, and literature, and developed early that power of acute observation which afterwards made him celebrated in literature and science. He did not care, however, to attend a university. In 1819 he was apprenticed to a stone-mason, and he worked at this trade steadily till 1836, though devoting all his leisure hours to geological researches on the beach and in the rocks, and to reading. In 1829 he published a volume of *Poems written in the Leisure Hours of a Journeyman Mason,* and after that time he became a frequent contributor to different periodicals. In 1836 he received a second-accountantship in a branch bank at Cromarty, married, published his *Scenes and Legends of the North of Scotland,* and during the Non-intrusion controversy in the Scottish Church his *Letters to Lord Brougham* on the Auchterarder case brought him prominently before the public. In 1840 he went to Edinburgh as editor of *The Witness,* a Free Church organ, and it was in the columns of this paper he first published *The Old Red Sandstone, or New Walks in an Old Field,* which made a great sensation, not only on account of the important geological discoveries it contained, but also by its exact reasoning and finished style. He also published *First Impressions of England and its People, Footprints of the Creator, Testimony of the Rocks, My Schools and Schoolmasters,* a very interesting sketch of his education, etc. Least satisfactory were his attempts to establish perfect harmony between the details of religious doctrines and scientific views. His denial of the universality of the deluge and of the literal meaning of the word "day" in the first chapter of Genesis aroused much suspicion among his coreligionists, and even met with some severe criticism; while, on the other hand, his assertion that the entire type of organic being was changed by each geological period did not escape the sneers of the scientists. But during this hard work, continued through many years without flagging, his brain at last gave way, and he shot himself at Portobello, near Edinburgh, Dec. 26, 1856. (See Peter Bayne, *The Life and Letters of Hugh Miller*, London, 1872, 2 vols.)

Miller (James), b. at Peterboro', N. H., Apr. 25, 1776; became a lawyer; major 4th U. S. Infantry 1808; lieutenant-colonel 5th Infantry 1810; brevet colonel 1812; colonel 21st Infantry 1814; brevet brigadier-general in 1814, when Congress presented him a gold medal for gallantry on the Canadian frontier; was governor of Arkansas Territory 1819–25; collector of Salem, Mass., 1825–49. D. at Temple, N. H., July 7, 1851. He was the father of Commodore James F. Miller, U. S. N. (1803–68).

Miller (John), served 1812–18 as lieutenant-colonel and then colonel of U. S. infantry, and was especially distinguished at Fort Meigs 1813; was register of public lands in Missouri, then a journalist at Steubenville, O.; governor of Missouri 1826–32, and was in Congress 1837–43. D. near Florisant, Mo., Mar. 18, 1846.

Miller (Joseph), known as Joe Miller, b. in England in 1684, was a comic actor in London somewhat celebrated for his ready wit, and d. there Aug. 13, 1738. The collection entitled *Joe Miller's Jests*, published the year after his death (1739), was really made by the publisher, John Mottley (1692–1750), and contained little or nothing really derived from the person whose name has thereby become a synonym for stale jests. A fac-simile edition was recently published by J. C. Hotten.

Miller (Joseph N.), U. S. N., b. in Ohio Nov. 22, 1836; entered the navy as a midshipman Apr. 8, 1850; became a passed midshipman in 1856, a lieutenant in 1861, a lieutenant-commander in 1862, a commander in 1870, captain Feb. 24, 1881. Served as executive officer of the iron-clad Passaic in the attacks upon Forts Sumter and McAllister during the spring of 1863, and in the same capacity on board the Monadnock in both the Fort Fisher fights. Highly commended for "ability and bravery" by Commanders Drayton and Parrott. Foxhall A. Parker.

Miller (Patrick), one of the numerous inventors of steam navigation, b. at Dalwinston, Dumfriess-shire, Scotland, about 1730, was a wealthy country gentleman who was fond of mechanical experiments; made some improvements in artillery; began in 1785 some experiments in ship construction and propulsion upon a loch near his estate, and published in 1786 a pamphlet giving an account of a vessel he had invented. In this pamphlet he stated his conviction that the steam-engine could be employed to work the wheels. In 1788 he, with the aid of Mr. James Taylor, propelled a boat five miles an hour by a steam-engine. The experiment proving unsatisfactory for several reasons, it was abandoned, but after the successful experience of Fulton his claims to the invention were put forward. D. at Dalwinston Dec. 9, 1815.

Miller (Samuel), D. D., b. near Dover, Del., Oct. 31, 1769; graduated at the University of Pennsylvania 1789; became associate pastor of the First Presbyterian church in New York City 1793, and professor of ecclesiastical history in the Theological Seminary at Princeton 1813, holding that office until May, 1849. Dr. Miller was prominent in the councils of his denomination, and was author of numerous theological treatises, chiefly of a polemical or denominational character. Among his works were *A Brief Retrospect of the Eighteenth Century* (1803) and the *Life of Jonathan Edwards* in Sparks's *American Biography*. D. at Princeton, N. J., Jan. 7, 1850.

Miller (Samuel F.), b. at Richmond, Ky., Apr. 5, 1816; educated at Transylvania University; became a physician, and afterwards a lawyer. Adopting emancipationist views in 1848, removed in 1850 to Iowa; became successful as a lawyer; declined all public offices until 1862, when he was appointed one of the justices of the U. S. Supreme Court. Resides at Keokuk, Ia.

Miller (Stephen D.), b. at Waxhaw Settlement, N. C., May, 1787; graduated at South Carolina College 1808; became a lawyer; was in Congress 1819–20; in the South Carolina senate 1822; governor 1828–30; U. S. Senator 1831–33; removed in 1835 to Mississippi. D. at Raymond, Miss., Mar. 8, 1838.

Miller (Thomas), M. D., b. at Port Royal, Va., Feb. 18, 1806. Received his degree from the University of Pennsylvania. Soon after with six others organized the Washington Medical Institute, and in 1832 began a course of instruction in anatomy. In 1839 assumed the professorship of anatomy in the National Medical College, which branch he taught twenty years, when he was made emeritus prof. and pres. of the faculty. He devoted his life to medical science at the capital. D. Sept. 20, 1873. Paul F. Eve.

Miller (Thomas), b. at Gainsborough, England, Aug. 31, 1807; was in early life a farm-laborer, and afterwards a basketmaker; devoted his leisure hours to the study of the English classic poets, and attracted attention by publishing pieces both of prose and verse descriptive of rural life. He was befriended by Moore, Rogers, and Campbell; became a bookseller, and thereafter published many volumes of novels, essays, and poems which had a considerable contemporary success. He also wrote a *History of the Anglo-Saxons*. D. at London Oct. 25, 1874.

Miller (William), b. at Pittsfield, Mass., Feb. 15, 1782; settled in Poultney, Vt., 1804; served as a capt. of volunteers on Canadian frontier during the war of 1812; moved in 1815 to Low Hampton, N. Y., and in 1833 began to announce the speedy second coming of Christ, which, by his interpretation of the biblical prophecies, he fixed for the year 1843, at which time the world would be destroyed. In a few years his converts in the U. S., Canada, and Great Britain numbered many thousands, and were popularly known as Millerites, though they styled themselves Second Adventists. On the failure of the original prediction Miller and his followers claimed that the error in calculation could not be great, and continued to assign dates for the consummation of all things, but the sect rapidly decreased in numbers, though it still exists and maintains its organ, the *Advent Herald*, published at Boston. Miller was untrained in biblical criticism, but his interpretations were plausible and gained the support of some educated theologians. D. at Low Hampton, Washington co., N. Y., Dec. 20, 1849.

Miller (William Allen), M. D., LL.D., F. R. S., b. at Ipswich, England, Dec. 17, 1817; was educated at the Merchant Taylors' School, at King's College, London, at Giessen, Germany, and at the London University; was a pupil of Daniell and Liebig; became in 1845 prof. of chemistry in the London University; was a member of many learned societies; best known by his *Elements of Chemistry* and his valuable chemical papers. D. Sept. 30, 1870.

Miller (William Hallowes), F. R. S., b. in England about 1803; graduated at Cambridge in 1826; became fellow and tutor of St. John's College; succeeded Dr. Whewell as professor of mineralogy 1832; was appointed in 1843 on a royal committee to superintend the construction of parliamentary standards of length and weight, in place of those destroyed by fire in 1834, and undertook the standard of weight, which he finished in Mar., 1854. He served in 1867 on a commission to inquire into the condition of the exchequer standards, and in 1870 on the international commission upon the metric system. He published in the *Philosophical Magazine* and the *Proceedings* of the Royal Society many important papers on mineralogy and crystallography, for which he received in 1870 one of the royal medals. With J. Brooke he edited Phillips's *Elementary Introduction to Mineralogy* (1852). Prof. Miller was the chief promoter in England of the method of representing crystalline forms by their spheres of projection and measuring their angles by Wollaston's goniometer. He was for many years secretary, and subsequently president, of the Cambridge Philosophical Society, was foreign secretary of the Royal Society 1856–73, and was a member of the principal scientific societies in Europe. D. at London, England, May 21, 1880.

Millerites. See Adventists and Miller (William).

Millersburg, on R. R., cap. of Holmes co., O. (see map of Ohio, ref. 4–G, for location of county), 82 miles N. E. of Columbus, has a good union school, foundry and machine-shop, flouring-mill, etc. Pop. in 1870, 1457; in 1880, 1814.

Millersburg, Dauphin co., Pa. (see map of Pennsylvania, ref. 5–G, for location of county), on the E. bank of the Susquehanna River and on the Northern Central R. R., at the junction of the Summit branch, 26 miles above Harrisburg. Pop. in 1870, 739; in 1880, 713.

Miller's Thumb, or **River Bullhead,** the *Uranidea gobio*, a small fish of European seas and streams. It is of the family Cottidæ. It is sometimes eaten. In Russia it is used as a charm against fever, and it is believed that if hung up by a thread its head will point the way from which the wind is going to blow—a prophetic weather-vane. (See Bullhead and Cottus.)

Millerton, R. R. centre, Duchess co., N. Y. (see map of New York, ref. 6–J, for location of county), has flourishing manufactures of iron, which is mined in the vicinity. Pop. in 1880, 600.

Mil'let [It. *miglietto*, from Lat. *mille*, "a thousand," in reference to its yielding 1000 to 1], a name applied to grasses of several distinct genera and species. The *Milium effusum,* or true millet, found throughout Europe and Northern Asia and in the Northern U. S., is a slender grass of the tribe Paniceæ, four to six feet high, which has never been cultivated, but is abundant in the woodlands both of England and America. The double-seeded millet-grass, so extensively found in the marshes of New Jersey, belongs to the genus *Amphicarpum.* The cultivated millet of ancient and modern times belongs to a third genus, *Panicum,* which embraces no less than 850 species. *Panicum miliaceum* is sown chiefly for forage, though the seeds yield a very nutritious flour, as do also those of the Hungarian, German, and Italian millets, now classified by botanists under the genus *Setaria.*

Millet′ (Aimé), b. at Paris about 1816; studied under David d'Angers; began to exhibit in 1842, and attracted great attention in 1857 by a statue, *Ariane,* which was bought for the museum of the Luxembourg. Of his other works, the best are *Mercure,* destined for the Louvre, and *La Jeunesse éffeuillant des roses,* on tomb of Henry Murger, the poet of "Bohemian" life.

Millet′ (Jean François), b. at Greville (Manche, formerly part of Normandy) in 1815. Millet studied in Paris under Delaroche, and exhibited in 1844. But instead of remaining in the metropolis, and striving with his contemporaries for wealth and fame by the production of works calculated to win the applause of the fashionable or artistic world, he retired to a secluded town, and devoted himself with the earnestness of an apostle to the task of representing the common aspects of nature and of celebrating the common lives of the peasant-people about him. He was an artist by himself, with strong originality, a deep reverence for truth, poetic sensibility, and warm human sympathies. The subjects for his painting were sowers, harvesters, sheep-tenders, women carding wool, pasturing cows, shearing sheep, suckling infants; scenes in agriculture and village life; landscapes soft with evening light or gray with cloud—all touched with pensive feeling, easily deepening into melancholy. His pictures have been exhibited at the Salons; two or three were at the Paris Exposition of 1867, and procured for him a medal of the first class, which in 1868 was followed by the decoration of the Legion of Honor. Few of his pieces have been brought to America, and they are little known. Such as are obtainable are highly prized as the work of a very true artist. D. Jan. 18, 1875.

O. B. Frothingham.

Mil′li [Fr., abbreviation of *millième,* "thousandth"], a prefix used in the French metric system to denote a thousandth part of the measure indicated by the word to which it is prefixed; as *milligramme,* the thousandth part of a gramme, is equal to 0.0154 grain troy; *millilitre,* a thousandth part of a litre, is equal to 0.0021 pint; *millimètre,* a thousandth part of a mètre, is equal to 0.0393 inch. (See Metric System.)

Mil′li (Giannina), b. at Teramo, in the Abruzzi, Italy, in 1828. When but five years old she is said to have composed verses; she read much alone, but at the age of seventeen she found a good literary guide in De Martinis. Having heard the poet Regaldi improvise, she was seized with an impulse to emulate him, in which she was encouraged by Regaldi himself. Leaving Teramo, she gave public improvisations in the Abruzzi, in Calabria, and finally at Naples under the protection of the learned Giulio Genoino. In the same way she made a tour through the Two Sicilies, was honored with two silver medals, and at Rome with a medal of gold. But her name was not generally known throughout Italy until after 1857, when she began her poetical excursions through Tuscany and Upper Italy. In 1860, Garibaldi, then dictator in Naples, settled an annual pension upon her; in 1863 a society was formed in Florence to secure by public subscription a regular income to Giannina Milli. In 1869 she was appointed inspectress of the elementary female schools of the province of Naples. A female normal school was afterward established in Rome, and Giannina Milli appointed superintendent. Two vols. of her poems have been published.

Mil′liken's Bend, post-v. of Madison parish, La., on the Mississippi River, 15 miles above Vicksburg, Miss. In June, 1863, near this place, a Confederate force of 2500, under Gen. H. McCullough, attacked a body of colored troops, numbering 1400, and part of an Iowa regiment, under Gen. E. S. Dennis, but with the assistance of gunboats from Admiral Porter's fleet they were repulsed, with a loss on each side of about 150 killed and 300 wounded.

Mil′lingen (James), F. S. A., b. in London Jan. 18, 1774, was son of a Dutch merchant; was educated at Westminster School; became a banker at Paris, and devoted much attention to classical archæology. Among his publications are *The Medallic History of Napoleon* (1819–21), commenced by A. L. Millin, *Ancient Coins of Greek Cities and Kings* (1821), *Ancient Unedited Monuments of Grecian Art* (1822–26). In 1821, Millingen went to Italy, where he spent the remainder of his life. D. Oct. 1, 1845.

Millington, N. J. See Appendix.

Mills (Abraham), LL.D., b. in Duchess co., N. Y., in 1796; teacher of rhetoric and belles-lettres in New York; wrote *English Literature* (1851), *Greek Literature* (1853), *Lectures on Rhetoric* (1854), and a *Compendium of the History of the Ancient Hebrews* (1856). D. July 8, 1867.

Mills (Charles), b. near Greenwich, England, July 29, 1788; studied law, and was admitted to the bar in 1809, but devoted himself chiefly to historical literature, and produced *History of Mohammedanism* (1817), *History of the Crusades* (2 vols., 1820), *Travels of Theodore Ducas* (2 vols., 1822), and *History of Chivalry* (2 vols., 1825). D. Oct. 9, 1825.

Mills (Clark), b. in Onondaga co., N. Y., Dec. 1, 1815. His first trade was that of a millwright, his second that of a plasterer. From this he proceeded to sculpture, which he began to practise in Charleston, S. C. He was self-taught, had never been in Europe or seen the works of the masters in his art, but made his way by perseverance and ambition. His first work was a bust of John C. Calhoun, which the city of Charleston purchased and placed in the town-hall in 1846. This led to other portrait-busts of local celebrities. In 1848, while preparing for a voyage to Italy, he was invited to furnish the design for an equestrian statue of Andrew Jackson for the government. The artist abandoned his European tour, returned to Charleston, completed his design, never having seen an equestrian statue in his life, and sent it in. It was accepted. The result was the statue on La Fayette Square near the White House, chiefly remarkable for the poise of the horse on its hind legs, for which the artist has had more than sufficient praise. The work was "inaugurated" on the anniversary of the battle of New Orleans, Jan. 8, 1853. The next performance was the colossal statue of Washington at the battle of Princeton, which was unveiled Feb. 22, 1860. The casting of the colossal statue of Liberty, after Crawford's design, for the dome of the Capitol, was finished in 1863. For the *Washington* Mr. Mills received from Congress $50,000. D. Jan. 12, 1883. O. B. Frothingham.

Mills (Robert), b. in South Carolina, studied architecture in Washington, D. C., under B. H. Latrobe, the original designer of the Capitol; designed and supervised the erection of several important buildings in Philadelphia, Pa., including the permanent (fireproof) wings of the Old State-House, Independence Hall; he also built the capitol at Harrisburg, Pa. The single-arch bridge of 740 feet spanning the Schuylkill River attests his originality and skill as an engineer. The custom-houses in New London and Middletown, Conn., and in New Bedford and Newburyport, Mass., the marine hospitals in Charleston and New Orleans, and the State penitentiary of Louisiana were all built according to his designs; so, also, was the Washington monument in Baltimore, Md. After completing other important works he returned to South Carolina in 1820, and was made State architect and engineer. In 1837 he was recalled to Washington, D. C., where he was appointed by President Jackson the architect of the general government, and held this office during the administrations of Jackson and Van Buren, designing and supervising the erection of the treasury building and the general post-office building. The patent-office building was also erected under his supervision. The national Washington Monument was designed by him, but his plan for a circular colonnade around its base was not carried out. He published *Statistics of South Carolina* (1826), accompanied by a folio atlas, *American Pharos, or Lighthouse Guide* (1832), and a *Guide to the National Executive Offices* (1842). D. Mar. 3, 1855. Robert M. Lusher.

Mills (Samuel John), b. at Torringford, Conn., Apr. 21, 1783; entered Williams College in 1806, and in Sept., 1808, was the principal organizer of a society of undergraduates who contemplated becoming missionaries in foreign lands. This was the first organization in behalf of that object in America. He graduated in 1809; spent some months at Yale College, studying theology and seeking adherents to his missionary project; entered Andover Theological Seminary in 1810, and associated himself with Messrs. Judson, Nott, and Newell in memorializing the "General Association of Massachusetts," then in session at Bradford (June 28, 1810), upon the subject of missions, which step resulted in the formation of the American Board of Commissioners for Foreign Missions. Mr. Mills was licensed to preach in 1812, and ordained in 1815; spent three years in missionary labors in the Southern States, and two years in New York and other great cities engaged in promoting the formation of the American Bible Society and the American Colonization Society, as well as other missionary organizations, and was sent by the Colonization Society, along with Rev. Ebenezer Burgess, to Western Africa, to select a site for a colony. They proceeded first to England to confer with British philanthropists (1817), and accomplished their object in Africa in the following year, but on the return voyage Mr. Mills d. at sea, June 16, 1818. He fully earned the proud title of "father of foreign missions in America." (See his *Memoir*, by Rev. Gardiner Spring, 1820.)

Mill Springs, post-v. of Wayne co., Ky., on the Cumberland River. On Jan. 19, 1862, the Federal troops, 28,000 strong, under Gen. G. H. Thomas, and the Confederate troops, 10,000 strong, under Gen. G. B. Crittenden, met in battle about 5 miles from this place. The latter were led by Gen. F. K. Zollicoffer, who was killed, and his forces defeated with a loss of 190 killed, 60 wounded, and 89 prisoners. The Federal loss was 38 killed and 194 wounded.

Millstone. See GRINDING AND CRUSHING MACHINERY.

Millstone Grit. See GEOLOGY.

Mill'town, a thriving post-v. of Charlotte co., N. B., on the St. Croix River, 2 miles above St. Stephen, and directly opposite Milltown, a post-village included in the limits of the city of Calais, Me. Immense quantities of lumber are sawed and shipped here. There are 18 gang saw-mills on the Canada side alone, besides an edge-tool factory and other works. The river is here narrow, and is crossed by bridges. It has an academy, 3 churches, a circulating library, and several schools. Pop. in 1881, 1664.

Millville, on R. R., Cumberland co., N. J. (see map of New Jersey, ref. 7-B, for location of county), 40 miles S. of Philadelphia, has large manufactures of cotton, iron, window and hollow-ware glass, lumber-mills. Pop. in 1870, 6101; in 1880, 7660; in 1885, 8824.

Mil'man (HENRY HART), D. D., b. in London Feb. 10, 1791, was the son of Sir Francis Milman, Bart., M. D., an eminent physician (1746–1821). He was educated at Eton and Brazenose, Oxford; became a fellow 1815; M. A. and took priests' orders 1816; was Bampton lecturer 1827; professor of poetry at Oxford 1821–31; rector of St. Margaret's, Westminster, and canon 1835; dean of St. Paul's 1849. D. at Sunninghill Sept. 24, 1868. His chief works are a prize poem, *Apollo Belvedere* (1812), *Fazio*, a successful tragedy (1815), *Samos*, a poem (1818), *The Fall of Jerusalem*, a poem (1820), *The Martyr of Antioch*, and other poems (1821), *Bampton Lectures* (1827), *History of the Jews* (1829), *History of Christianity to the Abolition of Paganism* (1840), *History of Latin Christianity* (1854–55), a sumptuous edition of *Horace* (1849), Gibbon's *History of the Decline and Fall*, with notes, etc. His *Poetical and Dramatic Works*, of which a collected edition appeared in London, 1839, in 3 vols., attracted much attention in their time, but are now forgotten with the exception of a few hymns. Quite otherwise with his historical writings. At their first appearance they encountered much criticism—chiefly on account of the strongly pronounced broad Church views on which they were based—but they have, nevertheless, proved able to vindicate for themselves a prominent place in English literature.

Milmore (MARTIN), b. at Boston, Mass., in 1845; entered the studio of Mr. Ball in 1860; modelled an alto-relief of an ideal subject entitled *Phosphor*, which was much admired; made busts of Sumner, Longfellow, Ticknor, and other distinguished citizens; received in 1864 a commission to execute granite statues of Ceres, Flora, and Pomona for the Horticultural Hall at Boston, a task which occupied him two years; designed in 1867 a bronze statue for the soldiers' monument at Forest Hill Cemetery, Roxbury, and was subsequently employed by the city of Boston to execute an army-and-navy monument, which was placed on Boston Common. D. July 21, 1883.

Milne (WILLIAM), D. D., b. at Kennethmont, Aberdeenshire, Scotland, Apr., 1785; went to China as a missionary in 1812; visited the chief islands of the Indian Archipelago, and established himself at Malacca, whence he circulated throughout Eastern Asia the Scriptures, as well as religious books in Oriental languages written and printed by himself. He published the *Indo-Chinese Gleaner*, a quarterly magazine, aided in translating the Bible into Chinese, and wrote *Retrospect of the Protestant Mission to China*. D. in Malacca in 1822. (See his *Life and Opinions*, by Rev. Robert Philip, 1839.)

Milne-Edwards (ALPHONSE), M. D., son of Henri, was b. at Paris in 1835; doctor of medicine 1859; professor in the Paris School of Pharmacy and knight of the Legion of Honor; succeeded his father in 1876 as professor at the Musée; author of several valuable treatises and papers on geology, palæontology, and zoology and comparative anatomy: *Recherches anatomiques, zoologiques, et paléontologiques sur la famille des chevrotains* (1864), *Recherches anatomiques et paléontologiques pour servir à l'histoire des oiseaux fossiles de la France* (1866–72), etc.

Milne-Edwards (HENRI), M. D., b. at Bruges, Belgium, Oct. 23, 1800, was the son of an Englishman; took his medical degree at Paris 1823; became professor of natural history at the Lycée Henri IV.; professor of natural history at the Musée 1841; professor of zoology 1862; dean of the Faculty of Sciences; member of the Academies of Sciences and of Medicine; commander of the Legion of Honor, etc. Author of *Anatomical Researches concerning Crustaceans* (1828), *Handbook of Materia Medica* (1832), *Elements of Zoology* (1834–35; new eds. 1840, 1851), *Natural History of Crustaceans* (1837–41), a new edition of Lamarck's *Natural History* (1838–45), *Leçons sur la Physiologie* (10 vols.), and of a great number of valuable scientific papers. Died July 29, 1885.

Mil'ner (ISAAC), D. D., brother of Joseph, b. near Leeds Jan. 1, 1751; graduated at Queen's College, Cambridge, and received a fellowship 1775; became Jacksonian professor of experimental philosophy 1783; master of his college 1788; dean of Carlisle 1791; vice-chancellor at Cambridge 1792 and 1809; Lucasian professor of mathematics 1798; d. at Kensington Apr. 1, 1820. Is chiefly remembered for his continuation of his brother's *Church History*.

Milner (JOHN), D. D., F. S. A., b. in London Oct. 14, 1752; was educated at Douay; became a Roman Catholic priest in 1777; became in 1803 bishop of Castabala and vicar-apostolic of the Midland district of England, but was expelled from his office by the English Catholic board in 1823. D. at Wolverhampton Apr. 19, 1826. He was author of *History and Antiquities of Winchester* (1798), *Letters to a Prebendary*, *Ecclesiastical Architecture* (1811), *The End of Religious Controversy* (1818), and a *Vindication* of the same (1822).

Milner (JOSEPH), b. near Leeds, England, Jan. 2, 1744; graduated at Catharine Hall, Cambridge, 1766; entered the Anglican priesthood, and became head-master of the Hull Grammar School. D. Nov. 15, 1797; author of *History of the Church* (1794–1812), continued by Isaac Milner.

Milnes (RICHARD MONCKTON). See HOUGHTON, BARON.

Milnor (JAMES), D. D., b. in Philadelphia June 20, 1773; studied at the University of Pennsylvania; was admitted to the bar in 1794; practised at Norristown 1794–97, and at Philadelphia 1797–1814, attaining a prominent position; was member of Congress 1811–13, and opposed the war with England; took orders in the Protestant Episcopal Church 1814, and became rector of St. George's church, N. Y., where he remained until his death, Apr. 8, 1844. He was a zealous and efficient pastor, prominently connected with the Bible and tract societies, and with benevolent societies, and published a number of sermons and addresses. (See his *Memoir*, by Rev. J. S. Stone, D. D., 1848.)

Mi'lo [anc. *Melos*], a Greek island, the most westerly of the Cyclades, 14 miles from E. to W., 8 from N. to S., and about 65 miles E. of Peloponnesus, with a pop. of nearly 3000. It is volcanic and very fertile, producing wine, oil, fruit, and grain, and rich in sulphur, vitriol, and alum. But its water is brackish, and its climate malarious. The ancient city, of the same name, near whose ruins stands the modern village of Kastron, was on the N. side of the island, and had an excellent harbor. The celebrated statue of Venus, found here by Boutier in 1820, is now in the Louvre, Paris. The arms of the statue were found in 1877.

R. D. HITCHCOCK.

Milrea', or **Milree'** [Port. *mil*, a "thousand," and *real* (pl. *reis*), a "real"], called also *corão* or *crown*, a Portuguese and Brazilian coin and money of account. The Portuguese milrea is worth about one dollar U. S.; the Brazilian is 51¼ cents of our money.

Milroy (Gen. ROBERT H.), b. in Indiana about 1814; became a lawyer; served in the Mexican war as captain of the 1st Indiana Vols.; appointed in 1861 brigadier-general of Indiana volunteers; served in Western Virginia under McClellan and Rosecrans, and afterwards under Fremont and Sigel; was appointed major-general of volunteers Nov. 29, 1862, and was in command at Winchester, Va., when that place was attacked, June 15, 1863, on which occasion he retreated with a loss of half his force.

Milti'ades, b. at Athens, son of Cimon, succeeded his brother Stesagoras as tyrant of Chersonesus, and joined Darius Hystaspis in his campaign against the Scythians. Together with the other Greeks he was left in charge of the bridge over the Danube, and when Darius did not return at the appointed time he recommended the destruction of the bridge, while the Ionians, on the advice of Histiæus, insisted on its preservation. Afterwards he conquered Lemnos, which was a Persian possession, and when the Persian fleet, after the capture of Miletus, approached Chersonesus, he fled and repaired to Athens. Here he was chosen commander against the Persian force, which under Datis and Artaphernes threatened Athens, and defeated it in the memorable battle of Marathon (490 B. C.). A new armament which the Athenians placed under his command he used for an expedition against Paros for merely private purposes. He was arraigned, and condemned to defray the whole cost of the armament, and as he could not pay this enormous fine, he was thrown into prison, where he d. from a wound he had received during the campaign. His son Cimon afterwards paid the fine, and a monument was raised in honor of him on the plain of Marathon.

Milton, city, on R. R., cap. of Santa Rosa co., Fla. (see map of Florida, ref. 1-B, for location of county), on Blackwater River, here crossed by a ferry. It has a large lumber trade, a drydock, shipyards, foundries, etc. Pop. in 1870, 1014; in 1880, 1058.

Milton, Norfolk co., Mass. (see map of Massachusetts, ref. 5-I, for location of county), 9 miles S. of Boston, with which it is connected by the Old Colony R. R. and a street railway. It contains the Blue Hills, which gave name to the State, the word *Massachusetts* probably signifying Great Hills. The principal industries of Milton are market-gardening and the manufacture of paper, leather, chocolate, and rubber goods. Ice and building-stone are procured here. Milton has a high school. Pop. of tp. in 1870, 2683; in 1880, 3206; in 1885, 3555.

Milton, on R. R., Caswell co., N. C. (see map of North Carolina, ref. 2-G, for location of county), 12 miles N. E. of Danville, Va., has numerous plug-tobacco factories and tobacco warehouses, a mill, and a furniture establishment. Business, manufacturing and dealing in tobacco. Pop. in 1880, 613.

Milton, R. R. junction, Northumberland co., Pa. (see map of Pennsylvania, ref. 4-G, for location of county), on the Philadelphia and Erie and Philadelphia and Reading R. Rs. and the Pennsylvania Canal, contains graded schools, extensive car-works, rolling-mill, nail-factory, agricultural works, machine-shops, foundries, saw-mills, and planing-mills. Pop. in 1870, 1909; in 1880, 2102.

Milton (JOHN), b. in Bread street, London, Dec. 9, 1608; received a very careful education, first under a private tutor, then at Christ's College, Cambridge, which he entered Feb. 12, 1625. He was originally destined for the Church, but, reared in a family of Puritan cast, and consequently opposed in many points to the Episcopal Church of that time, he gave up this plan, and when in 1632 he left Cambridge he returned to his father's house in Horton, a village in Buckinghamshire, whither the family had retired on an independency. Here he studied classical literature and philosophy with great energy, being by nature a studious and industrious man; cultivated music, in which both he and his father were quite proficient; and composed the *Sonnet to the Nightingale, L'Allegro*, and *Il Penseroso*, the elegy *Lycidas*, and the two masques, *Comus* and *Arcades;* the first collected edition of his poems was not published, however, until 1645. After his mother's death in 1637 he went abroad, visited Leyden, Paris, and Rome, and made the acquaintance, among others, of Grotius and Galileo. His Latin verses and other scholarly attainments, his personal beauty and noble disposition, introduced him to learned and elegant society, and made him friends. On his return home after an absence of fifteen months, he settled in London, the household at Horton having been broken up in the mean time, and took a few pupils, sons of relatives and friends, under his tuition. But soon he became deeply entangled in the turbulent controversies, religious and political, which filled that period of English literature, and for twenty years the bright though somewhat pensive poet of *L'Allegro* and *Comus* was engaged as a most violent and intolerant, though candid and eloquent, controversialist. His first polemical onset was an attack on the Episcopal Church (1641-42). Five treatises belong to this contest—namely, *Of Reformation, Of Prelatical Episcopacy, The Reason of Church Government, Animadversions*, and *Apology for Smectymnuus*. In 1643 he married Mary Powell, but she left him after one month on account of the "spare diet and hard study" she found in his house. Four tracts on divorce followed (1644-45)—namely, *The Doctrine and Discipline of Divorce, The Judgment of Martin Bucer, Tetrachordon*, and *Colasterion*, in which he maintained that moral incompatibilities justify divorce. The couple became reconciled afterwards, and lived together until the death of the wife in 1653: she bore him three girls. In 1644 he also published two other essays, *On Education* and *Areopagitica, a Speech for the Liberty of Unlicensed Printing*, which latter treatise is his most eloquent piece of prose writing. After the execution of Charles I. (Jan. 30, 1649) he wrote three powerful pamphlets (1649-50) in order to defend the acts of the English people in its struggle with its king—namely, *The Tenure of Kings and Magistrates, Eikonoclastes*, and *Pro Populo Anglicano Defensio contra Salmasii Defensionem Regiam;* and to this group of writings belongs also his controversy with Dumoulin (1654-55), comprising three pamphlets, among which was *Defensio Secunda*. The attack on Salmasius made a great sensation in Europe. It was written at the demand of Parliament, as in 1649 Milton had been appointed secretary in the ministry of foreign affairs by Cromwell. This position he held till the Restoration in 1660, though he became entirely blind in 1654, and could work only by the aid of a reader and a scribe. After the Restoration he was compelled to keep himself concealed for some time, and even after the Act of Oblivion he continued to live very secluded. On Nov. 12, 1656, he married Catharine Woodcock, but she died fifteen months after in childbed. In 1663 he married his third wife, Elizabeth Minshull, but his home was not a happy one. A severe regularity and haughty solitude characterized his life; studies and literary compositions occupied his time. *Paradise Lost* was published in 1667; *History of Britain* in 1670; *Paradise Regained* and *Samson Agonistes* in 1671; *Of True Religion* in 1673. A Latin manuscript, *De Doctrina Christiana*, which shows his very heterodox conceptions of different points of Christianity, was not published till 1825. He d. Nov. 8, 1674, and was buried in the church of St. Giles, Cripplegate, beside his father. At its first appearance *Paradise Lost* made no great impression. The author received £5 for the first 1300 copies; the second edition was not published until 1673. The widow of Milton sold in 1681 her interest in the work for £8. The English public of that time consisted of those in whose blood there still lingered a remembrance of Shakspeare and the Elizabethan dramatists, of Puritans who acknowledged nothing which lay outside of their religious enthusiasm, and of the dissolute swarm around Charles II. For such people *Paradise Lost* was not the book. But in the eighteenth century, when a decent deism had superseded Puritanism, when imitations of Latin models were considered as signs of genius, and the general taste preferred artistic perfection to poetical excellence, *Paradise Lost* was raised to the most conspicuous place in English literature; and it held this position till of late some few sharp voices have begun to object. Its artistic merits are in most respects above all praise. The English language was probably never written with greater mastership, and while the verse of Homer, nevertheless, has a greater charm, it is simply because that which it relates is more charming. It is against the æsthetical character of the work that objections have been made. (Among others, see Masson's *Life of Milton*, 2 vols., 1859-71; new edition 1881.) The most complete edition of Milton's prose works is that in Bohn's library (1848-53, 5 vols.). The best edition of the poetical works is that by Mitford (London, 1851, 8 vols.). CLEMENS PETERSEN.

Milton College. This institution had its origin in a select school which was opened in Milton, Wis., in 1844. Three years afterwards it was incorporated as an academy by the Territorial legislature. In 1867 it received its college charter from the State. The success of the enterprise is due largely to the late Hon. Joseph Goodrich, the founder of the village of Milton, who gave several thousand dollars for the erection of its buildings. The school has grown steadily from the beginning. Starting with 1 teacher and 70 pupils, it has recently employed a faculty of 9 members and secured the attendance yearly of over 300 students. Of these, 65 have been, on an average, members of the college classes. Like most Western institutions of the same grade, it maintains also an academical department. Its work from the opening has been threefold—first, to prepare young people for teaching public schools by furnishing them with a thorough English education; second, to fit them for the usual business pursuits of life in the study of the higher English and mathematical branches in connection with the commercial; and third, to lay the foundation of full college courses by adding to most of the studies mentioned above the natural and mental sciences and the ancient and modern languages. The college is connected with the Seventh-Day Baptist denomination, which supports several important schools in this country. Nearly $40,000 have been expended in furnishing buildings, apparatus, and libraries. Both sexes recite in the same classes and compete for the same honors in all the departments. Since 1857 it has graduated 200 students—92 ladies and 108 gentlemen. During the civil war 311 of its students were enrolled in the regiments, chiefly from Wisconsin, and 43 of them died in the service. The school is situated in one of the most fertile and beautiful sections of the West, and is surrounded by an intelligent, hardy, and enterprising people. The president, Rev. W. C. Whitford, D. D., has had the supervision of the institution since 1858, assisted by an able and experienced corps of teachers. W. C. Whitford.

Milwaukee, the metropolis and commercial city of Wisconsin, an important R. R. centre, port of entry, and the cap. of Milwaukee co. (see map of Wisconsin, ref. 7-F, for location of county), situated on the bay and river of the same name, on the western shore of Lake Michigan, in 43° 2′ N. lat., 87° 54′ W. lon. It is 84 miles from the State capitol at Madison, and 85 miles from Chicago by rail. It has an area of about 14 square miles.

Its *commerce* is largely in agricultural products: the bulk of the produce of Minnesota, Iowa, Wisconsin, and much from Northern Illinois is received here and shipped to the seaboard by the lakes and by rail. The harbor, at the mouth of the Milwaukee River, a little S. of the centre of the bay, is one of the best upon the upper lakes. A harbor of refuge which is being constructed here by the U. S. will be the best on the lakes. The river is navigable for vessels of the largest lake tonnage for 3 miles from its mouth, directly through the business part of the city. At this point there is a dam which raises the water 12 feet above high water, allowing slack-water navigation some 2 miles farther up the stream. A canal 1¼ miles in length from this dam on the W. side of the river creates a water-power estimated as equal to 100 runs of millstones. There are mills and factories upon this canal, and the largest lake steamers can load at them on the river-side without transfer. The Menomonee and Kinnickinnic rivers empty into the Milwaukee about a mile from its mouth, and are navigable for nearly 2 miles. Several limestone-quarries, which furnish an excellent stone for building, are worked along the banks of the Menomonee. The bay is a beautiful expanse of water, running inland about 3 miles, and measuring about 6 miles across from its extreme points. The elevation of these points furnishes admirable shelter for shipping, and the clay bottom affords good anchorage-ground. Numerous railways centre in and radiate from the city; the Detroit and Milwaukee R. R. connects with a daily line of steamers across Lake Michigan. Wheat is the great commercial staple, and the amount received and stored in elevators constitutes this one of the largest primary wheat-markets of the world. These elevators have an aggregate capacity of 3,800,000 bushels.

Manufactures.—There are over 900 manufactories; capital, $20,000,000: average number of hands employed, 20,886; wages paid during the year, $6,946,105; value of products, $43,473,812. Among the most important are the following: North Chicago Rolling Mill Co.; capital, $5,000,000; annual capacity, 155,000 tons; Milwaukee Cement Co.; annual capacity, 500,000 barrels. Slaughtering and meat packing, 7 establishments; capital, $789,000; value of products, $6,099,486. Flouring and grist-mill products, 11 establishments: capital, $1,066,000; value of products, $4,204,708. Malt liquors; value of products, $9,353,784. Foundry and machine-shop products, 30 establishments; capital, $1,286,445; value of products, $2,252,784.

Waterworks of an excellent character were completed in 1874 at a cost of $2,000,000; they furnish the city with water from Lake Michigan. The city has been lighted with gas since 1852, and has a thorough system of sewerage. The principal streets are well paved. The city has U. S. circuit, U. S. district, State circuit, county, probate, and municipal courts.

Public Buildings, etc.—The county court-house is a large and elegant structure, built of Lake Superior sandstone at a cost of over $400,000. The post-office is a plain, substantial building, erected by the general government, of Illinois marble; it is also used for U. S. courts and custom-house. The Wisconsin Industrial School for Girls; a fine Industrial Exposition Building, Marquette College (Jesuit), the seminary of the Lutheran Synod of Missouri, and a fine Chamber of Commerce have all been completed since 1880.

There are numerous public schools and one high school for both sexes; a normal school, all under the care of the superintendent of public schools. There are about 50 private schools; 16 are Roman Catholic, 12 Lutheran, 5 corporate academies, 1 female college; the others receive both sexes. The city has a large free public library and museum of natural history. The Immanuel Presbyterian church is a beautiful stone edifice of mediæval Gothic style, completed in 1874 at a cost of over $200,000. St. Paul's Episcopal church, Norman architecture, built in 1884, cost over $200,000. There are 2 cathedrals, Roman Catholic and Episcopalian; each of these, with the episcopal residence and school buildings, occupies the entire front of a square. The Roman Catholic bishop was consecrated archbishop in May, 1875. A Capuchin monastery and a Franciscan college are just out of the city. The Convent de Notre Dame, the mother-house in the U. S., owns and occupies an entire square, and has two branch schools in the vicinity. There are 4 orphan asylums, 1 Protestant and 3 Roman Catholic; a home for the friendless, and in connection with it a home for young women: a bethel house for sailors; St. John's Home (Protestant Episcopal) for old and infirm women; 2 hospitals, St. Mary's Roman Catholic and Milwaukee Protestant. The National Asylum for Invalid Soldiers is located about 3 miles from the city, and with its extensive and beautifully ornamented grounds and miniature lakes furnishes a most attractive resort. A park adorns the lake bluff for half a mile, beautifully terraced in places down to the beach.

Milwaukee is mentioned by Lieut. Sarrow, U. S. engineers, in an official report in 1817 as "a Pottawattomie village lying on the right bank of the Milwaukee River at the confluence with the lake." The first white settler was Solomon Juneau, a French fur-trader, who came to Milwaukee about 1825. He entered a claim to a part of the land now occupied by the city, and lived to be mayor of the city after it had become one of the most prosperous towns upon the lakes. Milwaukee was settled and laid out as a village in 1835. The lake bluff and the banks rising from the rivers, sometimes abruptly, sometimes with a gentle slope, furnish beautiful sites for residences, commanding fine views of the bay, rivers, and surrounding country. The elegance and beauty of its residences, with tasteful and highly cultivated grounds, form one of the marked features of the place, the delicate cream color of the brick forming a pleasant contrast with the fresh green of the foliage. An unusually large proportion of the houses are owned by the occupants.

Population.—In 1836, 1206; in 1860, 45,286; in 1870, 71,440; in 1880, 115,587; in 1884, about 169,000.

William P. Lynde.

Mimánsá. See Hindu Philosophy.

Mime [Gr. μῖμος; Lat. *mimus*], a rude form of the drama which prevailed in ancient Greece and Rome. The Greek mime was of Italian origin, and corresponded to our farce, but Sophron, the greatest of the mimographers, mingled ethical teachings with buffoonery. The Greek mime was written in prose, which was often rudely rhythmical. The Roman mime was a sort of modern pantomime, but it was sometimes in part dialogue. It had a generally coarse and indecent character. The actors themselves were called *mimi*, whence our word "mimic."

Mimner′mus, b. probably at Smyrna about 634 B. C.; gave to elegiac poetry, hitherto treating of warlike and joyous topics, that plaintive and melancholy strain which has remained its characteristic ever since. Of his elegies considerable fragments, mostly erotic and belonging to the poem *Nanno*, are still extant, edited by Bergk in his *Poetæ Lyrici Græci* (1866), and frequently translated into German.

Mimo′sa [Gr. μῖμος, a "buffoon," referring to the movements of the leaves in the sensitive species], an interesting genus of leguminous trees, shrubs, and herbs which gives name to the great sub-order Mimoseæ, distinguished by having regular flowers. The genus includes at least ten species which have decidedly sensitive leaves. (See Sensitive Plant.) Of these, the *Mimosa pudica* is the most remarkable, and the only one familiar in cultivation. Most of the numerous species are tropical, many are African, many American, and one, an herb, *M. strigillosa*, is a native of the Southern U. S.

Mi′na [μνᾶ; Heb. *maneh*], in Greek money and weights, containing 100 drachmæ and forming the sixtieth part of a talent. The value varied according to the talent used. (See Talent.) The Attic mina is generally stated to have been worth $17.61 U. S. money; it was a money of account, and was not coined.

Mina (Francisco Espoz y), b. at Ydocin, near Pamplona, Spain, July 17, 1782; joined his nephew, Xavier Mina, in 1809 in organizing the mountaineers into guerilla bands to oppose the French invasion. In the following year he succeeded to the command on his nephew's capture (see Mina, Xavier), and soon became the most efficient as well as celebrated of the numerous partisan leaders of Northern Spain. In 1812 he received a commission as general, and was appointed commander-in-chief of Aragon; became "political chief" of Navarre 1813; contributed to the victories of Salamanca and Victoria; blockaded Pamplona 1812–13, and retired to private life on the restoration of Ferdinand VII. The despotic measures of that king, however, induced the two Minas to head an insurrection, but, having failed in an attack upon the citadel of Pamplona, Sept. 25, 1814, he was obliged to escape to France. In 1820 he took part in the constitutional revolution of Riego, becoming captain-general of Navarre; suppressed the royalist insurrection in Catalonia 1822; became captain-general of Catalonia Jan., 1823; capitulated to the French at Barcelona Nov. 1, 1823, and proceeded to England. In 1830 he was again engaged in an unsuccessful revolt against Ferdinand VII. in Navarre, and again escaped to England. In 1834 he was recalled to Spain to defend the liberal government established in the name of the young queen Isabella against the Carlists, and took command of an army corps, but with indifferent success. Resigning in 1835, he d. at Barcelona Dec. 24, 1836.

Mina (XAVIER), nephew of Francisco, b. in Upper Navarre, Spain, in 1789; was studying for the priesthood when the French invasion of 1808 impelled him to place himself at the head of a band of guerillas, and being joined by his uncle, he achieved important successes, which were, however, somewhat tarnished by the general ferocity of that war. Taken prisoner in 1810, he was kept four years at Vincennes, and employed his time in studies. Returning to Spain in 1814, he soon took up arms against the absolutism of Ferdinand VII., and having joined his uncle in his attack upon Pamplona, was, like him, forced to cross the border into France (Oct., 1814). He proceeded to England and formed the plan of an expedition to Mexico in aid of the patriots who were there struggling for independence. He succeeded in interesting some distinguished Englishmen in his plans, received subscriptions, bought a considerable quantity of arms, chartered a vessel, and sailing from Liverpool arrived at Norfolk in June, 1816, with fifteen officers, Spaniards, Italians, and English. He proceeded to Baltimore; conferred with many prominent Americans, including Gen. Scott; obtained sympathy and support; enlisted 200 volunteers, with whom he landed at Galveston, Tex., Nov. 24, but being unable to effect a junction with the Mexican patriots, he proceeded to New Orleans. Here he met with assistance, and was invited to undertake an expedition against Pensacola, but declined; reorganized his expedition; returned to Galveston, where he obtained a reinforcement of 100 Americans under Col. Perry, who had been serving in the insurgent squadron; landed at Soto la Marina, Tamaulipas, Apr., 1817; was joined by a few Mexicans, and at the head of less than 500 men forced his way to the centre of Mexico after several desperate actions with the Spaniards, especially at Peotillos, where he defeated 1800 royalists (June 18), and arrived June 24 at the fort of Sombrero, near Leon, held by the insurgents under Pedro Moreno. For the next three months Mina made repeated daring excursions, and in August attacked the Spaniards before the fort of Remedios at the head of 1000 cavalry. After numerous engagements, Mina was surprised at night at the rancho of Venadito, near Irapuato, Guanajuato, Oct. 10, and after a trial was executed in front of the insurgent fortress of Remedios Oct. 27, 1816. Mina was remarkable for generalship and heroism, and with proper support from the insurgents would have effected the independence of Mexico. The viceroy of Mexico received the title of count of Venadito as a reward for his capture. (See Robinson's *Memoirs of the Mexican Revolution.*) PORTER C. BLISS.

Min'aret [Arab. *menarah*, "lantern"], a slender turret which stands near every Oriental mosque. It represents the campanile, but the bell, being a Christian device, is unlawful in the Moslem religion. Hence, the blind muezzin's call or melodious chant, *adan*, is used instead of a bell to call the faithful to prayer.

Mi'nas Gera'es, a large province of South-eastern Brazil, extends between lat. 14° 20′ and 22° 50′ S., and between lon. 40° 27′ and 51° W., and comprises an area of 223,000 square miles, with about 1,500,000 inhabitants. It consists of an elevated plateau diversified by ranges of hills, rich in gold, silver, copper, and other useful minerals, covered with beautiful and valuable forests, and everywhere containing an exceedingly fertile soil. The climate is mild and healthy, except in some low tracts along the rivers. Cotton, sugar, coffee, maize, rice, and tropical fruits grow in abundance, but the resources of the country are as yet very far from having been duly developed. The inhabitants are mostly a mixed race composed of Indians, negroes, and whites. It has been attempted to draw European emigration hither, but without success. Chief town, Ouro Preto.

Min'cio, a river of Northern Italy, issues from the southern extremity of Lake Garda, passes by Mantua, and joins the Po 8 miles below this city after a course of 38 miles. It is navigable for barges from its union with the Po up to Mantua.

Mind [Gr. *μένος*; Lat. *mens, mentis*], contradistinguished from *matter*, is free, self-determined being, and hence exists in the form of atomic individuals, and not, as is the case with matter, in that of mere mechanical or quantitative aggregates. Wherever we observe activity which is in conformity to an end or purpose, we attribute it to mind. Mind contemplates its potentiality or want in the form of an idea, and uses means to realize it, while material things, although having potentialities, do not act with conscious purpose. Taken generally, material things are limited or constrained from without—conditioned through others—while spiritual beings are always free and self-conditioned, at least formally, originating their own limitations, first as ideas or purposes theoretically, and then realizing them as practical activity or will. Pure matter, devoid of all self-determination, is perhaps mere empty space—pure chaos; pure mind or absolute self-determined being is God. Between these ultimates lies the world of nature and that of man, the former containing material beings that manifest various degrees of self-determination—from the mineral through the crystal, the plant up to the animal; the latter containing the world of man or human history, which is the revelation of self-determination or mind in its progressive emancipation from matter, the humblest human soul being immortal and potentially free, though involved in manifold external complications with circumstance. Historically, it was Anaxagoras who first announced mind (*νοῦς* = reason) as the simple self-existent essence of things, that which sways matter. Besides this general signification of the term *mind*, in which it is a synonym of spirit, and corresponds to the German term *Geist*, including the several activities of feeling, volition, and thought, the word mind is used in a narrower sense to imply only the theoretical activity or the Intellect—the activity of cognition. Aristotle's *ψυχή* is identical with mind in the first-mentioned sense, if we interpret it as including the *νοῦς ποιητικός*. In the second book of the *De Anima* in his careful manner he defines soul (*ψυχή*) to be "the first entelechy of a physical organic body having life potentially." By "first entelechy" he means a self-determining or free being in its undeveloped first stages, when it *has* not unfolded, but *may* unfold, its capacities—hence, a formally free being; the "second entelechy" is the actually self-developed free being. According to this definition, soul would seem to be correlative of body. But he proceeds in the third book to describe the creative reason (*νοῦς ποιητικός*) as possessing independent and eternal existence apart from body, thus apparently making the term soul apply to God as well as to mixed earthly natures. In opposition to the theory of the speculative philosophers and theologians, represented by such names as Plato, Aristotle, Leibnitz, Hegel, St. Augustine, Thomas Aquinas, Duns Scotus, and Meister Eckhart, the materialists repudiate the co-ordination of mind with matter, or the subordination of matter to mind, and explain mind as a function of matter. Psychology with them, accordingly, falls into a department of physiology. From Democritus and Empedocles, and their gifted expounder Lucretius, down to Hartley and Bain, this unpopular doctrine has found in every age its hardy advocates. Physiological investigations into the conditions under which mind is active in its various phases have doubtless been of great benefit to psychology, and more is to be expected from this source in the future. Notably, in certain practical spheres—for instance, in the medical treatment of the insane—we have profited by adopting the physiological theory. John Stuart Mill, holding the doctrine of sense-perception as the highest authority, defines matter to be "the permanent possibility of sensation," and likewise mind to be "a series of feelings with a background of possibilities of feeling"—definitions which point toward Berkeley's theory of immaterialism. Another class of thinkers are found in open hostility to the theological and speculative view first mentioned, although they do not adopt the physiological view of mind. The early commentators of Aristotle were divided—some, like Themistius, holding that individual men are immortal; others, like Alexander Aphrodisias, holding that the lower faculties of the soul, memory, feeling, the discursive intellect, etc., called by Aristotle the passive reason (*νοῦς παθητικός*), are mere dispositions connected with the animal faculties, and therefore perishable with the body. The creative reason (*νοῦς ποιητικός*) was conceded to be immortal and independent of matter, but only as One, the deity or the world-soul, while men, who participate in this pure activity, lose their individuality at death with the lapse of sense-perception, memory, reflection, fancy, etc., which furnished the distinguishing attributes. The adoption by Averroës of this doctrine, subversive of all claims on the part of man as man to essential participation in the divine life, made an epoch in the history of thought. The dangerous predicament of the Church upon the revival of learning, and the study of Aristotle through Arabian commentary and translation, aroused the mightiest thinkers of the period of scholasticism, and Christian theology at length settled its dogmas upon a firm foundation beyond the power of the subtle metaphysics of the Arabians. The great question regarding mind was this of the relation of the particular individual to the universal soul; and there is no second problem of equal importance to man.

The philosophy of mind must verify its theories by their application to the interpretation of human institutions. The nature and destiny of mind is revealed in those gigantic products of the united endeavor of entire peoples—the work of the will rather than of the intellect, embodied in the state, the Church, civil society—with unmistakable tracings, while the scientific theories, born of individuals, are the field of interminable disputes. Psychology as a science has been taken by some to include the entire realm of the philosophy of mind; by others it has been understood to include only the subjective manifestation of mind, or, still more limited, the self-conscious phase of it. (See PSYCHOLOGY.) An outline of the entire philosophy of mind as treated by one of the most comprehensive and profound of modern thinkers includes the following departments: A, Subjective Mind falls under three heads—I. Anthropology, or the science of those phases of mind beginning with its enthralment in nature and its struggle for individuality; these are (*a*) the peculiar qualities and processes arising from race, climate, age, sex, sleep, sensation, passions, etc.; (*b*) feeling, the interaction between consciousness and the unconscious life of instinct, ideas for the most part remaining obscure and in the form of mere impulses; (*c*) symbolism and language, the mind creating for itself a conventional medium in which it fixes the products of its thinking activity for the sake of communication, combination of the individual with the race, and self-contemplation. The human mind thus frees itself from animal impulse and elevates itself to consciousness. II. Phenomenology of mind is the science of the process by which mind comes to recognize free self-determining intelligence as the presupposition and logical explanation of the objective world. It begins (*a*) with the consideration of immediate consciousness of objects, and traces the history of its (*b*) discovery of their relativity and the origin of their properties and attributes in their mutual relations, until (*c*) it arrives at the conviction that the objects of sense-perception are mere phases or manifestations of forces which are in a state of perpetual transition into each other, originating and annulling individual things, leaving no permanent material beings, but only an abstract internal power, of which the phenomenal world is a manifestation. The thought of a genesis of difference and distinctions from an abstract force in which all concrete distinctions have vanished is the thought of a self-determining or self-duplicating entity, a manifestation by means of self-opposition; and this radical idea that underlies the thought of force is the idea of a universal that exists as a particularizing process. Here may be recognized the thought or concept of the personal Ego or of mind. Hence, all distinctions among objects in the outer world are traced ultimately to mind as their Creator, and this investigation has found the substance underlying objects and identified it with the Ego or a thinking subject. III. Psychology, considered as a special department, is the science of mind as subject; it considers the subjective factor of knowledge and investigates its forms. It treats (*a*) of theoretical mind as sense-perception, representation and pure thought; (*b*) of the emotional activity of mind; (*c*) of the practical activity, or the will. B, Objective Mind includes the world of human history and the organized institutions of man—(*a*) the family, (*b*) civil society, (*c*) the state. C, Absolute Mind (*νοῦς ποιητικός*) includes (*a*) the phase of manifestation of the divine mind to sense-perception in the form of the beautiful in art; (*b*) the revelation of the divine to the will in the form of the good as set forth in religion; (*c*) the systematic exposition of the divine mind as the ultimate truth in the form of science, culminating in theology or philosophy. WM. T. HARRIS.

Mindana'o, or **Magindanao,** the southernmost and (next to Luzon) the largest of the Philippine Islands in the East Indies. Its area is estimated at 36,000 square miles. It is high, covered with immense mountains, among which are several active volcanoes (Buhayan). Earthquakes are frequent, and often very destructive. On Feb. 3, 1864, a terrible earthquake visited the province of Zamboanga, levelling most of the houses to the ground and causing some of the islands along the coast to disappear. Numerous lakes occur, expanding during the rainy seasons into vast sheets of water. In the dry season, from December to May, the weather is generally very fine and the heat moderate, but in May the heat rises rapidly; terrific hurricanes set in, especially on the western coast; one rain-storm with thunder and lightning follows another, and from June to November the lower portions of the island are flooded. The soil is exceedingly fertile, producing excellent timber, rice, cotton, pepper, and other spices, and yielding gold and coal. The fauna comprises oxen, buffaloes, sheep, goats, swine, a great variety of monkeys, immense swarms of birds—especially ducks, pheasants, and parrots—and myriads of lizards, snakes, reptiles of all kinds, and insects; but only one beast of prey, the wildcat. Fish are everywhere abundant, and always excellent. Only a small part of the island, comprising some districts on the northern and eastern coasts, with a population of about 74,000, belongs to Spain; the rest is divided into many independent states, of which the sultanate of Magindanao is the largest and most important. The inhabitants of all these states are very savage, especially those of the western coast; piracy is their chief passion, and seems to be their only occupation. Some of them are Mohammedans, a few Roman Catholics; the rest are idolaters. On the south-western shore the Spaniards have built a strong fortress, Zamboanga, to keep these tribes in order.

Min'den, town of Prussia, in the province of Westphalia, on the Weser. It is an old town, closely built, with few open places or interesting buildings. The Roman Catholic cathedral, however, has a tower which dates back to the eleventh century and illustrates the first stage in the development of the Gothic spire. The town was formerly strongly fortified, and has been the scene of some hard fighting; but now the place of its fortifications is occupied by manufacturing suburbs. It has manufactures of soap, chemicals, tobacco, and hosiery. Pop. 17,867.

Minden, La. See APPENDIX.

Minden, on R. R., cap. of Kearney co., Neb. (see map of Nebraska, ref. 11–E, for location of county). Pop. in 1880, 98; in 1885, 945.

Mindszent, a town of Hungary, situated on the river Kurcza, at its confluence with the Theiss, has 10,859 inhabitants, mostly engaged in agriculture, cattle-rearing, and fishing.

Mine. See MINES, MILITARY, and MINING ENGINEERING.

Minée (JULIEN), b. at Nantes 1739, was first a sailor, then a strolling actor, but finally took holy orders and was appointed priest at Trois Patrons, near St. Denis. When the Revolution broke out, he embraced its principles with great zeal, and was the first priest who took the oath on the constitution, for which he was rewarded with the bishopric of Loire-Inferieure. He died in Paris Feb. 23, 1808, married and unreconciled with the Church.

Mine'o, town of Sicily, in the province of Catania, pleasantly situated in a very fertile district W. of Agosta. Not far from this town is the little lake Palici or Natia (anciently called *Thalia*), with its sulphurous fetid waters, which, though cold, seem in a state of continual ebullition. In very dry seasons the water of this lake nearly disappears, and then the sand of its bottom is blown up as if by subterranean currents. Pop. 9337.

Mineola, R. R. junction, Wood co., Tex. (see map of Texas, ref. 2–J, for location of county), is situated at the intersection of the Texas and Pacific and the Missouri Pacific R. Rs., 110 miles W. of Shreveport, La. Pop. in 1880, 1175.

Miner (ALONZO AMES), A. M., D. D., b. at Lempster, N. H., Aug. 17, 1814; was raised on a farm, but received an academic education; was principal of the Scientific and Military Academy, Unity, N. H., 1835–39; ordained a Universalist clergyman June, 1839; edited the *Star of Bethlehem;* was settled as pastor at Methuen, Lowell, and Boston, Mass.; filled many important offices in Massachusetts connected with educational interests (*e. g.* on the State board of education and on the board of overseers of Harvard College), and was president of Tufts College 1862–74. Dr. Miner has contributed to various periodicals, and has been noted as an anti-slavery and a temperance reformer.

Miner (CHARLES), b. at Norwich, Conn., Feb. 1, 1780; emigrated in 1799 to the Wyoming Valley, Pa., where, with an elder brother, he established the *Luzerne Federalist,* and afterwards the *Gleaner,* in which he wrote a series of humorous essays which were widely appreciated; became assistant editor of the *Political and Commercial Register* at Philadelphia; established at West Chester, Pa., the *Village Record,* in which his sketches, signed "John Harwood," were very popular. He was a member of Congress 1825–29; was an active opponent of slavery and friend to the agricultural and silk-growing interests, which latter industry he was the first to introduce and popularize in the U. S. by his writings; declined a re-election on account of deafness; returned to the Wyoming Valley in 1832, and published in 1845 a *History of Wyoming,* in which the account of the celebrated Wyoming massacre was given according to the carefully gathered testimony of eye-witnesses. He also republished in a volume his early essays in the *Gleaner,* under the title *Essays from the Desk of Poor Robert the Scribe.* Mr. Miner was the author of the celebrated ballad of *James Bird*. D. at Wilkesbarre, Pa., Oct. 26, 1865.

Miner (Thomas), M. D., b. at Middletown, Conn., Oct. 15, 1777; graduated at Yale College 1796; taught school several years and studied law, but ultimately became a physician, practising for some years at Middletown. He was one of the founders of the Yale Medical Institute and of the Connecticut Retreat for the Insane; became a high authority upon fevers: published *Essays upon Fevers and other Medical Subjects* (1823), a treatise on *Typhus Syncopalis* (1825), several translations from French medical works, and a series of biographical sketches of distinguished physicians of Connecticut. D. at Worcester, Mass., Apr. 23, 1841. His autobiography was published in the *New Englander*, vol. ii.

Mineral Acids, Medicinal Uses of. Sulphuric, nitric, hydrochloric, nitro-hydrochloric, phosphoric, and carbonic acids are all used in medicine. The first four, undiluted, are powerfully corrosive, quickly destroying animal tissues. Sulphuric acid produces black sloughs, the others yellow. When swallowed, they are virulent poisons, causing intense pain, bloody vomiting, and speedy collapse. The antidotes are the non-poisonous alkalies—viz. lime, magnesia, and their carbonates. As caustics for surgical purposes, nitric and hydrochloric acids are alone used, sulphuric and nitro-hydrochloric being too intense in their action. Diluted, any of the four just mentioned may be used as lotions in sluggish skin diseases and to allay itching and check profuse sweating. Taken internally, all acids tend to increase the flow of saliva and the mucous secretions of the mouth and throat, and thus acid drinks quench thirst far better than simple water. Any of the acids of the present group may accordingly be used for this purpose, the stronger ones being of course greatly diluted. Acids taken before meals are useful in certain forms of dyspepsia, improving digestive power and preventing sour fermentation of the food. Sulphuric acid has an astringent effect in addition to its acidity, and is much used in diarrhœas, especially when associated with acid dyspepsia, and as a preventive of night-sweats. For internal administration this acid is most commonly given in the form of the "aromatic sulphuric acid" of the Pharmacopœia, or "elixir of vitriol," as it is often called. This is a tincture of ginger and cinnamon, to which a small quantity of sulphuric acid is added. All of the corrosive acids, even when medicinally diluted, should be taken through a glass tube to avoid injury to the teeth. Phosphoric acid is given internally in an officinal dilute solution in water. Carbonic acid, in the form of the popular carbonic-acid water, or "soda-water," is well known as a grateful thirst-quenching drink. It is also useful to allay nausea and vomiting, and to correct the nauseating tendency of many medicines, such as the diuretic and purgative salts. Edward Curtis.

Mineral'ogy [from *mineral*, and Gr. λόγος, "discourse"]. This science treats of the chemical and physical properties, relations, occurrence, and classification of minerals; the word *mineral* denoting any homogeneous, inorganic, natural product, not gaseous, and not the immediate result of organic processes. A mineral may be the indirect and altered product of organic life, like coal, which results from the alteration of the once organic wood, or amber, which is an altered vegetable resin; but fossil bones, shells, etc. are not to be classed as minerals. Minerals are distinguished by their chemical properties, their form, structure, lustre, color, hardness, specific gravity, etc.

Chemistry.—The exact composition of a mineral is ascertained by quantitative analysis; the nature of its constituents by qualitative analysis, the blowpipe reactions being especially useful in determining minerals, from their simplicity and certainty. Every one of the elements occurs in the mineral kingdom, and a mineral may consist of one element or of a combination so complex that no present system of chemical notation will give a satisfactory representation of its composition. Like any other chemical compounds, minerals are to be regarded as combinations of atoms and molecules, and in writing the formulas for these the ratios of the elements present are calculated in three ways. The *atomic ratio* is the ratio between the number of atoms; thus, for the aluminium, silicon, and oxygen in Al_2O_3,SiO_2 it is 2 : 1 : 5. The *oxygen ratio* is the ratio between the number of atoms of oxygen in the different oxygen compounds present. In Al_2O_3,SiO_2 the O ratio of the Al_2O_3 and SiO_2 is 3 : 2. The *percentage ratio* is the number of parts in 100, and is deduced from the ratio between the atomic weight of the compound and that of each constituent. The atomic weight of Al_2O_3 is 51.5 (old system); of O_3 it is 24; hence, 51.5 : 100 :: 24 : 46.6, the percentage of oxygen. For Al_2 (at. wt. = 27.5) we have 51.5 : 100 :: 27.5 : 53.4, the percentage of aluminium. The at. wt. of Al_2O_3,SiO_2 is 81.5, and that of SiO_2 is 30; hence, 81.5 : 30 :: 100 : 36.8, the percentage of SiO_2 in the compound. The atomic ratio of the constituents may be calculated from their percentage ratio by dividing the latter by the atomic weight of each constituent. In Al_2O_3 the percentage ratio of Al and O is 53.4 : 46.6; hence, $53.4 \div 13.75 = 3.93$, and $46.6 \div 8 = 5.82$, from which we obtain the ratio 3.93 : 5.82, or nearly 2 : 3, the atomic ratio of the aluminium to the oxygen. The ratio of any constituents in a compound may also be obtained by comparing the amounts of oxygen in the percentages of the constituents. Thus, in Al_2O_3,SiO_2 the percentage of $SiO_2 = 36.8$, of $Al_2O_3 = 63.2$. In 100 of SiO_2 there are 53.33 of oxygen; hence, $36.8 \times .5333 = 19.625$; 100 of Al_2O_3 contain 46.6 O; hence, $46.6 \times .632 = 29.45$; then 19.625 : 29.45 :: 2 : 3, and since SiO_2 contains 2O and Al_2O_3 3O, the result shows that the compound contains one of silica and one of alumina, or has the formula Al_2O_3,SiO_2. The atomic ratio is therefore of use in obtaining the formulas of minerals.

Compounds containing two kinds of elements are called *binary*, and one element is regarded as negative to the other. A *ternary* compound contains three kinds of elements, which are so combined as to form a base and an acid. Thus, MgO,SiO_2 contains the base MgO and the acid SiO_2, or the *basic* element Mg, the *acidic* Si, and the *acidific* O. The *replacing power* of the elements is in proportion to their combining power, reckoned in number of atoms of the acidific element, oxygen, sulphur, or whatever it may be. In accordance with this principle, if R represent any basic element, $R_{\frac{2}{3}}O$ may be written for R_2O_3, and may then replace RO in a compound.

According to the new system of chemistry, in the formulas of ternary compounds the acid and base are not written separately, as $2MgO,SiO_2$, but the symbol of each element is written by itself—Mg_2SiO_4. Regarding certain elements as negative to the others, it is held that each element has power to fix a certain number of atoms of a more negative element. The elements are divided into two classes—perissads (περισσός, "odd"), which combine with one another in the ratios 1 : 1, 1 : 3, 1 : 5, taking hydrogen as the unit; and *artiads* (ἄρτιος, "even"), with combining ratios 2 : 2, 2 : 4, 2 : 6, taking the same unit.

In some classes of compounds it is held that only a part of the oxygen present serves to unite the acidic element to the base. For example, in the formula MgO,SiO_2 we have Si combining with 2O, equivalent to 4H, and Mg with 1O, equivalent to 2H. The *tetrad* Si has then four bonds of attraction, and the *dyad* Mg two; O is likewise a *dyad*. Hence, we may represent the combination of Si, Mg, and 3O by the graphic formula $\mathrm{O} = \mathrm{Si} \begin{smallmatrix} \diagup \mathrm{O} \diagdown \\ \diagdown \mathrm{O} \diagup \end{smallmatrix} \mathrm{Mg}$, the dashes representing so many bonds of attraction, and indicating that only ${}_2O$ unite the Mg and Si, one O being combined with Si alone. Dana writes this formula $SiO \parallel O_2 \parallel Mg$. The formula $2MgO,SiO_2$ may be represented similarly by $\mathrm{Mg} \begin{smallmatrix} \diagup \mathrm{O} \diagdown \\ \diagdown \mathrm{O} \diagup \end{smallmatrix} \mathrm{Si} \begin{smallmatrix} \diagup \mathrm{O} \diagdown \\ \diagdown \mathrm{O} \diagup \end{smallmatrix} \mathrm{Mg}$; by $Mg = O_2 = Si = O_2 = Mg$; or, as Dana writes it, $Si \parallel O_4 \parallel Mg_2$. These formulas are written on the principle that the number of atoms of uniting oxygen is equal to the number of bonds of attraction of the basic or acidic element, according as the former or latter has the smaller number. The formulas are similar for sulphur, tellurium, and selenium compounds, and for ternary fluorides.

Form and Structure.—Some minerals occur only in an amorphous state, never showing any signs of crystallization, but the majority are at times well crystallized or distinctly crystalline. Any crystal can be referred to one of six systems, in which the crystal faces are determined by their position in regard to a set of assumed axes intersecting within the crystal. In the *first* (*isometric*) system there are three axes, all equal, and intersecting at right angles; hence this is called the *regular* system. In the *second* (*tetragonal*) there are two equal horizontal axes at right angles, and a third of different length, vertical to their plane. In the *third* (*orthorhombic*) are three unequal axes at right angles. In the *fourth* (*monoclinic*) are three unequal axes, one horizontal, one vertical, and a third inclined to the vertical and making a right angle with the horizontal axis. In the *fifth* (*triclinic*) the axes are all unequal and inclined to one another, one being assumed as the vertical axis. In the *sixth* (*hexagonal*), which is in some respects analogous to the *tetragonal*, are three equal horizontal axes, making angles of 60° with each other, and a fourth of different length, vertical to their plane. The physical characteristics of minerals in the isometric system are the same in the direction of any crystal axis, or any line symmetrically situated with reference to these axes; in the tetragonal and hexagonal systems they will be different in the direction of the vertical and of the horizontal axes. In minerals crystallizing in the third, fourth, and fifth systems, authorities sometimes differ in the selection of the vertical axis, being guided by questions of cleavage, simplicity of form, and analogy.

The crystalline form is very useful in distinguishing minerals, because it is an established fact that the angle between any two faces of a crystal will, under similar conditions, always be the same for the same minerals, subject to slight variations corresponding to changes in the composition of the varieties of the mineral. The similar faces may vary greatly in size, so that one or more faces may almost or entirely disappear, but the angles between the similar faces will remain the same.

Isomorphism, or the property of similar substances to crystallize in very similar forms, admits of their mutual replacement in crystallized minerals, this replacement being often accompanied by a slight change in the angles of the crystals. Thus, lime, magnesia, the protoxides of iron and manganese, and oxide of zinc, are isomorphous bases, and yield very similar crystals when combined with the same acid. Hence, the close relation between the forms of calcite, dolomite, and the related minerals. *Dimorphism* is the property of the same substance to crystallize in two different systems, or two different types of the same system; thus, carbonate of lime appears in the hexagonal system as rhombohedral calcite, and in the orthorhombic as aragonite. *Trimorphism* and *polymorphism* refer to crystallization in more than two forms. *Pseudomorphism* is the assumption by one mineral of the peculiar form of another, but the second mineral always retains its own internal structure and physical characteristics. Pseudomorphs may result from the deposition of one mineral upon another, followed by the removal of the first mineral by solution, and subsequent filling up of the mould thus formed with the material of the second mineral; by filling up of the cavity left by previous removal, through solution or otherwise, of the first mineral from its matrix; by alteration of the original crystal through removal or addition of some components; or, lastly, by simple molecular change within the mineral, which is possible only in case of dimorphous substances, as in the alteration of andalusite into cyanite.

A distinction is made between crystallized and crystalline minerals, the latter not showing free or partially individual crystals. If a crystalline mineral does not even show recognizable individuals, it is called cryptocrystalline. Crystalline minerals are classified, according to their structure, into *granular, lamellar, scaly, radiated,* and *fibrous.*

Lamellar structure is described as *parallel, divergent,* etc. In amorphous minerals there is no trace of crystalline form or special characteristic of structure due to individual crystals, although an intermittent deposition of the mass composing the mineral may have occasioned differences of color, hardness, and texture. The majority of the solid amorphous minerals are the result of a gradual change from a gelatinous state, or of rapid cooling from a melted condition, but many of them are the result of the alteration of pre-existing minerals.

Cleavage, or the tendency to split in certain directions, is characteristic of most crystallizable minerals, and is of great use in determining minerals, the cleavage planes being always the same for the same mineral, no matter what the modifications of the crystal. Thus, *calcite*, whether occurring as a rhombohedron or a hexagonal prism, will cleave always parallel to the faces of the type rhombohedron of calcite; *fluorite*, whether occurring in cubes, octahedrons, or any other form of the isometric system, will always cleave parallel to the faces of the octahedron. Cleavage takes place parallel to certain planes, but there may be two or more sets of cleavage-planes in the same crystal, and in this case the cleavage will be easier parallel to one set of planes than to another, but will always be easiest parallel to the same planes. Thus, *orthoclase*, in the monoclinic system, has a very perfect cleavage parallel to the base of the prism, a less distinct cleavage parallel to the clino-pinacoid, faint parallel to the ortho-pinacoid, and only in traces parallel to one face of the prism. Some minerals are devoid of cleavage, especially the amorphous minerals and native malleable metals, while the cleavage of some minerals, like mica and gypsum, is so perfect that they can be easily split into very fine laminæ. Other minerals have a distinct cleavage, which may be very hard to obtain, as in quartz, while some, like argentite, show scarcely any traces of cleavage.

Fracture differs from cleavage in not being parallel to fixed planes. It is classified as conchoidal, even, and uneven, according to the shape, and smooth, splintery, earthy, and hackly (like broken copper), according to the nature of the resulting surface.

Hardness.—Minerals vary in hardness, from the liquid hydrocarbons and water to the diamond. Hardness does not usually vary much for the same mineral, and is therefore a valuable aid in determining minerals. Its degree is ascertained by reference to the following scale, beginning with the softest: 1, talc; 2, gypsum; 3, calcite; 4, fluorite; 5, apatite; 6, orthoclase; 7, quartz; 8, corundum; 9, diamond. A mineral scratched easily by apatite, and easily scratching fluorite, would be fixed at 4.5.

According to their *tenacity*, or resistance to blows and cutting edges, minerals are classified as *brittle, sectile, malleable,* and *flexible*, the latter being *elastic* or *non-elastic.* It has been shown that the degrees of tenacity depend properly upon the elasticity of minerals.

Specific gravity is confined to narrow limits in its variations for the same minerals, and is of importance in distinguishing them.

Magnetism, or the power of affecting the magnetic needle, is possessed by a few minerals containing the magnetic oxide or sulphide of iron, and *magnetite* sometimes possesses polarity.

Electricity is developed in all minerals by friction; certain minerals become electric by pressure, cleavage crystals of calcite showing positive electricity when pressed between the fingers; others show electrical disturbance on warming, and are called *thermo-electric.* When opposite kinds of electricity are simultaneously developed at opposite parts of such crystals, they are said to possess polar thermo-electricity, and certain of these crystals are *hemimorphic*, or have different faces at their opposite ends. Tourmaline affords a very striking example of polar thermo-electricity.

Optical Properties.—All transparent crystals not belonging to the isometric system (anisometric) possess *double refraction*, or divide into two rays a ray of light passing through them. One of these rays follows the ordinary law of refraction, and is called the *ordinary* ray, while the other is called the *extraordinary* ray. A ray of light passing through a doubly refracting crystal may escape double refraction if it passes through in certain directions, according to the crystalline system. These directions are called the *optical axes.* In crystals belonging to the tetragonal and hexagonal systems there is one optical axis, parallel to the vertical axis, and such crystals are called *uniaxial.* The other systems are *biaxial*, and the two axes of refraction lie in one of the three planes passing through any two of the crystallographic axes, and are usually symmetrically situated with reference to the crystallographic axes in the same plane. The angle between the optical axes is called the optic-axial angle. A line bisecting the acute optic-axial angle is called the *acute bisectrix*, or simply *bisectrix*, and one bisecting the obtuse angle, and which is at right angles to the acute, is the *obtuse* or *conjugate bisectrix.* The optic-axial angle may vary widely for different varieties of the same mineral, but the position of the bisectrix is nearly constant. In the orthorhombic system the bisectrix is parallel to one of the crystallographic axes.

The emerging doubly refracted rays are *polarized*, but this phenomenon disappears when the light passes in the direction of an optical axis, and in the case of easily cleavable minerals we can readily determine whether they are uniaxial or biaxial by examining thin laminæ between two crossed Nicol's prisms or other suitable apparatus, because uniaxial crystals cleave best parallel to the base, and hence normal to the optical axes, while very cleavable biaxial crystals cleave best parallel to the base or one of the pinacoids, and would have neither of the optical axes normal to the laminæ.

Sections of doubly refracting crystals of proper dimensions exhibit colored rings when examined by convergent polarized light, owing to the interference of the rays. Uniaxial crystals show one set of rings, intersected by a dark cross; biaxial crystals, one or two systems of elliptical rings, crossed by a dark band. Although *quartz* belongs to the hexagonal system, yet a section of a quartz crystal vertical to the optical axis exerts double refraction in a peculiar way, the rays progressing not in direct oscillations, but with varying velocity in circular oscillations, producing what is called *circular polarization.*

Certain isometric crystals sometimes show double refraction, especially *senarmontite, diamond, boracite, analcite,* and *alum.* This is owing sometimes to incipient alteration; sometimes, perhaps, to pressure exerted by gases within the crystal; sometimes to interposed layers of some doubly refracting mineral; and sometimes, perhaps, to a lamellar structure of the mineral itself, which produces the same results as a system of glass plates, and has given the name of *lamellar polarization* to the phenomenon.

Some crystals transmit light of different colors and intensity in different directions. This property is called *pleochroism*, and belongs more or less to all crystals not isometric. Colorless crystals cause only variation in the intensity of the light—colored crystals in the color also. Uniaxial crystals are *dichroic*, and biaxial crystals *tri-*

chroic. The phenomenon is closely connected with double refraction, as the two rays suffer different absorption, and in general the more refracted ray also suffers the greater absorption. The phenomenon is observed by means of the *dichroscope.*

Labradorite, chrysoberyl, and other minerals show a peculiar change of color in reflected light, attributed partly to the presence of microscopic lamellæ and scales of foreign minerals, partly to very minute fissures in the mass of the mineral. *Asterism,* sometimes resulting in the appearance of a star, as in certain sapphire crystals, sometimes as a changeable streak of light across the fibres of certain varieties of gypsum, etc., is allied to the above phenomenon.

Lustre, Color, and Translucency.—Minerals are divided according to their *lustre,* or appearance in reflected light, into two grand classes, *metallic* and *non-metallic,* and the non-metallic again into adamantine, vitreous, greasy, pearly, silky, and lustreless or earthy. *Color* is always the same, and characteristic in the case of some minerals, as metals, pyrites, the sulphides, certain metallic oxides, and salts; others are white or colorless and transparent, like ice, quartz, many silicates, etc., but these may be colored by mechanical admixture or isomorphous combination of colored constituents. The colors of minerals vary greatly, and so does their translucency, the native metals and minerals with metallic lustre being generally quite opaque, even in very thin films.

Phosphorescence is induced in some minerals, as diamond and calcined barite, by exposure to daylight; in others, topaz and fluorite, by warming, by electricity, or by mechanical disturbance, as pressure, cleaving, etc. The *taste, smell,* and *feel* of minerals are additional means of distinguishing them.

Classification.—For a long time mineralogy as a systematized science was in a very confused state, minerals and rocks (often only aggregates of different minerals) were confounded together, and widely different minerals were placed in the same classes. Cronstedt, about 1758, pointed out the difference between a rock and a mineral; De Lisle soon after applied crystallography to the study of minerals, and finally Mohs produced a natural system, founded chiefly on external characteristics. In the early part of this century Berzelius introduced chemistry in classifying minerals, and at the present day chemistry, combined with crystallography, forms the basis of the generally accepted systems of mineralogy. Dana's system of mineralogy, as given in the fifth edition of his work on the subject, an unexcelled example of research and judgment, may be cited in illustration of the chemical grouping of minerals combined with crystallography. He first arranges the elements into three series, beginning with the more basic, then the more negative, and finally the eminently negative: *Series I. gold group,* gold, silver; *iron group,* platinum and allied metals, mercury, amalgams, copper, iron, zinc, lead; *tin group,* tin. *Series II. arsenic group,* arsenic, antimony, bismuth; *sulphur group,* tellurium, sulphur, selensulphur; *carbon-silicon group,* diamond, graphite. *Series III.* Chlorine, bromine, iodine, fluorine, oxygen. The gold group also includes hydrogen and the alkali metals; the arsenic group, phosphorus, nitrogen, and probably boron; the iron group, calcium, magnesium, aluminium, cobalt, nickel, zinc (chromium, manganese, lead, in part, etc.); the tin group, titanium and zirconium. The general subdivisions are then as follows: I. native elements; II. compounds, the more negative element an element of Series II. (1) Binary—sulphides, tellurides of metals of the sulphur and arsenic groups; (2) binary—sulphides, tellurides, selenides, arsenides, etc. of metals of the gold, iron, and tin groups; (3) ternary—sulpharsenites, sulphantimonites, sulphobismuthites. III. Compounds, the more negative element belonging to Series III., Group I.: chlorides, etc. IV. Compounds, the more negative element of Series III., Group II.: fluorides. V. Compounds, the more negative element of Series III., Group III. Oxygen compounds: (1) Binary—oxides; (2) ternary, the basic element of Series I., the acidic of Series II., the acidific of Series III. (1) silicates; (2) columbates, etc.; (3) phosphates, etc.; (4) borates; (5) tungstates, etc.; (6) sulphates, etc.; (7) carbonates; (8) oxalates. VI. Hydrocarbon compounds. The silicates may serve as an example of the further arrangement into groups and species. First, they are divided into anhydrous and hydrous silicates, and each of these into bisilicates, unisilicates, and subsilicates. In the anhydrous silicates the oxygen ratio for bases and silica is for the bisilicates 1 : 2; unisilicates, 1 : 1; subsilicates, 1 : less than 1. The bisilicates are arranged into groups: amphibole group, crystallization orthorhombic or clinohedral; angle of prism not 120°: beryl group, hexagonal; pollucite group, isometric. The amphibole group has sub-groups: *pyroxene sub-group,* angle of prism, 86°–88°; composition, RO,SiO_2 or $(3RO,R_2O_3)3SiO_2$, and when both RO and R_2O_3 are present, ratio of $3RO : R_2O_3 = 3 : 1$ to $1 : 2$. *a,* Orthorhombic; *b,* monoclinic; *c,* triclinic. *Spodumene sub-group,* angle of prism, 86°–88°; composition $(3RO,R_2O_3)3SiO_2$, and $3RO : R_2O_3 = 1 : 4$. *Amphibole sub-group,* angle of prism, 123°–125°: *a,* orthorhombic; *b,* monoclinic.

The sulphides, etc. of the gold, iron, and tin groups may serve for further illustration. There are three divisions: (1) *Basic,* atomic ratio between the sulphur, arsenic, etc. and the basic metal is less than one to one; (2) *Proto,* with the ratio 1 : 1; (3) *Deuto,* ratio 2 : 1. The *Proto* division has four groups: (1) *Galena group,* isometric, holohedral; (2) *Blende group,* isometric, hemihedral; (3) *Chalcocite group,* orthorhombic; (4) *Pyrrhotite group,* hexagonal. The *Deuto* division has two groups: (1) *Pyrite group,* isometric; (2) *Marcasite group,* orthorhombic. H. B. Cornwall.

Mineral Oil. See Petroleum.

Mineral Park, cap. of Mohave co., Ariz. (see map of Arizona, ref. 5–F, for location of county). Pop. in 1880, 318.

Mineral Pitch, Resin, etc. See Bitumen.

Mineral Point, on R. R., Iowa co., Wis. (see map of Wisconsin, ref. 7–D, for location of county), 175 miles N. W. of Chicago, has a seminary and high school, zinc and lead furnaces, iron-foundries, a planing- and several grist-mills, a car-shop, etc. Pop. in 1870, 3275; in 1880, 2915.

Mineral Springs. See Geology, Chemical, and Water.

Mineral Tallow, or **Hatchettine,** a fossil hydrocarbon, found in iron-stone nodules and in coal. It seems to be a fossil resin.

Mineral Veins and Deposits. See Ore Deposits.

Mineral Waters. See Water.

Mineral Wax. See Paraffine.

Mineral Wool. When in the molten state, vitreous or scoriaceous substances may be converted into fibres by the force of steam or air under pressure. These thread-like filaments have the appearance of wool or cotton when massed together, and hence the names "mineral wool" and "silicate cotton." As an article of commercial value the material first came into use in 1871, it having been produced in that year at Osnabruck, Germany. The production of it in this country commenced about four years later, and subsequently in England. In the various processes of smelting ores of metals the compressed air necessary to accelerate combustion sometimes escapes from the furnaces through the tapping-hole or tuyeres in such a way as to separate the cinder into shot-like particles, which in tearing themselves from the fluid stream draw out threads of various length and fineness. Most furnacemen are familiar with such freaks of the blast; so that the material in this sense has but little novelty, and it is to be noticed that as a result of this occurrence the only patent which seeks to protect the article at all does not claim the product as such, but the method of manufacture. John Player of Norton, near Stockton-on-Tees, England, was the inventor of the process as practised at the present time, and while he never made any mineral wool except in an experimental way, and although patents have been granted to others, still it is generally conceded that he was the only one who comprehended the method, as well as the usefulness and value of the product. The readiness by which long attenuated threads may be formed by drawing apart a heated rod of glass might seem to be suggestive of the whole process of converting vitreous substances into innumerable fibres, for the action of the air or steam is also mechanical, but except in the limited manufacture of spun glass the principle involved has not been utilized, and the conclusion is forced upon us that the method of making mineral wool had its origin in the accidental production above alluded to. What might be called the natural product occurs about the crater of Kilauea, in Hawaii, Sandwich Islands. The explosive force of the vapors escaping from the volcano spins the molten obsidian into filaments of great length, but, being highly silicious, they are brittle and too coarse for any practical use. These silky threads are called "Pélé's hair," after a native fire-goddess.

The slag of blast-furnaces is the cheapest and most abundant substance which can be utilized for the manufacture of the article. This, however, is only a coincidence, and furnace-slags in every case cannot be availed of, for some of them contain too large a proportion of silica to make fine and pliable fibres, while others are so basic, owing to the high percentage of lime, that they will not draw out satisfactorily. Besides, when there is an excess of lime, the tendency is for the fibres to become caked or solidified, there not being sufficient acid present to give stability and permanence to them. An objection to the use of mineral wool made from slag is that it generally contains sulphides of calcium, potassium, and sodium which are soluble in weak acids and in water containing alkalies, and to some extent also in warm water. When such a sulphur-bearing material is used on pipes or boilers, there is a danger of it becoming wet from leaks or from external moisture and the sulphur thus brought into solution to attack the iron. Cases of corrosion from this cause are, however, very rare, and it is contended that so long as the heat is kept on the pipe no dampness will reach its surface. In order to produce a non-sulphur-bearing mineral wool a plant has recently been put in operation to melt down such rock-mixtures as are free from the obnoxious element and are of the proper composition to form a cinder of a specific character. By mixing together four parts of orthoclase feldspar and six parts of dolomitic limestone a cinder is obtained which runs fluid and is susceptible of conversion almost entirely into fibres of a stable nature. Experience has shown that in treating slag two pounds of shot are made to every pound of fibre, while in the case of cinder prepared from minerals the proportion is about two and a half pounds of fibre to one pound of shot, thus illustrating the fact that the chemistry which governs the running of furnaces does not produce a slag which is specially well adapted for making mineral wool. These different products are named "slag wool" and "rock wool," the chief distinction between them being the presence of sulphides in the former, while the latter is free from them. As a general thing, the color of mineral wool is white. When made from furnaces using ores containing manganese, the fibres will be of a decided green color; other things being favorable to a white cinder, the color is pink if the furnace is running on hard iron. Rock wool made from limestone and potash feldspar has a delicate sea-green color when seen by reflected light.

The shot are not uniformly spherical, but elongated into imperfect tear-shaped bodies, sometimes containing vesicles or cavities and displaying iridescence in a marked degree. The fibres have little regularity of shape, and when seen under the microscope exhibit strange markings and appendages; while here and there in the field will be noticed decomposed light, showing that some of the particles have slight polarity. Split *hairs* are not infrequent, and one shot occasionally is found to be drawing out a number of fibres. The violent action of the steam, together with the sudden cooling, would seem sufficient cause for all the distorted and fantastic shapes assumed by the glassy filaments.

The shape of the orifice through which the steam escapes has much to do with the abundance of fibres into which a small stream of molten scoria may be converted. An aperture in the shape of a crescent, with horns up, seems to answer well with slag, but not so successfully with prepared cinder as one emitting the steam in a fan-shaped sheet. It has always been a subject of interest to devise a way by which the fibres may be caught and the shot allowed to go, but, as this involves some impossible features, the difficulty is best overcome by gathering the whole product in a large chamber, and when sufficiently cool selecting the lighter grade from the heavier and riddling any portion which may contain intermingled shot.

Mineral wool so well answers the term "non-conductor" that to study the one is to learn about the other. Possibly the most concise definition of a poor conductor of heat is that it is a good absorbent. The two properties, non-conduction and absorption, are complementary; so that when one is ascertained the other may be inferred. It would seem to be detracting from the merits of this article to impute its virtue entirely to an invisible component which is incidental to its make-up, but it is apparent that the fibres simply act as a medium to prevent the circulation of the air; which being accomplished, the passage of heat is retarded. The percentage of air in mineral wool is estimated with accuracy in the following manner. We find that 192 pounds, or one cubic foot, of molten slag will make 192 pounds, or thirteen cubic feet, of *extra* mineral wool; so that the resulting fibres encase eighty-three times the quantity of air that the slag did. In other words, the cubic foot before conversion contained 100 per cent. of material, but after conversion the same bulk contained only 8 per cent.; therefore 92 per cent. of its volume must be air. On the facility with which air circulates depends climatology and ventilation, while insulation depends solely on its retention in a quiescent state. The degree of conduction of air may then be said to be proportional to its freedom, and the degree of non-conduction proportional to its divisibility by any media. By reason of its porosity the material also forms a most effective barrier to the transmission of sound. The indestructible character of the fibres is, of course, what makes mineral wool available for all purposes of insulation. It cannot decay, char, or disintegrate. Insects or vermin find in it nothing wholesome to eat, while its glassy nature forbids their making homes in it.

There are now in use in this country over 9,000,000 pounds of mineral wool; and the outlook promises that more than this quantity will soon be marketed annually.

R. D. A. PARROTT.

Mineral Wool in America, The Manufacture of. Mineral wool was for a number of years made on a small yet on a working scale at a blast-furnace at Greenwood, Orange co., N. Y. Gradually the demand for the article increased, and another blast-furnace, delivering 20 slag-cars per day, was put in operation at Stanhope, N. J. The method adopted in the latter place shows several original details, and has been described in *Eng. and Min. Jour.* as follows: Steam under pressure of 45 to 80 pounds is allowed to escape from a crescent-shaped aperture 1½ inches by ⅛ inch, and it strikes a stream of molten slag about a finger thick flowing from the cinder-car over a gutter which controls the stream. The steam divides the slag into innumerable shot-like bodies, which in becoming detached pull out a thread or fibre. The conversion is due entirely to the mechanical force of the particles of steam, which, it is estimated, travel at a speed of about 2000 feet per second. They strike against a brick wall built up in a large chamber for collecting the wool. The shot are broken off from the fibre and lie embedded in the wool as it has settled upon the floor of the chamber. At Stanhope there are two such chambers, into each of which four jets, arranged in pairs, deliver. While one of the chambers is in use the other is being cleaned up, it having been allowed to cool off after blowing for half a day. The capacity of the furnace at Stanhope is about 2000 pounds per day. At present, however, only a part of the cinder is utilized, as it chills. The length and fineness of the fibre obtained by blowing steam across a stream of molten cinders largely depend upon the composition and temperature of the fluid material, a very liquid and hot cinder furnishing a large percentage of very fine fibre, which it is the principal object to produce. It is suggested that the building of a reverberatory furnace, into which the molten cinder from the blast-furnace is charged, to be kept there until wanted, would give more regularity to the working, as it would act as a stock which could be drawn upon at any time, while the cinder could always be kept at the proper temperature.

Miner'bio, town of Northern Italy, in the province of Bologna, about 16 miles N. E. of the city of Bologna. It lies in a fertile plain, and has an industrious population of 7244.

Minersville, R. R. junction, Schuylkill co., Pa. (see map of Pennsylvania, ref. 5-H, for location of county), on the Mine Hill branch of the Philadelphia and Reading R. R. and the West Branch of the Schuylkill River, has a library, excellent waterworks, a good fire department, foundries, and anthracite furnace. Principal occupation, coal-mining. Pop. in 1870, 3699; in 1880, 3249.

Miner'va, a great Roman divinity, the virgin daughter of Jove, early identified with the Greek Athena, whom she much resembled. She was the patron of the arts and of all crafts requiring skill and tact, the inventress of wind instruments, and the frequent guide of men in battle and on other dangerous occasions. She ranked third among the gods of the Capitol. Like Athena, she took a profound interest in human affairs, and her worshippers seem to have been inspired with a profound reverence for her. Her name is evidently derived from the same root as *mens*, "mind," and she is accordingly the thinking, calculating, and inventive power personified. Varro considered her simply as the impersonation of all ideas or as the plan of the universe. She also had the surname NAUTIA, which, according to a widespread legend, had originated in the following manner: Diomedes, who had carried the palladium away from Troy, soon found out from his misfortunes that it availed him nothing, and he consequently asked the oracle what to do with it. The oracle told him to bring back the palladium to the Trojans, and on his wanderings through Calabria he decided to deliver it up to Æneas; but when he came to the Trojans, he found Æneas engaged in offering up a sacrifice, and thus it came to pass that Nautes received the palladium instead of Æneas. The goddess, however, did not repudiate him; on the contrary, she bestowed many favors upon him, made him her servant, and instructed him in many arts. Afterward the family of the Nautii was considered the exclusive possessors of all knowledge concerning the manner in which Minerva Nautia was to be worshipped. Her mysterious image was preserved in the most secret part of the temple of Vesta, and was regarded as one of the safeguards of the city.

Minervi'no Mur'ge, town of Southern Italy, in the province of Bari delle Puglie. This rich and commercial city is situated on an eminence about 24 miles from Barletta; its climate is healthy, its buildings are respectable, and from the extent and grandeur of the view which its peculiar location affords it has been called the "balcony" of Apulia. Pop. 13,844.

Mines, Coal, and Mining. See MINING ENGINEERING.

Mines, Military. I. *General Definitions.*—The term military mine originally signified a subterranean passage. In modern warfare the object of such a passage is usually to deposit a quantity of powder for subsequent explosion, and the term is now employed to designate the charge as well as the passage leading to it. This subterranean passage is called a shaft when it is vertical, a gallery when it is horizontal or inclined and exceeds in dimensions 3′ × 4′, and a branch when it is under these dimensions. When a gallery or branch is inclined it is called ascending or descending, according to the direction of its inclination. Mines used in the attack are generally called simply mines; in the defence, countermines. In the latter the principal communications, being generally prepared long in advance, are lined with masonry; in the former wood is used for lining.

II. *Communications for Mines of Attack.*—The names and dimensions in the clear of the galleries employed in the attack are—

1st, *Great Gallery*, 6′ 6″ high and 7′ wide, used for the descent into the ditch and passage of cannon.

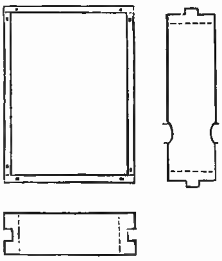
2d, *Principal Gallery*, 6′ 6″ high and 3′ 6″ wide, used for the descent into the ditch and passage of troops two abreast.

3d, *Common Gallery*, 4′ 6″ high and 3′ wide, used for all the general purposes of the attack, being executed more rapidly than any other.

4th, *Branch*, 3′ 6″ high and 2′ 6″ wide, used to reach a position adjacent to a gallery; is too small to work in for a distance greater than ten or twelve feet.

The wooden linings are of two kinds—viz. frames and sheeting, and cases. With the former stout frames are placed at intervals of about 4 feet, and outside them sufficient sheeting planks to prevent the earth falling in. In shafts two pieces of sheeting on a side, and in galleries sheeting for the top only will generally be required; but the case sometimes occurs when it is necessary to close-sheet all round. A mining case consists of four pieces of plank arranged with mortises and tenons (Fig. 1). The cases being fitted together, are placed touching each other, so as to form a continuous lining. Notches are cut in the uprights to facilitate handling them. In both frames and cases the pieces laid on the ground are called groundsills, the uprights stanchions, and the top-pieces capsills. In our service frames and sheeting are preferred to the other kind of lining, though the use of either has been exceedingly limited.

FIG. 1.



In driving long galleries great care must be taken to provide ventilation. A current of air may be produced by boring a hole upward to the surface; or by a fire arranged so that its supply of air must come from the gallery; or by mechanical means, such as a bellows or ventilating-fan. Should there be two galleries parallel to each other, communication opened between them will produce a current.

III. *Loading and Firing Mines.*—The cavity excavated to receive the powder is called the chamber. It is usually placed at the extremity of a branch, and is cut at right angles to it. In dry soil the powder is deposited in bags, these being kept from contact with the ground by straw or brushwood. In damp soil the bags must be coated with waterproof composition, or the powder put into a watertight box. The powder, having been deposited, is connected with the surface by a fuze in the shape of the ordinary safety-fuze, powder-hose, or electric wires, generally the latter. To prevent the force of the explosion acting in the direction of the gallery, it is necessary to fill the latter up for a certain distance with solid materials. This operation is called tamping. To get the full effect of the powder, the tamping should extend from the charge a distance of at least one and a half times the line of least resistance. (See IV. below.) A given effect may be produced, however, with less (and indeed without any) tamping, provided the charge be sufficiently increased, though it is at the cost of considerable damage to the gallery. When the tamping is diminished one-third, the charge should be increased one-fourth; when two-thirds, the charge should be increased one-half; and when the mine is not tamped, the charge should be doubled. The materials used for tamping may be the earth just excavated or sand-bags—*i. e.* bags filled with earth or sand. The latter are the better, as they are more quickly deposited. Those farthest from the chamber are also more readily removed after the explosion; the consistency of the others is destroyed.

Mines may be fired (or, as it is technically termed, sprung) by electricity, by the ordinary safety-fuze, or by powder-hose. The first is by far the preferable method. Powder-hose is a long cylinder of linen or calico, about an inch in diameter, filled with powder. The cylinder having been prepared is filled from the top of a house. The outer end is ignited by a piece of portfire or safety-fuze. The powder-hose by its explosion itself poisons the galleries, and it is not well adapted to the simultaneous explosion of several mines. The same may be said, to a lesser degree, of safety-fuze. They are resorted to only when there are no facilities for creating the electric current.

IV. *Charges and Nomenclature.*—The explosive used in military mines is generally gunpowder—nitro-glycerine, gun-cotton, and other violent explosives being too sudden in their action to have the lifting effect required. These compounds may sometimes be used in small mines in a rigid medium like rock or masonry, where a sudden blow will do the work required; but they are not suited to the general purposes of the military miner.

The effects caused by an explosion underground depend upon the quantity of powder, upon its depth below the surface, and upon the nature of the soil. Besides the disturbance at the surface, there is a violent internal commotion which extends in all directions. The distances to which this commotion extends are called the radii of rupture. When the charge is so small as not to produce any effect at the surface, the radii of rupture are equal in all directions; but when the charge is sufficiently large to produce a crater, the horizontal radii of rupture are much greater than the vertical radii. The radius of the circular opening on the ground is called the radius of the crater. The shortest line drawn from the centre of the charge to the surface of the ground is called the line of least resistance, and is always measured in feet. The line drawn from the centre of the charge to the edge of the crater is called the radius of explosion. A crater of which the diameter is equal to the line of least resistance is called a one-lined crater; when the diameter is double the line of least resistance, a two-lined crater, and so on. Mines charged so as to produce two-lined craters are known as common mines, and are those generally employed to produce destructive effects at the surface. If more heavily charged, they are called globes of compression or overcharged mines; these are employed to produce destructive effects beneath the surface; for example, to destroy the enemy's galleries. Those with smaller charges are called undercharged mines, and are frequently used by the defence to avoid making large excavations in which the enemy can obtain cover for a lodgment. Those with charges so small as not to produce any crater are called camouflets; they are used to blow in the wall of earth remaining between two hostile miners. A small mine, with a line of least resistance not greater than 10′, formed by sinking a shaft from the surface of the ground and placing the charge at the bottom of it, is termed a fougasse; its object is somewhat similar to that of the more modern torpedo. A stone fougasse consists of an excavation in the form of a frustum of a cone, with its axis inclined towards the enemy, at the bottom of which is placed a charge of powder. The powder is covered with a platform of planks, and this with a heap of stones or bricks. The explosion throws the latter forward, scattering them over a large surface. Its action resembles that of a mortar, and it is not strictly a mine, though generally classed as such.

Charges are said to be at one, two, three, etc. lined intervals when the distances between their centres are respectively one-half, two-halves, three-halves, etc. of the sum of their lines of least resistance. It is generally assumed that the volume of a two-lined crater is equal to four-sixths of the cube of the line of least resistance.

The following are the formulæ employed at Chatham, England, for calculating the powder-charges of mines and their radii of rupture in earth. Representing the radius of the crater by r, the charge of powder in pounds by c, and the line of least resistance by l,

In a common mine, $c = \frac{1}{10}l^3$.
In an overcharged mine, $c = \frac{1}{10}[(r-l)0.8+l]^3$.
In an undercharged mine, $c = \frac{1}{10}[l-(l-r)0.8]^3$.

An undercharged mine becomes a camouflet when the value given to r in the equation is less than $\frac{3}{8}l$.

The horizontal radii of rupture are—

In a common mine, $\frac{7}{4}l$.
In an overcharged mine, $\frac{7}{4}[(r-l)0.8+l]$.

The vertical radii of rupture are—

In a common mine, $l\sqrt{2}$ or $l \times 1.4142$.
In an overcharged mine, $[(r-l)\ 0.8 + l]\sqrt{2}$.

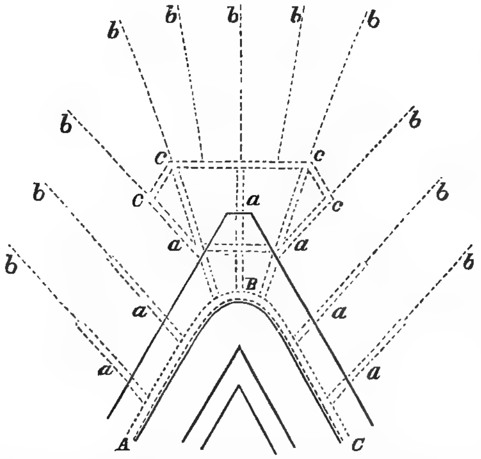
The quantity of powder for a common mine in earth having been found by the above formula, the proper amount for a different medium may be obtained with sufficient approximation by multiplying the calculated amount by

1.25 for dry sand;
1.31 " wet sand;
1.41 " earth mingled with stones;
1.55 " clay mingled with tufa;
1.66 " poor masonry;
2.25 " rock;
2.50 " good masonry.

V. *Countermines.*—The object of countermines has been, in the past—1st, to repel the enemy's miner; 2d, to annoy the besieger by their powerful moral effect; and, 3d, to overthrow the siege-works erected near the fortress, such as trench cavaliers, saps, and breaching batteries. The increased power of modern artillery has rendered them less necessary for the last-mentioned purpose, but at the same time has made it more probable that they will be needed for the first, since an attacking force, finding its advance more difficult on the surface, will resort more frequently to underground works. A system of countermines consists of two parts—viz. that exterior to the main ditch, and that under and within the main ditch. The two leading principles to be observed in its arrangement are—1st, to make each group of chambers and branches independent of the others, by giving it a separate communication with the main gallery in rear, so that the destruction of one group may not paralyze another; and, 2d, to present the ends of galleries to the blows of the enemy, rather than the flanks, since the effects of his globes of compression are thus much diminished.

Fig. 2 shows an arrangement of the most important galleries in a system of countermines. The continuous gallery A B C is placed behind the counterscarp, and is the base of the first part of the system; it is called the counterscarp gallery. The galleries *a a a* are called galleries of communication. The galleries *b b b*, of which the function is to reconnoitre the enemy's miner, are called listening galleries. The galleries *c c c* are called transversals; their object is to facilitate ventilation and the service of the mines. In the second part of the system—not shown in the diagram—the mines under the ditch, having for their main object to disperse the débris from the breaches, are placed in front of the foot of the scarp. Their branches debouch from a gallery behind the scarp and about twenty yards from it, called the scarp gallery. This gallery serves as the base to all the mines within the scarp.

Fig. 2.



Only such galleries are constructed in masonry in time of peace as are under the close protection of the works on the surface; since if they are carried far out, the enemy who, it must be assumed, knows their position, can pass rapidly over and thus paralyze a part of them.

VI. *Subterranean Warfare.*—The attack and defence by mines is not limited to the case of a regularly countermined fortress. Countermines may often be improvised after the investment of a place. In the attack the miner should advance by several galleries, the outer or flank ones being guarded by branches as listeners, and should push his advance with great vigor, at the same time taking all precautions to discover the enemy and to conceal his own approach. Upon discovering the enemy's presence, he must at once establish globes of compression, to destroy the countermines. But before springing them he must prepare for the following operations, which are to immediately follow: viz. 1st, to occupy and intrench himself in the craters; 2d, to construct shelters for the troops ordered to protect them from sorties; and, 3d, to establish surface communication between them and his trenches. The latter is done by means of the sap, and by intermediate small mines which are sprung at the same time as the globes. As soon as he has occupied the craters, the besieger should sink a shaft and debouch with his galleries. These will generally be directed straight to the front to continue the attack, but sometimes also in a lateral direction, either to unite two craters by the explosion of intermediate small mines, or as a precaution to guard his flanks. Should he be unable to advance with galleries, he may pass rapidly over the surface with the flying sap, and sink a shaft over the countermines. This shaft, being heavily charged, may be fired without tamping, and will crush in the galleries near it. It is called a shaft of attack.

Should the enemy open a crater by the explosion of a countermine, the besieger will occupy it and proceed to search for the gallery leading to it. Having taken possession of the gallery, he may convert it into a trench by the simultaneous explosion of heaps of powder deposited in it from distance to distance. The besieger should use large charges of powder, as a general rule employing globes of compression.

In the defence the besieged should suspend his labors several times a day to listen. As soon as he hears the enemy, he should push forward a branch to meet him; or he may at once excavate a chamber and load it as a camouflet, and then wait until the enemy is near enough. The object of the besieged is to destroy as much of the enemy's galleries as possible, while at the same time he avoids producing deep craters at the surface in which his enemy can make a lodgment. Hence, he should place his mines at such a depth that, even while he employs considerable charges, these shall not produce extensive craters, and he must not spring them until the distance of the enemy is less than the line of least resistance. Under favorable circumstances he should himself occupy a crater. After the enemy has sprung his globes of compression, the besieged, besides keeping up a heavy artillery fire on the craters, should at once advance with numerous branches close up to them, in front and on both flanks. If he succeeds in preventing the enemy from debouching with a gallery, he proceeds to drive him out of the crater by further explosions. He opposes the sinking of shafts of attack over his countermines by countershafts, made by boring a hole upward, loading, and firing it. He repels the storming of his galleries by barricading his loopholed doors, and firing a smoke-ball on the enemy's side; the latter being thus driven away, he has time to effect an explosion which shall destroy a portion of his gallery, and thus raise an effective barrier.

VII. *Sketch of the History of Mining.*—Military mines have been used in war since long before the Christian era. They were originally employed by the attack to obtain secret access to the interior of the besieged place, and later to reach the foundations of fortress walls, under which considerable excavations were made, the walls being supported by temporary props of timber which were afterwards set on fire. The defence was not slow to adopt this weapon, and employed it to oppose the attempts of the enemy to fill up the ditch, by carrying away from below what he deposited above, and to make cavities under the heavy movable towers and battering-rams, into which these machines were to fall, thus becoming disabled. Subterranean combats with the sword and buckler were not uncommon even as late as the Middle Ages. At the siege of Melun, in 1420, the besiegers excavated a mine and the besieged a countermine, in which they held a sort of tournament, in which Henry V. of England and the duke of Burgundy took part.

Gunpowder had been discovered for nearly two centuries before it was applied to mines, and the first attempt to use it was unsuccessful. In 1487 a Genoese engineer opened a breach with gunpowder in the citadel of Sassano in Tuscany, but the breach was incomplete and produced no results. This attempt was witnessed by Pedro Navarro, a Spanish captain, who in 1500 repeated the experiment in the island of Cephalonia, and with more success. Three years later, at the Chateau d'Œuf at Naples, he obtained a success so striking that mining became at once the means generally employed for destroying works of defence. It was so efficient that sometimes when the besieger had prepared his mine he would invite the besieged to inspect it, and the latter having verified its existence, would surrender at once. This occurred at Milan in 1515.

The first efforts of the defence to repel this method of attack were of a passive nature. They excavated galleries either in front of or behind the foundations. By the former they cut off the approach of the enemy, and lying in wait for him attacked him as soon as he made his appearance. By the latter they sought to draw the action of the enemy's mine away from their walls, by allowing it to vent itself in the direction of their gallery, rather than against the wall. Sometimes they advanced to the chamber while the enemy was tamping, and either cut off the powder-hose or carried away the powder. But the besieged soon passed to a more active defence. He surrounded his ramparts with galleries, from which ran out branches provided with mine-chambers established at different depths, and he destroyed by successive explosions the works of the besieger as he advanced. Arranged under the glacis, the countermines prevented the enemy crossing it and establishing his breaching and counter batteries; under the bottom of the ditch they served to destroy the works of the passage, and to remove the débris at the foot of the breaches; in the body of the parapet they obstructed the assault. Their utility was so evident that all the great powers organized and attached to their military forces bodies of miners.

During the eighteenth century vast systems of countermines were proposed by various authors, and some of them were in part executed. Mines were arranged in several tiers, so as to blow up the same portion of ground several times, and some were advanced as far as the second parallel. One writer (Delorme) claimed that he could blow up the same portion of ground as many as thirty times. Another (Dubuat) proposed to go below the water-level, so as to be certain of getting lower than his enemy. The enormous cost of these systems was an objection, but the great advantage of being the first in possession of the ground caused some of them to be executed on a large scale at many of the European fortresses. In subterranean warfare the attack could not take advantage of its preponderance in numbers, and the defence seemed to resume once more its superiority. This state of affairs was based upon the generally received opinion that no crater could be formed of which the diameter should be greater than twice its depth, and that the interior effect of an explosion was very limited. About the middle of the eighteenth century Belidor discovered the fallacy of this opinion, and thereby revolutionized the whole art of subterranean warfare. He found that by using very large charges he obtained an interior commotion sufficient to destroy galleries at a distance equal to four times the line of least resistance. He gave to mines so charged the name of "globes of compression." By their employment the besieger could clear the ground for a considerable distance without coming himself within range of the more limited mines of defence. They were first used in war at the siege of Schweidnitz in 1762. These globes, however, required considerable time for their preparation, since to give them a long line of least resistance it was necessary to descend to a considerable depth below the surface and employ a long branch to give room for the requisite tamping. This enabled an active enemy to place a small mine near them and destroy them; until Mouzé discovered that by increasing the charge the tamping might be diminished.

Belidor's globes of compression had an effect upon systems of countermines similar to that which artillery had upon fortifications; that is, it became necessary for the defence to be an active and not a passive one. The complicated and costly system of countermines gave way to simpler preliminary arrangements, with a view to greater vigilance and activity during the time of action. Some military engineers have proposed to drop countermines altogether, but that, it is believed, they cannot afford to do.

The most recent employment of mines on a large scale was at the siege of Sebastopol in 1855. An excellent account of them is given in the *Défense de Sebastopol, exposé de la Guerre souterraine*, prepared under the direction of Gen. Todleben by Col. Frolow of the engineers, and printed at St. Petersburg in 1870, to which the reader is referred for an illustration of the subject. O. H. ERNST.

Minghet'ti (MARCO), b. in Bologna, Italy, in 1818; studied physical and social science almost without assistance, and as soon as he was of age he travelled extensively in Italy, France, and Germany. In 1846 he pronounced a discourse at Bologna on the corn-law reform in England, declaring himself in favor of free trade. His next work was a *Dialogue on the Philosophy of History*. In 1854 he published an essay on the *Decay of the Fine Arts* and a eulogy on Gastano Recchi; in 1859 a treatise entitled *Della Economia publica, delle sue attinenze con la morale e col diritto*, which is the most remarkable of his works. Meanwhile, Minghetti had established in 1846 a journal, *Il Felsineo*, which gave him great consideration at Bologna. In 1847 he was invited to Rome as member of the Consulta della Finanze. In 1848 he was named by Pius IX. minister of public instruction, but on the defection of the pope from the liberal cause Minghetti left the ministry and hastened to the Lombard camp, where he was appointed captain on the staff of Carlo Alberto. After the battle of Goito he was created major, and after that of Custoza (1848) he was decorated by the hand of the king himself. Rossi invited him to form a part of his constitutional ministry. Minghetti arrived at Rome on the very day of the assassination of his friend, and at once published an indignant protest against the infamous crime. Pius IX. desired Minghetti to take the place of the murdered minister, but he refused, and returned to the Piedmontese army. After the battle of Novara he gave himself up to his private studies, taking part in politics only when it was necessary to sustain the policy of Cavour. In 1858 he went to Egypt and Sinai; in 1859 he was appointed by Cavour secretary-general of foreign affairs, and contributed powerfully to secure the annexation of the duchies and of the Romagna. After the peace of Villafranca he became a member of the assembly of the Romagna, and upon the annexation he was elected member of Parliament from Bologna. In 1860, Minghetti was named minister of the interior, in 1862 minister of finance, and at the same time president of the council; in 1864 he effected a loan of 700,000,000 francs, and with the concurrence and aid of Peruzzi brought about the famous September convention which transferred the capital of the kingdom of Italy to Florence. In the Menabrea ministry Minghetti was at the head of the agricultural and commercial department, and from 1873 to 1876 he was at the head of the cabinet—first as minister of finances, afterward as minister of foreign affairs. He has published *Opusculi Letterari ed Economici* (1872), *Le Donne Italiane nelle Belle arti al Secolo XV. e XVI.* (1877), and *La Chiesa e lo Stato* (1878).

Mingrelia, which down to 1804 formed an independent principality of Transcaucasia, but which in that year became subject to Russia, corresponds to the ancient *Colchis*, and its capital, Izgaur or Iskuriah, situated on the Black Sea, is identified with the ancient *Dioscurias*, a colony of Miletus. The Mingrelians, numbering about 197,000, are closely related to their neighbors the Georgians.

Min'ho, or **Entre Douro-e-Minho,** the northernmost, the most densely peopled, and the best cultivated province of Portugal, is bounded W. by the Atlantic, N. by the Minho, and S. by the Douro. Area, 2671 square miles. Pop. 982,735. The surface is much diversified by mountains and valleys; the soil is not very fertile, but the mild, moist climate, the copious streams fit for irrigation, and a most careful cultivation have made it very productive. Useful minerals are found, but not much worked. Trade and manufactures are flourishing. Cap. Oporto.

Minho [Spanish *Miño*], a river of Spain and Portugal, rises in Galicia, forms for some distance the boundary between the two countries, and falls into the Atlantic after a course of 130 miles.

Min'iature, a delicate style of painting, generally applied to very small portraits, whence a "miniature." The word is also used as an adjective to indicate anything in a reduced form retaining all its original appearance. Thus, "Tragedy is the miniature of human life." The term is derived from the Latin *minium*, "vermilion," once employed in MSS. for capital letters, which were afterwards developed into ornaments with small portraits. In Middle Latin *miniare* means to "color" or "write in red." The word "miniature" long continued to be used for red. "If the names of other saints are distinguished with *miniature*, the Virgin's ought to shine with gold." (*Hicks.*) Warton uses *miniature* for colored with red.

Miniature painting may be divided into two kinds—that of the illuminated manuscripts, which was always executed on parchment, and the modern art so called, applicable to any material, but for which ivory plates almost invariably serve as the ground. The *miniatori* or illuminators of the Middle Ages were distinguished for great care, especially in the preparation of their colors, which are generally as fresh to-day as when first applied. After the invention of printing had superseded calligraphy and illumination, the demand for pictures, whether small portraits or reduced copies of larger works, by no means diminished; it in fact greatly increased, and the art assumed new characteristics. Though less modern in many respects than their Italian contemporaries, Hemling, and especially Holbein (d. 1554), may be regarded as the fathers of the present miniature. The earlier painters used egg, gum, or glue as a vehicle, though D'Agincourt mentions some works the colors of which were insoluble in water. They always employed body-colors thickened with white; thus, the shades were not executed with a transparent medium, but with light colors which were opaque. Many of the old miniaturists painted in oil. Opaque coloring was really better suited to parchment and to the state of art at that time than the transparent. But as it was found that the exquisite and peculiar tone of ivory with its barely perceptible grain (see Ivory) bore a resemblance to the human complexion, transparent hues were more and more employed, until the body-colors were limited to drapery and the accessories. In fact, the delicate cross-hatching or cancellation which is peculiar to ivory, and which aids in producing the infinite blendings of the skin, had a great influence in not only inducing the free use of transparent colors, but in changing the style from stippling (or dotting), or washing and broad coloring, to *hatching*, or making repeated small lines, which are graduated and varied in every possible way to produce the requisite effect. At present, opaque colors are very sparingly used for occasional touching. The paints and brushes are the same which are employed in all water-color painting or illuminating. Among the most distinguished miniaturists may be cited Nicholas Hilliard (d. 1619), Isaac Oliver (d. 1617), who was employed by Queen Elizabeth; Anne Segers (1550), Jean Mielich (1572), Giovanni Cerva (1620), F. de Lianno (1625), J. Ligorio (1627), Scorza (1631), F. and M. de Costello (1636), Castulli (1637), Bauer (1640), Du Guerrier (1659), Stefaneschi (1659), Fruitiers (1660), Oliver (1660), Gerbier (1661), T. Flatman (1668), Sam. Cooper (1672), who painted Cromwell and Charles II.; Padre Pittorino (1662), Berganzone (1662), Garzoni (1670). With the eighteenth century miniature painting became more popular than ever, the unlimited gallantry of the Regency in France causing a great demand for pictures, especially for nude subjects. This had at least one good result in the increased study of anatomy and flesh-tints. Prominent among these *roués* of the pencil was Klingstedt (b. at Riga 1657; d. at Paris 1734), who called himself the "Raphael of snuff-boxes," since such works as his were invariably set in such objects. The duke de la Ferres once paid 12,000 livres for a Leda by Arland of Geneva, which picture the artist in a fit of penitence repurchased and destroyed. Ladies now began to distinguish themselves as miniaturists; among these were Elisabeth Sophie Cheron (1711) and Giovanna Maria Clementina. Greatest of all the artists of her time in this style was the Venetian Rosalba Carrara, who came to Paris about 1720. Her chief work was a portrait of Louis XV. About 1750, Massé was the popular miniaturist. He painted a portrait of the marshal de Richelieu, which Voltaire in a poem declares was to be found in a thousand snuff-boxes. Among the distinguished miniaturists of this time mentioned by Millin (*Dictionnaire des Beaux Arts*, 1806) and Larousse (*Dict. Univ.*) are Jacques Ferrand, Charlier, and Garand, who painted Diderot; Joseph Camerata (1764), Melendez, Baudouin, G. A. Wolfgang, De Meytens (1770), Ismael Mengs, and Jean Gros. Under Louis XVI. miniatures became still more the fashion; the art was specially patronized by Marie Antoinette. The great artists of this era were Vincent, De la Chaussée, Mosnier, De Musson, König, Chodowiecky, Füger, De Villers, and the great Hall, a Swede, called by his contemporaries the Van Dyck of miniature painting. He was followed by Siccardi and Fragonard, Vestier and Nöel Halle. With the next generation came Saint, Isabey, Augustin, and Duchesne de Gisors (b. 1770, d. 1856). This latter is claimed by the French, not without reason, as the greatest of modern miniature painters. He was in this as in enamels a true artist. This art has produced many distinguished female painters; among others of our time, Mme. de Mirbel and Mme. Herbelin. In England and America the names of Hoskins, Gibson, Newton, Ross, Thorburn, Malbone, Charles Fraser, Inman, and Staig are well known. The last phase of miniature painting is one of decadence, since it consists simply of applying color to photographs. This has become an art by itself, and is rapidly improving, yet it cannot be denied that in its best development its best productions are thus far very much inferior to third-class miniatures. It seems to be a fixed law in art that substitution of mechanism for human skill involves deterioration.

The principal works on this subject are the *Traité de la Miniature*, by Cathérine Perrot (1625); Félibien, *Entrétiens sur les Vies, etc. des plus excellens Peintres* (vol. vi.); *Traité de Miniature, etc.* (Lyons, 1672); *The School of Miniature* (1733) and *Art of Painting in Miniature* (1750), both from the French; *L'Académie de la Peinture, etc.* (Paris, 1679); Eliæ Brennesi, *Nomenclatura trilinguis, etc.* (1680); *Traité de Miniature*, by Vincent de Montpetit (1765); *Trattato del Disegno e della Pittatura in Miniatura* (Venice, 1668); *Introduction à la Miniature*, par M. Wayol (Amst., 1771); *Traité sur l'Art de peindre en Miniature, etc.*, par M. Violet (Paris, 1788); *Élémens de la Peinture*, by De Piles; Bellart, *École de la Miniature* (1817); L. Mansion, *Lettres sur la Miniature* (1823), a book in which the principles of painting are taught in a series of sentimental letters to a young lady, the whole ending with a marriage. An English translation of it was published by R. Ackermann. Also, *Manuel de Miniature*, by Viguier and Langlois Longueville (*Encyclopédie Roret*). All the artists' color-shops at the present day can supply the student with cheap handbooks teaching the elementary principles of miniature painting.
Charles G. Leland.

Minié′ (Claude Étienne), b. at Paris about 1805; entered early the army as a volunteer; fought in Algeria; was made a captain in 1849; became a teacher in gunnery at the school of Vincennes in 1852, and went in 1858 to Egypt as superintendent of a factory of firearms on the invitation of the viceroy. In 1849 he brought out his invention of the rifle-ball which is called after him. It is cylindrical, conical in the front, hollow in the rear, and provided with a ridge of thin iron, which by being pressed into the grooves of the barrel when the ball is forced through, gives to this a much higher precision and range. His invention was the first application of the principle of expansion in the construction of firearms. D. Dec. 15, 1879.

Min′im, in music, an open-headed note equal in time-value to half a semibreve, and hence often called a "half-note." As the semibreve is in length the half of a "breve," so the name "minim" (Lat. *minus*) seems to imply or suggest a similar relation to the semibreve.

Min′ims, or **Minimi** [Lat. *minimus*, "the least"], **Order of the,** instituted by St. Francis de Paula about 1436, under the name of "Hermits of St. Francis;" confirmed in 1474 by Sixtus IV., and the name changed to Minims by Alexander II. They are also called Pauliners; in France, Bons-Hommes; in Spain, Fathers of Victory, from a victory over the Moors gained by Ferdinand IV., according to the prediction of the founder. Convents of nuns were established in 1495 in Spain, and in 1621 in France. Agreeably to their name, humility was the distinguishing feature, and with the usual vows of poverty, continence, and obedience, the most rigid abstinence was inculcated, animal food, as well as butter, cheese, and milk, being prohibited, and their dress was coarse and black. At one time the order extended through France, Germany, Spain, Italy, and even into Asia. In the present century, however, it has fallen completely into decay. (See D'Atticby, *Histoire des Minimes*.)

Minimum. See Maxima and Minima.

Minimum Squares. See Squares, Least, Method of.

Mining Engineering. Mining is the most important, next to agriculture, of all the arts of civilization, because it goes directly to the supplies of nature, and forms the basis also of all those manufacturing interests which use mineral or metallic products. As an art, mining is an art of excavation, but as a science, it may be considered justly as the science of avoiding excavation, since the true skill of the engineer is to design and develop his underground works so as to reach and remove the valuable masses entirely if possible, and no more.

The miner's method of excavating, whether in galleries or on larger fronts of attack, consists essentially in first undermining the face of rock and then prying, wedging, or blowing it down. The tools and instruments for this are picks, wedges, hand-drills, power-drills, cutting-machines, and blasting-powders, among which last the compounds of nitro-glycerine are the most handy and economical. Besides the undermining at the bottom of the face, it is often expedient to disengage the sides also with the pick; the wedges, therefore, if used, or the drill-holes and shots, are placed near the top. The perfecting of this business at present tends to the use of power-drills and cutting-machines run by compressed air sent from the surface, and also, of course, to the prompt adoption of new blasting explosives which are proved advantageous.

Many mines have been begun by a simple quarrying on the outcrop of a mineral deposit, but the increasing difficulty of supporting the yawning sides, the great amount of dead earth and rock to be disposed of, and the trouble from rain and surface-water, as well as that of infiltration, invalidate this method so decidedly that at the depth of 100 feet mostly the science of deep mining has to be invoked. Desirable as it is to car or hoist the least possible dead rock, yet it is impracticable to avoid making certain and ample preparatory works in the masses surrounding a mineral vein before the attack or exploitation can be properly commenced. These works are tunnels, shafts, and adits. Any mineral deposit, or that part of a deposit which lies above the highest water of the adjacent valleys, ought to be reached by a tunnel, and that is a universally accepted rule, particularly in metallic mining. The advantages of a tunnel are the saving of hoisting and pumping; the fact that a tunnel is a more searching prospecting work than a shaft, since in a mining region full of parallel veins—which is usually the case in metalliferous districts—the tunnel may intersect the whole system; and finally because the tunnel is cheapest to make. Below the superficial drainage a vein or bed must be reached by a shaft or a slope, with a series of horizontal adits, spaced conveniently apart, which lead to the mineral mass at different levels.

If we imagine an inclined tabular deposit, such as a metallic vein usually is, and as a coal-bed may be, it would seem cheapest to run down in it by means of a slope dug in the material itself. That process, in fact, turns out the valuable matter at once, and might more or less pay for itself while in operation; but as a shaft or slope is the most important of all the preparatory works, usually being intended to endure, and requiring substantiality for the incessant needs of hoisting and pumping, it is necessary to make such a construction solid, and therefore a slope in a vein must be supported by flanking masses devoted to that object alone. In a coal-mine this sacrifice is not of much importance, but in a metallic one it might be a greater loss than the slight advantage of a slope would compensate for. Moreover, a slope to a given level is longer and more irregular than a shaft sunk vertically in the country-rock; the development of hoisting-ways, cables, pump-rods, pipes, etc. is therefore greater and the service more inconvenient.

Supposing, then, that a vertical shaft for the attack of a vein has been sunk, and as deep down at once as various reasons will allow, it is next put into connection with the deposit by means of the adits, which are galleries sloping a little towards the shaft for drainage and rolling. These, like the shaft, should be ample for the circulation expected, and spaced apart vertically say 100 feet. The cross-section of a shaft adapted to hoisting, pumping, and ladders, or a man-engine, all together, may be 20 by 30 or more, and the section of galleries for single track about 6 by 6 feet. From where the adits pierce the vein next are run gangways to right and left in the vein itself. These make the different levels; and as they are permanent ways for rolling, they have the same dimension as the adits, and like them and the shaft are strongly timbered. Finally, these levels being put into communication by slopes in the vein —200 feet apart, for example—the mineral mass is seen to be subdivided into a set of parallelopipeds 100 by 200, and presenting each four disengaged angles on which they may be easily attacked for the prosecution of exploitation. This finishes the preparatory work, and it remains to be said that such interior preparation should always be kept up and urged quite far in advance of the exploitation proper, so as to explore the vein for at least a year's work in prospect.

Exploitation is the taking out of the parallelopipeds so prepared and exposed. If such a parallelopiped be attacked on an upper corner by miners, who with pick, drill-bar, and shovel delve into and break away the mass beneath them, such is called underhand stoping; and for ease and celerity of work the workmen are spaced behind each other 12 or 15 feet, so that the mass attacked necessarily takes the form of steps. And indeed to look into the flank of such a stope is to see a rude great stairway inclined to one side, wide as the vein, and occupied by laborers, who by the dim light of lamps and candles are employed in picking, drilling, prying down, blasting, or pushing and hauling the breached and sorted ore down to the gangway beneath. The gangue and refuse sorted out from the ore-matter is piled up behind the miner on platforms between the walls of the vein; and in most all metallic veins, always in thin ones, the refuse furnishes a complete and substantial filling for the chasm which the miner makes. This filling, however, in underhand stoping requires the accessory support of considerable timber. Overhand stoping is where the workmen attack one of the lower angles of a parallelopiped. In this case the miners, all of them, are, as it were, undermining the whole parallelopiped; the one in advance is directly on the timbering of the gangway beneath him; the refuse is piled up behind on this timbering, and the other miners follow standing on that or on trestles, so that the profile of attack becomes and shows like a stairway upside down.

In comparing these two methods it is seen that both serve to extract the entirety of the valuable mass, which is the first requisite, but differ considerably in other ways. In underhand stoping the miner, for example, treads on the vein-matter itself; therefore this method ought not to be used for coal. The filling exacts more timber, and the getting down to the gangway is, on the whole, not so easy as in overhand stoping. Here, on the other hand, gravity is always an aid to the miner, but sometimes endangers his position. He stands on the refuse, and in the interstices thereof it might therefore happen that valuable particles would be lost, unless it is covered with cloth or boards. Underhand stoping is therefore best for mining precious metal, and overhand for coal. When the vein lies flat it is evident that the same profile of steps may be laid out for the attack; but then, also, a larger style may be adopted with advantage, and particularly in coal-beds, where it is always an object to get out the material in ample dimensions. Either then longer steps are designed, with several miners on each face, or the long-wall method is applied. This, which is common now even in beds of coal nine to ten feet thick, where strong propping is attainable, consists in attacking a long, straight line of face with all the miners abreast. They prop behind them, and if there is refuse sufficient to fill up in rear, they do so, reserving open rolling ways to the shaft. This method is convenient for every element of interior economy, such as rolling, ventilating, lighting, overseeing, etc. If filling cannot be procured adequate to replenish the vacancy, then what little there may be is built into pillars or walls, and the ground is allowed to sink upon these, or even completely down if the rolling-ways can be kept open by hacking into the roof.

The exploitation of thick veins is effected by different dispositions. For example, when there is abundant filling they may be attacked from below upward, taking out horizontal slices, which are successively filled; or, again, where caving is allowable, they may be taken from above downward, each slice being treated like a horizontal bed, without filling. It is found sometimes profitable to introduce filling brought from the exterior; it is convenient then to take the mineral mass in narrow vertical slices, dumping in the filling; and finally the method by pillars and galleries is applicable anywhere. That title ordinarily refers to an exploitation in which the pillars are used for support alone, and are supposed to be left and abandoned utterly. This relinquishes one-third to one-half the material in the earth, and is the worst possible almost, though in thick veins of cheap ore or coal sometimes the only one possible. It is combined often, however, with a subsequent robbing of the pillars, whereby it becomes more economical and rational. The robbing involves caving of course, and when the creep of the caving can be commanded nicely the method is as exhaustive as any.

All the foregoing, except underhand stoping, applies to coal-mining, but this last is at the same time a larger and yet a more delicate kind of mining than metallic. Coal-mining differs from other mining principally because the fronts ought to be larger, because there is comparatively little refuse in ordinary coal-beds, and because the generation and blowing out of fire-damp in fiery mines exact peculiar lighting, particular ventilation, and besides a disposition of works in which the different portions, and even the different breasts, are isolated one from another, so that an accident in one may not compromise all. This consideration leads to disposing the main plan in boundaries, with walls of coal left between, and also to the well-known style of pillar-and-stall exploitation. In this the pillars are long strips left between the stalls, which are headings run into the coal, directed so as to take an easy grade, and out of which the coal is entirely won. The pillars are intended to be subsequently cut through and robbed out; in the mean time there is in each front or breast quite a seclusion from outside damage. The perfection of an exploitation is to get out all the valuable material, and nothing else, with rapidity and with safety and comfort to the miners.

Interior Transportation.—From the fronts down to the gangways the matters are sent in barrows, sledges, shutes, or cars. In the main-ways there are always railroads; the tracks are narrow and the rails light, but laid best on sleepers, as above-ground. The cars may be iron or wood; they must have a low centre of gravity; wheels close together, for the curves are short, and encumber with the least possible dead weight. The motors are men and boys, mules, small horses, stationary engines with endless chains to take trains, and now also locomotives for the same purpose. Examples of great drains used as canals for subterranean transportation are also not unfamiliar.

Hoisting.—At the mouth of the shaft is planted a great derrick, usually made with four uprights, on top of which are two large sheaves or pulleys to bend the cables from the shaft to the winding-drums or reels. The cables are hemp, aloes, iron or steel wire, and either round or flat; they are terminated with an end of chain, which is hooked on to the buckets, skips, or cages. The cages, now so prevalently used, are simple elevators, which carry one or more cars; they are guided by vertical strips of timber fixed to the sides of the hoisting-way for that purpose, and these also serve in connection with the parachutes, which ought to be attached to all cages, particularly if miners are hoisted in them. Parachutes are of various patterns; the best are probably those with toothed eccentric wheels, which, when the cable breaks, incrust themselves into both lateral flanks of each guide. The advantages of parachutes and guides are immense in increasing the safety and rapidity of hoisting. The best winding apparatus is for round cables conical drums, and reels for flat. The operation of hoisting is for many reasons delicate, and the engine ought to be sensitive. The best hoisting system of these is composed of two horizontal cylinders, without any fly-wheel if possible.

Pumping.—The pumps of a deep mine are composed of a series of lifts, each more than 100 feet high. All the pumps are force-pumps with plungers, except the lowest, which is a lift-pump, more convenient for following the sinking of the shaft or being moved about. One main rod of wood and iron stretches from top to bottom of the shaft, and to this are fixed by spurs or shoulders the rods of the force-pumps. The weight of the main rod is almost always greater than that of the column to lift; therefore the work of the engine is limited to lifting that rod, which when released sinks and moves the plungers. If lift-pumps were used alone, the engine would have to lift rods and water at the same time, thereby doubling its work. The best pump-engines undoubtedly are single-acting, with large cut-off. Double-acting engines would diminish the required size of lift-pipe, and they are sometimes used in the interior of mines, but on the whole the Cornish engine is preferred; and this is usually arranged with a cataract or some other automatic machinery for regulating the number of strokes per minute. The lift-pipes are ordinarily cast iron, either galvanized or lined with wood if the waters are corrosive.

Ventilation is either natural or artificial. Many circumstances may cause a natural draught between two orifices, such as difference of level, difference of section, variety of exposure, and prevailing winds. Artificial ventilation is produced by pneumatic machines, the cheapest of which is the old Hartz blower; by fans, such as Guibal's and Fabry's; by furnaces, a common and cheap method, but dangerous in fiery mines; and by jets of steam. The use of compressed air in the drills of mines assists ventilation, but not so much as might be imagined. On the whole, it is found preferable to ventilate by drawing out the air, rather than by forcing it in; and this course is particularly advantageous in coal-mines, because by rarefying the air, instead of condensing it, the fire-damp is more freely liberated to be wafted away. The difference between blowing-machines for mines and metallurgy is principally that metallurgical machines push small volumes of air at great velocities, and mining machines draw large volumes at small velocities. The amount of air required for any mine can hardly be told except by experiment. As for the distribution of it, a general principle is to carry the current low down at first, directing it afterwards through the works upward, and split into numerous untainted streams, until it reaches the upcast. In coal-mines it is imperative to split the air without stint, in order to subserve the isolation of the works; and, moreover, it is found to be easier anywhere to move a given amount of air in split currents than in entire ones. The directing and modifying of the currents is effected by doors and air-shutes in the mine-ways. Most miners who perish by explosion in coal-mines are victims not of the fire-damp, but of the choke-damp, or carbonic acid, which stations in the works after the catastrophe, particularly if the doors and ventilating-flues are disabled; therefore, in these dangerous mines the means and potentiality of ventilation are vitally important.

Milling at coal-mines consists only in breaking, picking, screening, and washing the coal. The breakers are toothed cylinders; the screens are revolving trommels, with different-sized apertures for sorting the lumps as they pass through; the washing is done in large jigs or cisterns, where the coal, like metallic ore in smaller apparatus of the same kind, is subjected both to a current of water and to a movement of vertical oscillation of the same impressed by pistons. Masses of metallic ore when first extracted and dumped are first broken by hammers or sledge-work in a pile-driver frame; then treated by jaw-crushers and cylinder rollers, sometimes toothed, then transmitted to the stamps, which are of various patterns, the most powerful being regular steam-pestles working direct from the steam-cylinder. For the same purpose heavy wheels rolling in a circular trough are used, and in some respects to better effect, as they do not destroy the metal when native, like stamps. The metallic mud thus obtained is concentrated further by washing in jigs, shaking-tables, cloth-rollers, and the slimes are finished off in sluices and long tailing labyrinths. It is advantageous, even in the cheaper metals, to carry slime-washing far, and in the preparation of coal washing tends to come more and more in vogue.

Mining Surveying.—No engineer ought to be content without accurate and adequate maps of his underground works. The main ways are surveyed with a transit, the narrower ones and the fronts of work with a compass and half circle suspended from a cord stretched at convenient points. The vertical and horizontal angles and linear measurements being referred to three co-ordinate planes, it is easy therefrom to make maps, sections, and elevations, or to solve any problem of underground projection, by the ordinary methods of descriptive geometry or trigonometry.

F. L. Vinton.

Min'ion, in typography, type of the same size as that used in the body of this work, and between brevier and nonpareil. (See Type.) The word is also used in a moral sense denoting a weak, mean, and ignoble fellow entirely dependent on his master and gaining his livelihood by flattery and subserviency.

Minister and **Ministry.** See Clergy.

Minister, Public. The ministers of a nation include those who have the direction of departments of public business (minister of state), and those who represent the state at the courts of other powers (ministers plenipotentiary, or ambassadors). A group of the former class form the ministry which in constitutional states form the government. In England it is doubtful whether the cabinet of ministers has any definite place in the constitution, or whether it is merely a committee of the privy council. The last named were originally a body of the king's advisers, but became too numerous for the carrying on of the sometimes delicate and intricate deliberations needful in the conduct of public affairs. Down to the reign of Charles I. the method of promulgating important resolutions was after deliberation by the privy council. In England the construction of a cabinet is entrusted by the monarch to some statesman, who surrounds himself with the chiefs of his own party, and holds the reins of power until the balance of political feeling varies, when he is replaced by the leader of the opposition. The premier or prime minister is at the head as first lord of the treasury. The cabinet includes the lord chancellor, the chancellor of the exchequer, the secretaries of state, etc. There are also a number of ministers who have no seats in the cabinet. An organization similar but not identical prevails in most European states.

Ministers who represent the country in foreign states may either be extraordinary ambassadors, sent for some special purpose, and with powers relating only to that particular object of their mission, or may be accredited representatives, empowered to attend to the general interests of their constituents. Ministers of the first class exercise the representative function in the highest degree, and can claim the distinctions due to the power by whom they are delegated. To this order belong papal nuncios and ambassadors ordinary and extraordinary. Envoys, internuncios, and plenipotentiaries do not enjoy this full representative character, whilst ministers resident, chargés d'affaires, and diplomatic consuls form a third grade. Every sovereign state has the right to send and to receive representatives, except when debarred by treaty obligations, but the class of ministers to be sent depends upon rules and etiquette grounded to a large extent upon the principle of reciprocity. Dependent states do not generally possess the power of sending representatives, although there seems to be some doubt as to the exact law or custom regulating this matter. In some federal states, as in the German empire and the Swiss union, the power of sending ambassadors is reserved to the individual states, whilst the Constitution of the U. S., on the contrary, appears to reserve this power to the Federal executive. There are other classes of diplomatic ministers besides those already named, such as deputies to international congresses and conferences, ministers, mediators, commissioners, etc. Ministers of the first and second rank are accredited by a letter to the sovereign of the country to which they are sent, and have the right to demand an audience. The title of "excellency" is accorded to ambassadors, and they are exempt from the municipal law. As to civil suits, this exemption is undoubted, and in England has been confirmed by statute (7 Anne, c. 12), but in criminal actions there is at least one weighty precedent against immunity. In 1654 the Portuguese ambassador to England was executed for murder. Later writers seem to be of opinion that international law would now hold sacred the person of an ambassador even in so extreme a case. A minister may, however, be complained of by the power to which he is accredited, and in special cases dismissed. W. E. A. Axon.

Min'ium [Lat.], the red oxide of lead, often called *red lead.* (See Lead.)

Miniver. See Ermine.

Mink [of uncertain etymology], a name given to the two small species of the weasel family (Mustelidæ) and of the genus *Putorius*—viz. (1) *P. lutreola* of Europe and North Asia, and (2) *P. vison* of North America. The former is a smaller animal, with a much finer fur than the American mink possesses. Still, the mink of North America yields fine and high-priced furs, especially northward. The minks frequent small streams and forests and mountains. They are easily bred in a half-domesticated state, and several large "minkeries" have been established in the U. S. with good pecuniary results. Minks are easily trapped, being neither suspicious nor cunning. They have not only the form of the weasels, but much of their activity and voracity, and are very destructive in poultry-yards, often taking up their abode near them. They frequent the streams, swim well, often catch fish, frogs, mice, and wild birds, and seldom ascend trees. They follow their prey by the scent.

Minks.

Minneap'olis, city, cap. of Ottawa co., Kan. (see map of Kansas, ref. 5–G, for location of county), on R. R. and N. bank of Solomon River, has a good educational system, grist and saw-mill, etc. Pop. in 1880, 1084.

Minneap'olis, city and important R. R. centre, cap. of Hennepin co., Minn. (see map of Minnesota, ref. 9–E, for location of county), on both sides of the Mississippi River, at the Falls of St. Anthony, 10 miles N. W. of St. Paul. It is regularly laid out, with straight avenues usually 80 feet wide, and is noted for its picturesqueness, its many fine residences and well-kept grounds, generally without fences. It has a large number of fine edifices, public and private, including chamber of commerce, cost $175,000, a hotel, cost $1,500,000, and Hon. W. D. Washburn's residence, cost about $1,000,000, the government building for the post-office, and a union dépôt. The site of Minneapolis is upon a broad esplanade which commands a fine view of the falls, and the surrounding country is noted for its beauty. Several picturesque lakes are within easy access, and the celebrated Falls of Minnehaha ("laughing water") are but 5 miles distant. These lakes are becoming summer resorts second only to Saratoga, being yearly patronized by thousands of people from all sections of the country. Minneapolis has 11 railroads, connecting it with all parts of the country, and is practically at the head of navigation on the Mississippi. The State University is located here, as well as the Augsburg (Lutheran) Theological Seminary, established in 1869 by the Scandinavians of the North-west; Hamline University has recently been re-erected. The city embraces a territory of about 33 square miles, and has a very efficient fire department and excellent water-works. There are 75 churches, 3 daily and 17 weekly papers, 9 monthly periodicals, 10 fine public-school buildings, an academy, 2 female seminaries and a medical college, an athenæum, 2 opera-houses, 2 spacious and beautiful cemeteries, extensive railroad repair and construction shops, 5 national and 6 private banks, and several very extensive commercial establishments.

Manufactures.—The leading industry is the manufacture of flour and lumber, though other branches are represented on a large scale. There are 25 saw-mills and 24 flour-mills, the latter producing more flour (30,935 barrels being the daily capacity) than those of any other city in the world. The flour-mills and part of the saw-mills are operated by water-power from the Falls of St. Anthony, which furnish a total of about 120,000 horse-power. The statistics of 1884 show 11,283 hands employed in manufactories; wages paid during the year, $5,449,689; value of products, $50,401,766. Among the principal articles were flouring-mill products, $25,000,000; lumber, $3,608,688. Minneapolis is also the leading primary wheat-market in the U. S.

The city was first settled in 1849, incorporated 1867, annexed the city of St. Anthony, on the E. bank, 1873. Population in 1870, 13,066; in 1880, 46,887; in 1885, 129,200.

C. M. Palmer,
Publisher of "North-western Miller."

Minnehaha ["laughing water" in the Dakota language], a waterfall in Hennepin co., Minn., celebrated for its beauty. Here the small river Minnehaha leaps 60 feet down a limestone precipice. It is half a mile from the Mississippi and near Minneapolis. The interesting legend of an Indian maiden leaping this fall when thwarted in her love for an Indian brave has been finely treated by Longfellow in his *Minnehaha.*

Minnesela, cap. of Butte co., Dak. (see map of Dakota, ref. 6–B, for location of county). Pop. not in census of 1880.

Min'nesingers, The [O. H. Ger. *Minni,* "love," and *singen,* "to sing"], the distinctive name of a peculiar class of poets who flourished in Germany from the middle of the twelfth to the close of the thirteenth century. Many things combine to make them prominent in the history of poetry. Before their appearance lyric poetry and versification were virtually unknown in Germany; and it is now placed beyond a doubt that the Minnesingers did not learn their art from the Provençal poets. Whence, then, did they get it? No one knows. It seems as if the religious fervor excited by the Crusades, together with the chivalric sentiments of the times, had suddenly inspired the whole knight-errantry of Germany with a poetic frenzy; and one of the most remarkable features of their productions is, that while those knights were mostly uneducated men, many of them not able to read and write, their poems are distinguished by a surprising elaboration of poetical form. This poetic outbreak was at first confined exclusively to the knightly class. When subsequently the peasants and citizens began also to practise poetical composition, the Minnesong soon lost its former grace and melody, and became changed into the laboriously constructed and uncouth Meistersong. None of the early knight-minstrels, and only few of the later, wrote down their songs. They improvised the poetry and the music at the same time. Generally, the song was composed for the knight's ladylove, to whom it was sent, not on paper, but through the agency of the knight's Sancho Panza, a young *Singerlein* of good voice and quick memory, to whom the knight sang his song till the young man had it by heart. Then he was despatched to the ladylove in question to sing her his master's song. Thus, the Minnesongs were passed from mouth to mouth, until towards the close of the thirteenth century Johann Hadloub, one of the sweetest of the later Minnesingers, himself was instructed by Ruediger of Manesse, a Swiss knight, to collect and have written down all discoverable Minnesongs. The result of Hadloub's labors was the famous Manessian collection of Minnesongs in the Paris library, which had remained unknown for centuries, and was rediscovered by the German poet Bodmer in 1748. It was first published in its entirety, together with all other discovered Minnesongs, by Van der Hagen in his *Minnesinger.*

The Minnesingers sang only lyrics, which were either of an amorous or religious character or in celebration of the beauties of nature. In course of time they became didactic, censorious, and critical. Some of the Minnesingers did not confine themselves to the composition of lyrics, but put into metrical form the romances of the knights of King Arthur and of Charlemagne, which were just then being invented and spread over all Europe and Asia. Most prominent amongst these writers of Minne-romances are Wolfram von Eschenbach, best known by his great epical romance *Parcival;* Gottfried von Strassburg, the author of *Tristan and Isolde,* and undoubtedly the most gifted and cultivated of all the poets of his time; and Hartmann von der Aue, whose *Golden Legend of Poor Henry* is as sweet an idyl as language can boast of. By far the most prominent among the purely lyrical Minnesingers ranks Walther von der Vogelweide. He is interesting, moreover, not only as a highly gifted poet, but also as a model knight of his time, a man of sterling qualities and most devoted patriotism. Ulrich von Lichtenstein, on the other hand, exhibits the Quixotic side of that knight-errant period in all its absurdity. Emperor Henry VI. and his son, young Conrad, the last of the Hohenstauffens, were also amongst the Minnesingers. Amongst the others may be mentioned, as foremost in their art, Von Veldegge, the duke of Breslau, Count von Leiningen, Count von Botenlauben, Jacob von Warte, Brother von Sax, Von Kuerenberg, Reimnar the Old, Von Hohenfels, Walther von Metze, Von Steinnach, Tannhuser, Nithart, Hadloub, Frauenlob, Konrad von Wuezburg, Regenbogen, etc. The Minnesinger poetry was first introduced into the English language by Mr. Taylor in his *Lays of the Minnesingers, or German Troubadours of the Twelfth and Thirteenth Centuries* (London, 1825). A more complete account, however,

has been attempted in *The Minnesinger of Germany*, by A. E. Kroeger (published by Hurd, Houghton & Co., N. Y., and Trübner & Co., London). A number of specimens are also contained in Longfellow's *Poets and Poetry of Europe*.
A. E. Kroeger.

Minneso'ta, one of the North-western States, at the head of the Mississippi Valley, lying between 43° 30′ and 49° N. lat., and 89° 29′ and 97° 5′ W. lon. It is bounded N. by British America, E. by Lake Superior and the State of Wisconsin, S. by Iowa, and W. by Dakota. The extreme length of the State from N. to S. is about 380 miles; its breadth is from 337 to 262 miles; area estimated at 83,365 square miles, or 53,353,600 acres. Its name is derived from that of the principal tributary of the Mississippi within its boundaries, and is said to signify in the Dakota or Sioux language "sky-tinted water."

THE GREAT SEAL OF THE STATE OF MINNESOTA
L'ETOILE DU NORD
1858

Seal of Minnesota.

Minnesota, by census of 1880, ranked 26 among the States in population, 19 in value of agricultural products, and 16 in value of manufactures.

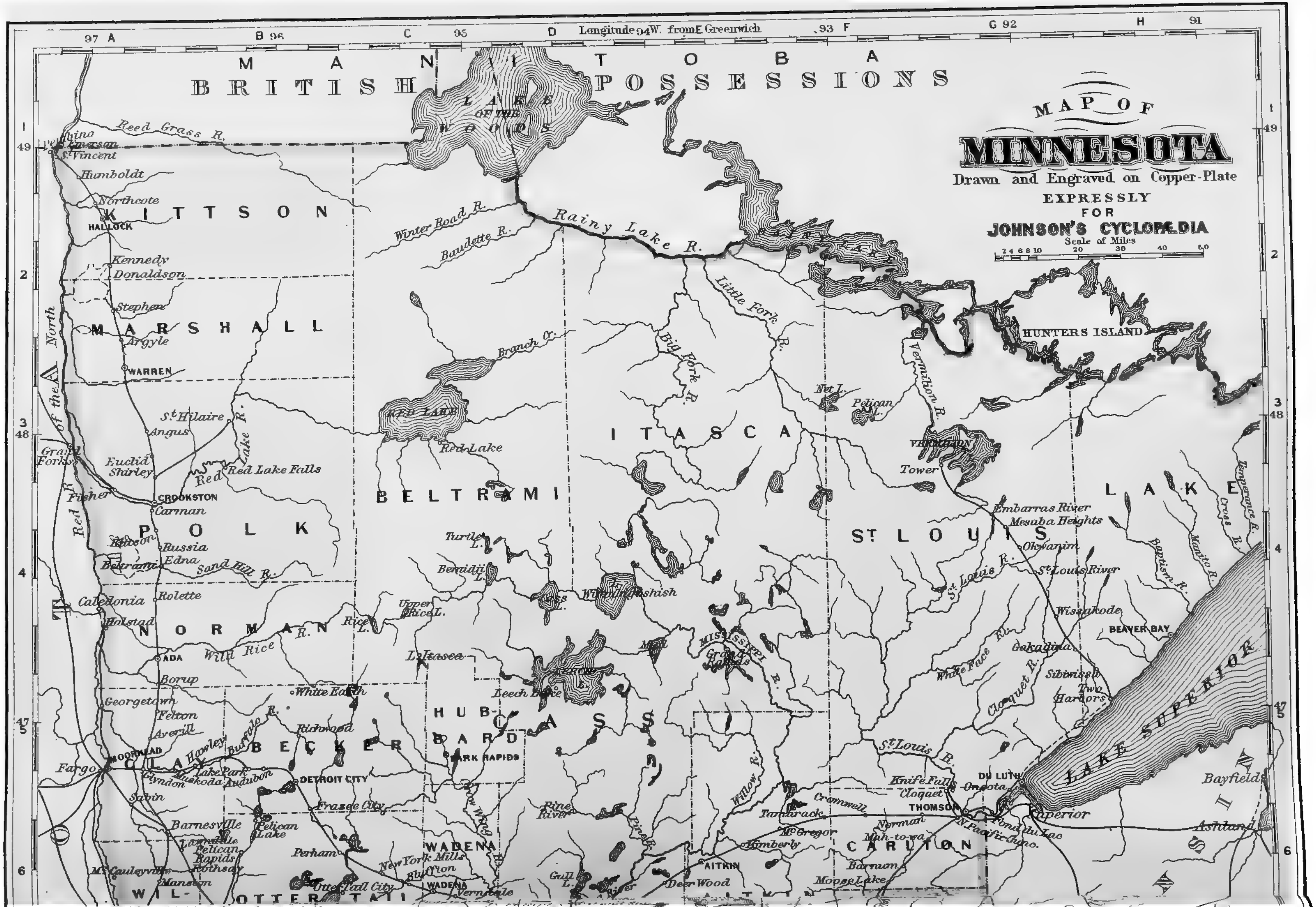
Face of the Country.—The general surface of the country is undulating, and though having nowhere any range of mountains, or even high hills, it is the actual watershed of all that part of the North American continent lying E. of the Rocky Mountains. Its central situation, midway between the Atlantic and Pacific oceans, between Hudson's Bay and the Gulf of Mexico, and between the arctic and tropic circles, makes this almost a necessity. Accordingly, we find a range of drift-hills crossing the upper portion of the State nearly from E. to W., mostly with flat tops, and nowhere exceeding 100 feet of elevation above the adjacent country (though they are 1680 feet above the sea), in or near which are the sources of the Mississippi River, of the Red River of the North (which discharges its waters eventually into Hudson's Bay), of the feeders and tributaries of the Lake of the Woods (which also connects with Lake Winnipeg, Hudson's Bay, and the immense system of water-courses of the northern part of the continent), and the sources also of the St. Louis River, the head and fountain of those waters which through the great lakes find their way to the Atlantic through the broad St. Lawrence River. There are, then, three distinct slopes, differing in soil, vegetation, and geological character, in the State—the northern slope, including not only the Red River Valley, but the valleys and lakes of the streams draining into Rainy Lake and the Lake of the Woods; the eastern slope, occupying the valley of the St. Louis River and its tributaries, and declining gently toward Lake Superior; and the southern slope, drained by the Mississippi and its affluents, comprising about two-thirds of the State, and extending into and forming part of the great Mississippi Valley. The descent from the summit of the divide, in lat. 47° 45′ to 48°, to the southern boundary of the State, lat. 43° 30′, is nearly 1000 feet, but, except in the successive terraces at and near the Falls of St. Anthony, the slope is mostly gentle, rarely exceeding two and a half or three feet to the mile. Three-fourths of the State may be generally described as rolling prairie, interspersed with frequent groves, oak-openings, and belts of hardwood timber, dotted with numberless small lakes, and drained by numerous clear and limpid streams. The remaining fourth includes the hills which form the divide, the extensive mineral tract extending toward Lake Superior, and the heavy-timbered region lying around the sources of the Mississippi and Red River of the North.

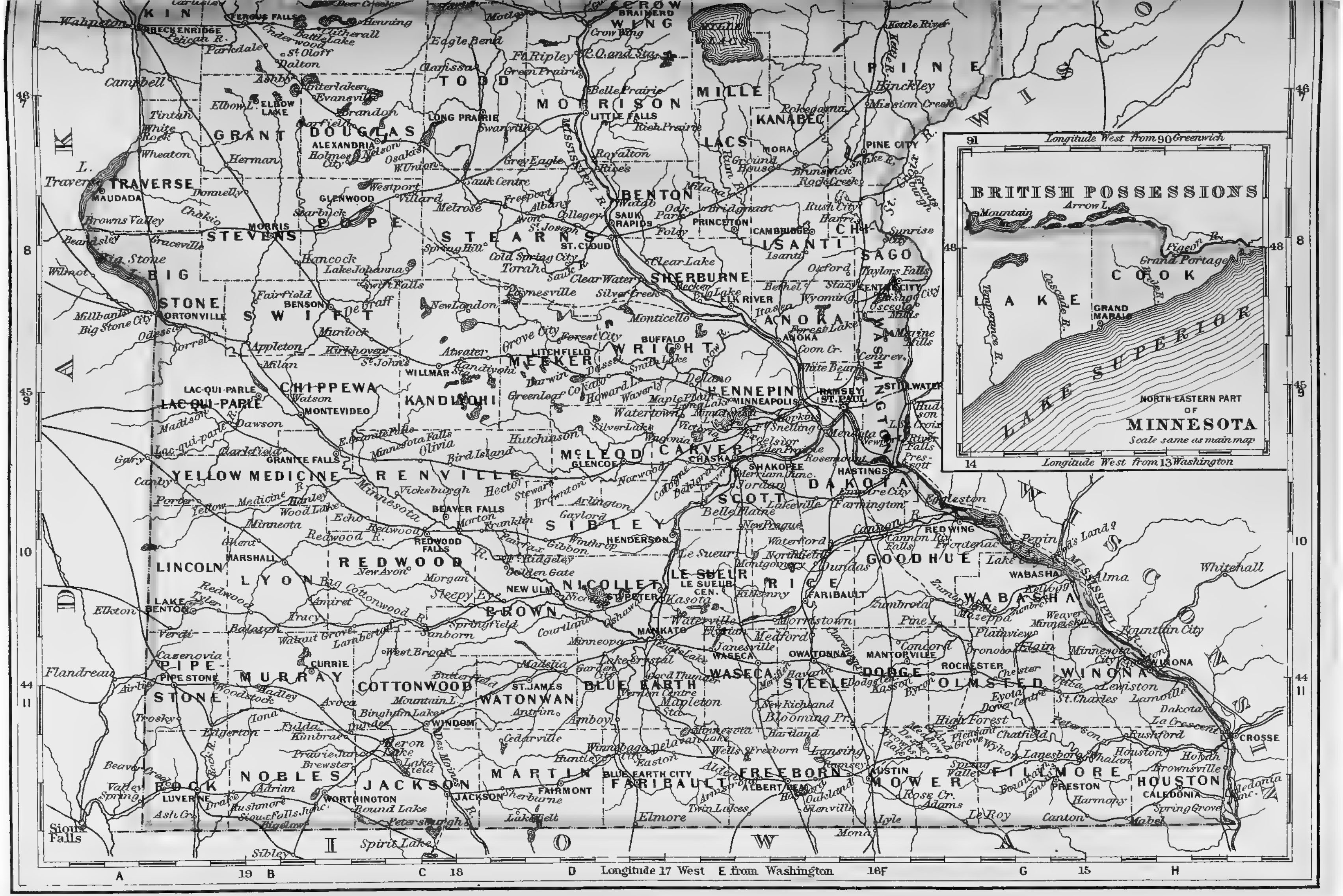
Rivers, Lakes, etc.—The State is mostly drained by the Mississippi, the Red River of the North, the St. Louis, and their numerous tributaries. Of the affluents of the Mississippi, the Minnesota is the principal on the S. W. side; the other tributaries on the S. W. side are the Root, Zumbrota, Cannon, Sauk, Crow Wing, and Willow rivers; on the N. and N. E. its largest affluent is the St. Croix; and Rum River, the outlet of Mille Lacs Lake, is the only other considerable stream; the Red River has several branches of but moderate size, known as Buffalo, Wild Rice, Red Lake, and Reed Grass rivers; the St. Louis has several streams, such as the Ushkabwahka, Big White Face, Stone, Floodwood, and Savannah rivers. There are also numerous small streams flowing into Lake Superior, and several of larger size, such as the Vermilion, Little Fork, Big Fork, and Baudette, discharging into Rainy Lake River and the chain of lakes which form a part of the N. boundary of the State. Minnesota is emphatically the land of lakes (about 7000). A few of these lakes, such as Leech, Red, Mille Lacs, Vermilion, Winnebegoshish, Big Stone, Traverse, Cass, and Otter Tail lakes, are of considerable size. Lake Itasca, the ultimate source of the Mississippi, is of horseshoe shape, and its longest diameter is only 10 or 12 miles; Lake Traverse, the source of the Red River of the North, is long but narrow; Dead Fish Lake, source of the St. Louis, is small; Lakes Pepin and St. Croix are only enlargements of river-beds of Mississippi and St. Croix rivers.

Mineralogy.—Iron of excellent quality exists in large quantities in the Lake Superior region, and also in the S. and S. W. portions of the State. Copper of equal purity with that in the upper peninsula of Michigan has been found in the Lake Superior region. Gold and silver exist in moderately paying quantities in the vicinity of Vermilion Lake. The other principal minerals of the State are slate, lime, salt, white sand for glass-making, building-stone, peat, tripoli, marl, etc. The red pipestone of which the Indians made their pipes is found abundantly in the S. W., and is quarried and used for many purposes.

Soil and Vegetation.—The three slopes specified above have each a different soil and vegetable growths. The N. is a rich alluvial deposit admirably adapted to wheat-culture and to grazing. This region has forests of oak, beech, elm, and maple. The E. slope is a better mineral than agricultural region, though the soil yields fair crops; much of this slope, as well as the highlands or divides, is covered with a heavy growth of pine, spruce, and other coniferous trees, valuable as lumber, but the soil beneath them, when cleared, is comparatively sterile. The S. slope, which comprises all of the State below the highlands, is composed of alternate rolling prairie and woodland, and is unsurpassed in fertility and productiveness. About one-third of the land-surface of Minnesota is timbered land. In this S. slope there are detached groves and copses of great beauty sprinkled everywhere among the prairies and around the numerous rivers and lakes, while growths of dwarfed oaks skirt the borders of the prairies and are known as "oak-openings." There is also a tract on both sides of the Minnesota River, over 100 miles in length and with an average width exceeding 40 miles, comprising an area of 5000 square miles, which is covered with a dense growth of magnificent hardwood timber. It is known as the "Big Woods." In this as well as the smaller groves are found almost every species of deciduous tree known in the Northern States. Minnesota has done more than any other State to repair the losses to her forest-area which result from the cutting of such immense quantities of timber for the manufacture of lumber. Already more than 20,000,000 forest-trees have been planted on the treeless prairies of the State, and their planting is encouraged by the State government. The indigenous flora of the State partakes of the mixed character of the Canadian or sub-alpine which is found along our northern boundary, and the Appalachian or Mississippian of the upper portion of the Great Valley. Owing to the great number of small lakes, streams, and marshes in the N. E. the aquatic plants of the sub-alpine flora predominate—wild rice, reeds, callas, and water-loving plants generally. In the N. E. part of the State it is estimated that there are 256,000 acres of cranberry marsh which yield abundantly. Among fruits, apples, Siberian crab-apples, pears, cherries, plums, grapes (the more northern varieties), strawberries, raspberries, currants, blackberries, whortleberries, and gooseberries are abundantly cultivated, and yield immense quantities of excellent fruit.

Zoology.—The prairies and forests abound in a great variety of wild animals, especially wolves (two species, the gray and the prairie wolf), bears, wild-cats, raccoons, foxes, deer, rabbits, squirrels, gophers, and woodchucks. Otter, mink, beaver, and muskrats are the principal aquatic animals. Pigeons, grouse, wild-turkeys, and partridges are among the feathered game, as well as ducks, brant, and wild-geese in their season, and multitudes of smaller birds distinguished for their gay plumage or melodious song make the woods, lakes, and rivers vocal with their music or brilliant with their beautiful and varied hues. The numerous lakes are plentifully supplied with pickerel, bass,


MAP OF
MINNESOTA
Drawn and Engraved on Copper-Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPÆDIA
Scale of Miles


BRITISH POSSESSIONS
LAKE
COOK
GRAND MARAIS
Grand Portage
Pigeon R.
Arrow L.
Mountain L.
Cascade R.
Temperance R.
LAKE SUPERIOR
NORTH-EASTERN PART OF MINNESOTA
Scale same as main map
Longitude West from 90 Greenwich
Longitude West from 13 Washington
TRAVERSE
GRANT
DOUGLAS
TODD
MORRISON
MILLE LACS
KANABEC
PINE
CROW WING
BENTON
STEVENS
POPE
STEARNS
SHERBURNE
ISANTI
CHISAGO
BIG STONE
SWIFT
KANDIYOHI
MEEKER
WRIGHT
ANOKA
WASHINGTON
LAC QUI PARLE
CHIPPEWA
HENNEPIN
RAMSEY
YELLOW MEDICINE
RENVILLE
McLEOD
CARVER
DAKOTA
SCOTT
SIBLEY
LINCOLN
LYON
REDWOOD
BROWN
NICOLLET
LE SUEUR
RICE
GOODHUE
WABASHA
PIPE STONE
MURRAY
COTTONWOOD
WATONWAN
BLUE EARTH
WASECA
STEELE
DODGE
OLMSTED
WINONA
ROCK
NOBLES
JACKSON
MARTIN
FARIBAULT
FREEBORN
MOWER
FILLMORE
HOUSTON
MINNEAPOLIS
ST. PAUL
ST. CLOUD
STILLWATER
HASTINGS
RED WING
WABASHA
WINONA
ROCHESTER
MANKATO
NEW ULM
FARIBAULT
OWATONNA
AUSTIN
ALBERT LEA
WORTHINGTON
LUVERNE
FERGUS FALLS
BRECKENRIDGE
ALEXANDRIA
LITTLE FALLS
BRAINERD
MISSISSIPPI R.
Minnesota R.
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Longitude 17 West E from Washington

pike, sunfish, and smaller fish, and the present fish commissioner is introducing into them in large numbers lake and brook trout, the lake white-fish, black bass, etc.

Climate.—The climate of Minnesota is remarkably healthful and bracing, and is largely sought by invalids for its dry and tonic character. The mean average temperature of the State for the year is 44.60°; the mean winter temperature, 16.10°; the summer temperature averages about 70.50°; the spring has a mean temperature of 46°, and the autumn about 38°. The largest amount of rainfall is in the spring and summer months, the winter being usually dry and the snowfall much lighter than in States farther S.

Agricultural Products.—The census of 1880 showed Minnesota to be the fifth great wheat-growing State in the Union, producing 34,601,030 bushels; corn, 14,831,741 bushels; oats, 23,382,158 bushels; barley, 2,972,965 bushels; wool, 1,352,124 pounds.

*Farm Animals.**—In 1880, Minnesota had 257,282 horses, 659,050 cattle, 267,598 sheep, 381,415 swine.

Manufactures.—With the exception of the lumber trade, Minnesota is not a heavy manufacturing State. In 1880 there were 3493 manufacturing establishments, employing 21,247 hands, paying $8,613,094 wages, with capital of $31,004,811; value of products, $76,065,198. Of lumber there were 472,280,000 feet sawed in 1880. The milling business at Minneapolis and elsewhere is enormous.

Railroads.—Minnesota had, Jan. 1, 1882, 3391 miles of railway, costing $207,040,999; net earnings, $4,794,447; dividends and interest, $3,797,954. Several of these are great trunk lines, like the Chicago Milwaukee and St. Paul, Chicago and North-western, St. Paul Minneapolis and Manitoba, and Chicago St. Paul and Minneapolis. The Northern Pacific railway also runs for 290 miles through Minnesota.

Finances.—The assessed valuation in 1880 was: real estate, $203,446,781; personal, $54,581,906; total, $258,028,687; State tax, 1⅘ mills on $1, producing $383,905. The whole tax, State and local, was $3,713,707; State debt, 1880, $2,565,000; total debt, State and local, $8,476,064.

Commerce.—The internal trade of Minnesota consists mainly of grain and other food-supplies, transported (chiefly by rail) to Eastern markets. The great rivers—the Mississippi, the St. Croix, and the Red River of the North, with the Minnesota—furnish no less than 2800 miles of navigable waters. In 1881 the State had 87 registered vessels, carrying 8346 tons; value of exports from the two customs districts, Duluth and Minnesota, in 1881, $2,275,163; imports, $783,284.

Banks, etc.—In October, 1881, Minnesota had 27 national banks; capital, $4,900,000; circulation, $1,845,234; bonds to secure circulation, $2,073,500; deposits, $13,010,427. There were also 20 State banks and trust companies, having deposits of $4,475,337; 3 savings banks, deposits, $506,510; and 89 private bankers, deposits, $2,772,567. Fire insurance companies in 1880 had risks of $105,803,134; received for premiums, $1,311,330; losses paid, $1,374,149.

Education.—Number of children of school-age (five to twenty-one years) in 1878, 271,428, of whom 180,248 were enrolled in public schools. In 1880 children attending school were 186,544; total expenditure for public schools, 1880, $1,622,919, of which teachers' salaries required $956,571. Total permanent school fund of the State, $4,050,729; value of school buildings, $3,382,352. Minnesota has 6 universities and colleges, with 63 instructors, 822 students, paying $7265 tuition fees. Newspapers and periodicals in 1882, 219, of which 13 were daily journals.

Churches.—Minnesota has about 1600 churches, the Lutheran denomination leading, with 418 churches and 55,000 members: Methodist Episcopal, 242 churches, 20,355 members; Roman Catholic, 212 churches; Baptist, 140 churches, 7026 members; Congregationalist, 137 churches, 6702 members; Presbyterian, 116 churches, 6717 members; Protestant Episcopal, 56 churches, 4584 members.

Population.—In 1860, 172,023; 1870, 439,706; 1880, 780,773 (whites 776,884, colored 3889, including 2300 Indians, 24 Chinese, and 1 Japanese); in 1885, 1,117,798.

Principal Cities and Towns, Pop. 1885.—Minneapolis, 129,200; St. Paul (cap.), 111,397; Stillwater, 16,437; Winona, 15,624; Mankato, 7845; Red Wing, 6870; Faribault, 6459; Rochester, 5313; St. Cloud, 4360; Duluth, 4063; St. Peter, 4036; Hastings, 3984; New Ulm, 3335; Owatonna, 3280; Northfield, 2948; Lake City, 2496.

COUNTIES.	† Ref.	Pop. 1880.	Pop. 1885.	COUNTY TOWNS.	Pop. 1885.
Aitkin	6–E	366	1,388	Aitkin	705
Anoka	9–F	7,108	10,089	Anoka	4,629
Becker	5–B	5,218	7,433	Detroit City	1,323
Beltrami	3–C	10	111		
Benton	8–D	3,012	4,721	Sauk Rapids	1,424
Big Stone	8–A	3,688	4,697	Ortonville §	732
Blue Earth	11–D	22,889	26,462	Mankato	7,845
Brown	10–D	12,018	13,976	New Ulm	3,335
Carlton	6–F	1,230	3,189	Thomson §	528
Carver	9–E	14,140	15,965	Chaska	1,720
Cass	5–D	486	1,135		
Chippewa	9–B	5,408	6,561	Montevideo	1,150
Chisago	9–F	7,982	9,765	Centre City.	
Clay	5–A	5,887	10,362	Moorhead	2,536
Cook	8–H	65	322	Grand Marais §	170
Cottonwood	11–C	5,533	5,894	Windom	641
Crow Wing	6–D	2,319	8,743	Brainerd	7,110
Dakota	10–F	17,391	18,590	Hastings	3,984
Dodge	11–F	11,344	10,487	Mantorville	387
Douglas	7–B	9,130	12,924	Alexandria	1,834
Faribault	11–E	13,016	15,163	Blue Earth City	1,112
Fillmore	11–G	28,162	26,677	Preston	910
Freeborn	11–E	16,069	17,364	Albert Lea	3,365
Goodhue	10–F	29,651	31,113	Red Wing	6,870
Grant	7–B	3,004	5,197	Elbow Lake §	367
Hennepin	9–E	67,013	148,737	Minneapolis	129,200
Houston	11–H	16,332	15,482	Caledonia	980
Hubbard ‡	5–C	......	853	Park Rapids.	
Isanti	9–F	5,063	7,031	Cambridge	202
Itasca	3–E	124	237		
Jackson	11–C	4,806	6,110	Jackson	608
Kanabec	7–E	505	1,109	Mora.	
Kandiyohi	9–C	10,159	12,849	Willmar	1,321
Kittson	2–A	905	3,462	Hallock §	329
Lac-qui-Parle	9–A	4,891	7,842	Lac-qui-Parle §	515
Lake	3–H	106	453	Beaver Bay §	101
Le Sueur	10–E	16,103	18,559	Le Sueur Centre	
Lincoln	10–A	2,945	4,362	Lake Benton	391
Lyon	10–B	6,257	7,936	Marshall	954
Marshall	2–A	992	5,560	Warren	509
Martin	11–D	5,249	6,426	Fairmont	888
McLeod	9–D	12,342	15,311	Glencoe	1,555
Meeker	9–D	11,739	14,501	Litchfield	1,000
Mille Lacs	7–E	1,501	1,897	Princeton §	1,105
Morrison	7–D	5,875	9,406	Little Falls	1,224
Mower	11–F	16,799	15,277	Austin	2,505
Murray	11–B	3,604	5,046	Currie.	
Nicollet	10–D	12,333	13,434	St. Peter	4,036
Nobles	11–B	4,435	5,639	Worthington	997
Norman ‡	4–A	......	8,335	Ada §	720
Olmsted	11–G	21,543	20,518	Rochester	5,313
Otter Tail	6–B	18,675	31,520	Fergus Falls	4,284
Pine	7–F	1,365	2,186	Pine City	515
Pipestone	11–A	2,092	3,956	Pipe Stone	1,109
Polk	3–A	11,433	23,475	Crookston	4,063
Pope	8–B	5,874	8,707	Glenwood	485
Ramsey	9–F	45,890	116,227	St. Paul	111,397
Redwood	10–C	5,375	6,488	Redwood Falls	1,123
Renville	10–C	10,791	13,153	Beaver Falls §	611
Rice	10–F	22,481	24,941	Faribault	6,459
Rock	11–A	3,669	5,239	Luverne	1,346
Saint Louis	4–F	4,504	20,453	Duluth	4,063
Scott	10–E	13,516	14,181	Shakopee	1,833
Sherburne	8–E	3,855	5,647	Elk River §	1,235
Sibley	10–D	10,637	13,126	Henderson	958
Stearns	8–C	21,956	28,712	St. Cloud	4,360
Steele	11–F	12,460	12,733	Owatonna	3,280
Stevens	8–B	3,911	4,511	Morris	1,230
Swift	9–B	7,473	8,373	Benson	597
Todd	7–C	6,133	9,643	Long Prairie	586
Traverse	7–A	1,507	2,860	Maudada.	
Wabasha	10–G	18,206	17,999	Wabasha	2,514
Wadena	6–C	2,080	3,565	Wadena	855
Waseca	11–E	12,385	13,342	Waseca	2,513
Washington	9–F	19,563	29,751	Stillwater	16,437
Watonwan	11–D	5,104	5,995	St. James	714
Wilkin	6–A	1,906	3,734	Breckenridge §	996
Winona	11–H	27,197	31,928	Winona	15,624
Wright	9–E	18,104	22,790	Buffalo §	928
Yellow Medici'e	10–B	5,884	7,863	Granite Falls.	
Total		780,773	1,117,798		

History.—The first European who set foot on the territory of Minnesota was Louis Hennepin, a Franciscan priest, who in 1680 ascended the Mississippi to the Falls of St. Anthony, to which he gave their name. In 1763 this region was ceded to Great Britain, and in 1766 it was explored by Capt. Jonathan Carver. In 1783 it was transferred to the U. S. as a part of the North-western Territory. In 1805 a tract of land was purchased from the Indians. In 1820, Fort Snelling was built, and in 1822 the first mill was erected in what is now Minneapolis. In 1823 the first steamboat visited Minnesota. Between this time and 1830 a small colony of Swiss settled near St. Paul. In 1838 the Indian title to lands E. of the Mississippi was extinguished. In 1843 a settlement was commenced at Stillwater; on Mar. 3, 1849, Congress passed an act organizing the Territory of Minnesota. At this time the population of the Territory was between 4000 and 5000. In 1851 the Indian title to the lands between the Mississippi and the Red River of the North was extinguished. Immigration at once commenced in earnest, and on Feb. 26, 1857, Congress passed an enabling act for its admission as a State, and on May 11, 1858, Minnesota was admitted to the Union as a State. Her growth has been one of wonderful rapidity. In 1862 the Sioux suddenly made an irruption upon the new settlements. Nearly 1000 persons perished from this outbreak; but the Sioux were defeated and conquered, the most guilty executed, and the whole tribe removed from the State. There are still in the State many friendly Chippewas. The locusts in 1873 and 1874 ravaged a few counties, and diminished by from 20 to 25 per cent. the crop of cereals, but this only slightly disturbed the prosperity of the State.

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* On farms only.

† Reference for location of counties. See map of Minnesota.
‡ Organized since census of 1880. § Township.

Governors.

TERRITORIAL.	
Alexander Ramsey	1849–53
Willis A. Gorman	1853–57
Samuel Medary	1857–58
STATE.	
Henry H. Sibley	1858–60
Alexander Ramsey	1860–64
Stephen Miller	1864–66
Wm. R. Marshall	1866–70
Horace Austin	1870–74
Cushman K. Davis	1874–76
John S. Pillsbury	1876–82
Lucius F. Hubbard	1882–86

Revised by A. R. Spofford.

Minnesota River rises in Big Stone Lake, on the boundary between Minnesota and Dakota, traverses the State of Minnesota, flowing first S. E. and then N. E., reaching the Mississippi 5 miles above St. Paul. It flows through "the Big Woods," a great forest of deciduous trees, and is navigable 300 miles in high and 45 in low water. Total length, 470 miles.

Minnesota, The University of, a public institution of learning in Minneapolis, Minn., established by virtue of the State constitution. The present charter dates from 1868. The government is vested in a board of regents, consisting (1) of seven members appointed by the governor, and (2) three members *ex-officiis*—the governor, the superintendent of public instruction, and the president of the university. The endowment consists of 202,083 acres of public lands, about one-half of which have been sold for $663,000. In 1884 the general faculty included 31 persons; the number of regular students was 278. Tuition free in all departments. Both sexes are admitted. There is no dormitory system. No honorary degrees are conferred. The library contains 19,000 volumes. The geological survey of the State was entrusted to the university in 1872, and is in successful progress. The first volume of the final report was issued in 1884. The permanent plan of organization adopted in 1870 is a novel one. The studies usually included in the first two college years are thrown out of the university proper, and are merged with a remainder of "preparatory" work to form the department of elementary instruction required by the charter. The "secondary" department thus formed is the common feeder of the university colleges, but for the time being only, it being part of the plan to drop the whole of this work to the high schools as soon as practicable. The following distinct but federated colleges are in operation: (1) A college of science, literature, and the arts, having three courses of general studies, classical, scientific, and modern, leading in two years to the degrees of B. A., B. S., and B. L.; (2) a college of agriculture, having a course of proper professional studies, leading to the degree of B. Agr. in two years; (3) a college of mechanic arts, having courses in civil and mechanical engineering, leading to appropriate baccalaureate degrees: (4) the medical college, organized in 1883, with a faculty of nine professors, whose duty is confined to examining candidates for degrees. No instruction is offered. Two degrees of M. B. were conferred in 1884. This faculty are made by law the State medical examining board, without whose license no person can begin the practice of medicine in Minnesota. Post-graduate courses have been organized, leading to the higher academical and professional degrees.

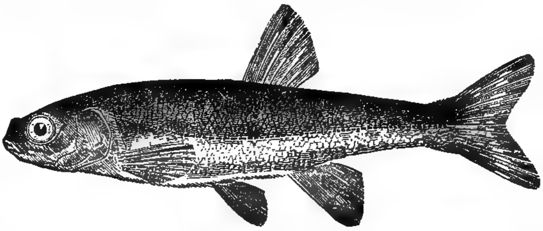
William W. Folwell.

Minnetarees, or **Hidatsa,** a tribe of Indians on the upper Missouri River, called also "Gros Ventres of the Missouri." They were formerly a branch of the Crows, but since the end of the eighteenth century have lived in close relations with the Mandans, and in permanent hostility with the Shoshones, the Flatheads, and the Sioux. In 1804 they numbered 2500, and lived in two villages on Knife River, but they lost half their number by smallpox in 1838, and settled with the Mandans in 1845 at Fort Berthold. They afterward suffered severely from inroads by the Sioux. They have always been friendly to the whites, and made treaties with the U. S. in 1825, 1851, and 1864. A large reservation on the frontier of Montana was set apart for them, along with the Rickarees and Mandans, in 1870. They live in colossal earth-covered lodges, each accommodating several families, and in their manners and religion resemble the Mandans, gaining their subsistence by hunting in the upper Missouri and Yellowstone valleys. They have been visited by Roman Catholic missionaries, but few, if any, have embraced Christianity. A *Grammar and Dictionary of the Hidatsa*, by Washington Matthews, was printed at New York in 1873, and a *Hidatsa-English Dictionary* in 1874.

Minnewaukon, cap. of Benson co., Dak. Ter. (see map of Dakota Territory, ref. 2–E, for location of county), is situated on R. R., at the western extremity of Minnewaukon, or Devil's Lake. Pop. not in census of 1880.

Minnewaukon, or **Devil's Lake,** is situated in the counties of Benson and Ramsey, in the northern part of Dakota Territory, on the 48th parallel of N. lat., and is about 40 miles long, and 12 miles wide in its broadest part. Its water is of a deeper tint than the surrounding fresh-water lakes, and is so brackish as to be unfit for man to drink. The buffaloes, when the vicinity was unsettled, drank it freely. Its outlet is unknown.

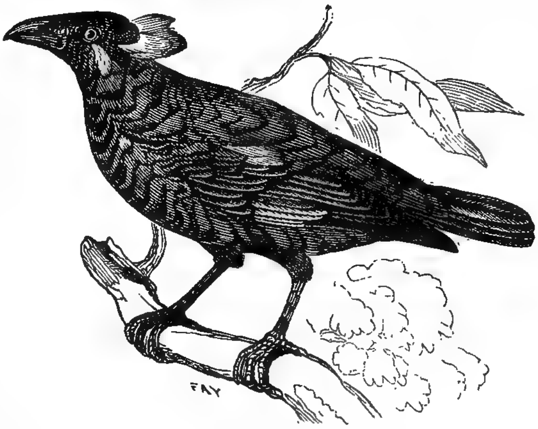
Min'now [Fr. *menu*, "small"], a name applied to many small fresh-water fishes of the family Cyprinidæ. The English minnow is *Phoxinus aphya*, a very common fish. In the U. S. the name is extended to the innumerable species of *Hybognathus, Hybopsis, Hyborhynchus, Photogenis, Coliscus, Sarcidium, Clinostomus, Rhinichthys*, etc.



The Minnow.

They are used as live bait in pike and pickerel fishing, and are important as affording food to larger and better fishes.

Mino Bird, the *Gracula musica*, called also *Eulabes Javanicus*, a remarkable bird of the starling family, found wild in the Malay Islands, and often seen caged in China and India. It is very lively and intelligent, and when trained is considered the best talker among the birds, far surpassing any parrot. It is also a good singer. It is almost entirely black, with orange wattles and yellow bill and feet. There is a white spot on the wing, and the bird is about a foot long.



The Mino Bird.

Minoides Minas, a Greek philologist, b. in Macedonia about 1790, and professor in the academy of Serez, Room-Elee, was by the Greek insurrection compelled to leave his native country, and settled in Paris, where he published several books, philological and political, and d. in 1860. His own works, written in Greek, with French translation, produced no lasting effect; but, having been sent by the French government in 1840 to search the Greek monasteries in European and Asiatic Turkey and buy or copy such Greek manuscripts as he deemed valuable, he brought back the *Refutation of all Heresies*, by Hippolytus, and the *Fables*, by Babrias. The discovery and publication of the former of these manuscripts have been of the greatest importance for the right understanding of many points in the history of the primitive Christian Church.

Minonk, city and R. R. junction, Woodford co., Ill. (see map of Illinois, ref. 4–E, for location of county), 118 miles S. W. of Chicago, is celebrated for its coal-mines, and has a steam-mill and 8 elevators. Principal employment, mining and agriculture. Pop. in 1870, 1122; in 1880, 1913.

Minoo'ka, in Au Sable township, Grundy co., Ill. (see map of Illinois, ref. 3-F, for location of county), is situated on the Chicago Rock Island and Pacific R. R., 11 miles S. W. of Joliet and 51 miles S. W. of Chicago. P. in 1880, 416.

Minor. See the article INFANT, by PROF. T. W. DWIGHT, LL.D.

Mi'nor [Lat.], in music, the designation of a mode or interval which in certain respects is *less* than others. Thus, the third in the minor mode is one semitone less than the third in the major mode. The same distinction applies to all thirds and sixths.

Minor (BENJAMIN BLAKE), b. at Tappahannock, Va., in 1818; was educated at University of Virginia and William and Mary College, and became editor of new editions of Wythe's *Reports*, with a memoir, and also of Hening and Munford's *Reports of Superior Court of Appeals*. He was for several years editor and proprietor of the *Southern Literary Messenger*.

Minor (LUCIAN), b. in Louisa co., Va., in 1802; graduated at William and Mary College 1823; was attorney-general for the commonwealth in his native county 1828–52; published several occasional addresses; contributed many articles to the *Southern Literary Messenger;* edited several legal publications, especially Call's *Virginia Reports;* condensed the four volumes of Hening & Munford's *Reports* into a single volume, with annotations of subsequent cases, and wrote a tract, *Reasons for Abolishing the Liquor Traffic*, of which 30,000 copies were sold.

Minor (VIRGINIA L.). See APPENDIX.

Minor (WILLIAM THOMAS), LL.D., b. at Woodbury, Conn., Oct. 3, 1815; graduated at Yale in 1834; was eight years in the Connecticut legislature; governor of Connecticut 1856–58; consul-general at Havana 1864–67; was appointed in 1868 a judge of the Connecticut superior court; resides at Stamford, Conn.

Minor'ca, the second largest of the Balearic Islands, situated in the Mediterranean, 27 miles E. N. E. of Majorca, and belonging to Spain, is about 35 miles in length. Area, 335 square miles. Pop. 39,005. It is high and mountainous, its highest point, Mount Toro, rising 4793 feet. It produces oil, wine, hemp, and fruits. The *Hedysarum coronarium*, or zulla, is extensively cultivated for fodder. Sweet potatoes are also raised here and exported to Algeria. The caper plant is abundant. The island has manufactures of wool, hemp, flax, etc. Among the principal exports are wheat and cattle. The island is less fertile than Majorca; lead, copper, and iron are found, but the scarcity of fuel prevents extensive working of them. Superior marbles and porphyries are found here, also lime and slate. The coast contains numerous creeks and bays, especially on the N. side. The chief town, Port Mahon, the capital, situated on the southern coast of the island, has a spacious, safe, and strongly-fortified harbor capable of accommodating a whole fleet of men-of-war. Minorca has also the ports of Addaya, Fornelle, Nitja, and Cindadela, which was formerly the capital and has a cathedral and several convents, also woollen manufactures.

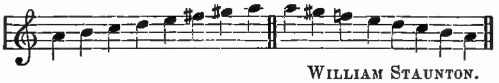
Mi'norites [Lat. *Fratres minores*], the name given by St. Francis of Assisi to his original order. (See FRANCISCANS.) The name is still borne by some congregations of that great order or group of orders.

Minority Representation. This general term has been very commonly used in political debate in recent years as properly covering various plans proposed for the more full and complete representation in government of popular constituencies and electoral bodies. But it is inaccurate and misleading, because it fixes attention upon one feature only of the plans in question, and to the ignorant and unreflecting appears to antagonize those plans to the principle—accepted by all persons devoted to free, popular government—that the majority shall rule. Hence the word "proportional" or "proportionate," and other words indicating completeness or totality, have been preferred by many writers to the word "minority" as a generic designation to comprehend all the plans proposed for representing electoral masses or bodies by *all* their principal divisions or parts. (See the article PROPORTIONAL REPRESENTATION, by HON. CHARLES R. BUCKALEW.)

Minor Mode. See MODE.

Minor Prophets, The, or **The Lesser Prophets** (thus called, not because their prophecies were less important, but because they were briefer), are twelve in number: Hosea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, and Malachi. In length all their writings do not equal those of Isaiah, and in the Hebrew canon they constitute only one book. According to the period of their lifetime they fall into three groups—the prophets of pre-Assyrian and Assyrian period (Hosea to Nahum), the prophets of the Chaldean period (Habakkuk and Zephaniah), and the post-exilean prophets (Haggai, Zechariah, and Malachi).

Minor Scale, in music, any scale corresponding in form with that of A minor—*i. e.* having a regular gradation of eight notes, with a minor third. The minor scale, however, is less perfect than the major, as the seventh degree ascending (being *minor*) does not properly possess the quality of leading note until raised a semitone by the addition of a sharp. But this change necessitates another—viz. a similar raising of the *sixth*, between which and the altered seventh there would otherwise be the interval of an "extreme" second—an interval only occasionally employed in the ascending scale. In *descending*, the natural or unaltered degrees of the *seventh* and *sixth* are commonly used, though in numerous cases a richer effect is produced (see MODE) by retaining the sharp on the seventh, and omitting it on the sixth, as in the example following:



WILLIAM STAUNTON.

Mi'nos, a king of Crete, to whom the Cretans traced their laws and political institutions, is said by Homer and Hesiod to have been a son of Zeus and Europa, a brother of Rhadamanthus, and, after his death, one of the judges of the Shades in Hades. Later poets and mythologists speak of two kings of Crete of the name of Minos, probably in order to establish harmony between the many contradictory myths which clustered around the name.

Minot (GEORGE), b. at Haverhill, Mass., Jan. 5, 1817; graduated at Harvard 1836; studied law with Rufus Choate; was admitted to the bar 1839, and became distinguished in his profession. He was associate reporter of the decisions of Judge Woodbury of the first circuit court; published in 1844 his *Digest of the Decisions of the Supreme Court of Massachusetts* (45 vols., with *Supplement*, 1852); edited the *English Admiralty Reports* (9 vols., 1853–54); aided Richard Peters, Jr., in editing the first 8 vols. of the *U. S. Statutes at Large* (1848), for which he prepared the *Index*, and was the editor of that important publication for the ten years preceding his death, which occurred at Reading, Mass., Apr. 16, 1858.

Minot (GEORGE RICHARDS), b. at Boston, Mass., Dec. 28, 1758; graduated at Harvard 1778; was admitted to the bar 1781; was clerk of the Massachusetts legislature 1782–91; was appointed judge of probate for Suffolk co. (Boston) 1792, and became chief-justice of the court of common pleas 1799. He was one of the founders of the Massachusetts Historical Society, and edited 3 volumes of their *Collections;* was orator on the anniversary of the "Boston Massacre," Mar. 5, 1782; wrote a *History of the Insurrection in Massachusetts in 1786* (1788), being that known as "Shays's Rebellion," and a *History of Massachusetts Bay from the Year 1748* (vol. i., 1798), being a continuation of Hutchinson's work. A second volume (1803) was published after the death of Judge Minot, which occurred at Boston Jan. 2, 1802.

Min'otaur, in Grecian mythology, a monster, half bull, half man, was the offspring of Pasiphaë, the wife of Minos, and Poseidon's bull. Minos shut the monster up in the Cnossian labyrinth, where a number of youths and maidens, paid as a tribute by Athens, were sacrificed annually to it until it was killed by Theseus. The monster has been frequently represented by Greek artists either in his early adventures, enclosed in the labyrinth, and fighting with or subdued by Theseus.

Minot's Ledge, or the **Minot's Rocks,** a portion of the extensive reefs called Cohasset Rocks, lying off Cohasset, Mass., the south-eastern promontory of the coast of Boston Bay, E. S. E., and 14 nautical miles from the city. A granite lighthouse with fog-bell is situated on the outer rock. (See LIGHTHOUSE CONSTRUCTION.)

Minsis Indians. See MUNSEES.

Minsk, government of Russia, on the upper part of the Dnieper. Area, 35,273 square miles. Pop. 1,504,576. The watershed between the basin of the Niemen, flowing to the Baltic, and the basin of the Dnieper, flowing to the Black Sea, is formed by a narrow plateau and a range of low hills seldom reaching the height of 1000 feet. Otherwise, the ground is low and level; the soil often sandy, often marshy; the climate in winter very severe. Extensive forests cover much of the land. An attempt on a great scale has recently been made to drain the marshes by an extensive system of canals, and the attempt proved successful so far as nearly 4,000,000 acres of swamp were reclaimed and made suitable for pasture. Rye, flax, and hemp are raised, sheep and horses are reared, and tar, timber, and potash are produced. The prevailing malaria, however, and the general poverty, are almost insurmountable barriers to any industrial development.

Minsk, town of Russia, the capital of the government of Minsk, on the Svislocz, a tributary of the Beresina. It has many good educational institutions and is the seat of the provincial government, but its trade and manufactures are unimportant. It is mostly built of wood. Pop. 43,995, one-third of which consists of Jews of the dirtiest description.

Min'strels [Fr. *ménestral*, probably from Lat. *ministrellus*, dim. of *minister*], the name applied during the Middle Ages in England, Scotland, France, and Normandy to strolling musicians who sang to the harp verses composed by themselves or others, and usually accompanied their songs with dancing, mimicry, and other devices to *minister* to the amusement of royal or noble patrons. There can be little doubt that they were direct successors of the skalds and gleemen of earlier Scandinavian and Teutonic antiquity, and connected, though more remotely, with the "bards" who figured so largely among the Celtic and Gothic tribes. They were, however, no longer the custodians of the national epics, like the Minnesingers, nor even permanently attached to the noble families as genealogists, but had begun to degenerate into jesters. The last representative of the earlier type of warrior-minstrels was probably Taillefer, who at the battle of Hastings rode before Duke William, tossing up and catching his sword and singing the song of Roland. By the time of Edward IV. the nobler occupations of the minstrels had given place to masquerading and playing at mysteries, and in the thirty-ninth year of Elizabeth a statute was passed classing minstrels and "jugglers, bearwards, fencers, common players of interludes, tinkers, and peddlers" as "rogues, vagabonds, and sturdy beggars," and to be punished accordingly. From that period nothing more is heard of minstrelsy as a profession. In modern times the name has been employed in a double sense. The comic singers of negro and other melodies are known as "minstrels," while the same term is often employed in a complimentary sense nearly as the equivalent of "poet." Of the latter conception Scott's *Lay of the Last Minstrel* is a good example.

Mint [Gr. μίνθη], a name applied to various fragrant labiate plants, but especially to those of the genus *Mentha*. Of these, the PEPPERMINT and SPEARMINT (which see) are the most important. The whole genus, with many other plants of the order, possesses aromatic qualities. The European pennyroyal (*M. pulegium*), bergamot mint (*M. citrata*), and others have considerable use in domestic medicine, and some are employed in cookery.

Mint [Ang.-Sax. *mynet*, "money"], a factory of coin conducted under the sanction of public authority. The use of the precious metals, as measures of value and mediums for effecting the exchange of commodities, dates from the earliest period in the history of the human race of which any record exists. Originally, gold and silver passed by weight in the form of lumps, buttons, wedges, and spikes. With the progress of civilization, increase of barter, and the extension of commerce came the necessity for individual pieces of metal of uniform fineness, weight, and value, in form for convenient use, and bearing in effect the certificate of the supreme authority as to such fineness, weight, and value, and to pass by tale or count. The best authorities are generally agreed in according the invention of coins to the Lydians, and the period of their first use to about the seventh century before the Christian era. Their introduction enabled the weighing of bullion in ordinary business transactions to be dispensed with, and placed the unskilled multitude upon an equality in the use of money with the skilled few. The use of coins rapidly spread over the commercial world, aided materially in the exchange of commodities, and powerfully promoted intercourse between the different countries of the world.

A description of the various modes employed in coinage prior to the invention of the present advanced processes and machinery would be, in fact, a history of the gradual development of the coinage-art from the stamping of rude characters on one side of a lump of metal, through all its changes and improvements, down to the time when it reached an advanced stage, and cannot be given within the limits of this article. A brief reference can only be made to the organization of the mints of the U. S., and the principal operations to which bullion is subjected in the manufacture of coin.

The mints and assay-offices are under the supervision of the director of the mint, whose head-quarters are in the treasury department at Washington, and who is subject to the general direction of the secretary of the treasury. The mints at which coinage is executed are located at Philadelphia, San Francisco, Carson, and New Orleans. Assay-offices are located at New York, at St. Louis, at Denver, Col., at Boisé, Id., and at Charlotte, N. C. The officers of the coinage mints are a supt., assayer, melter and refiner, and coiner; and for the mint at Philadelphia an engraver. The assay-office at New York has a supt., assayer, and melter and refiner. The other assay-offices have an assayer in charge, and a melter. Such assistants, clerks, and workmen are employed as are required and provided for by law.

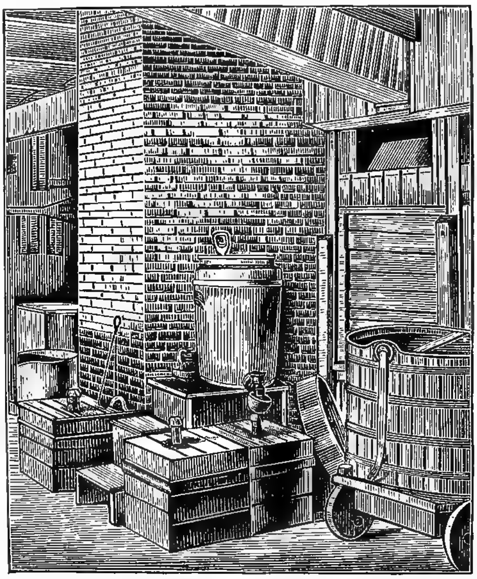
The various operations and processes to which bullion is subjected after being received at one of the coinage mints may be generalized as follows:

(1) *The preparatory melting*, usually with protective or refining fluxes, as the case may be; (2) *the assay*, which determines the precise proportion of fine gold or fine silver in each case, and also whether both metals are present and require parting; (3) *the parting process*, often called *refining*, since it takes the silver out, and leaves pure gold and pure silver as the separate products; (4) *the alloying of the metal*, so as to make ingots or thin bars of standard fineness, and the casting of such ingots; (5) *the assay of ingots*, to determine whether they are of the legal or standard fineness for coinage; (6) the various manipulations by which such standard ingots are converted into coin.

As a general rule, all bullion when received is subjected to "deposit" or preparatory melting, for the purpose of freeing it from all earthy matter and adhering substances, as well as to render the mass homogeneous preparatory to assay. Samples for assay are taken while the bullion is in a fused condition and before being cast into bars. The weight of the bullion after deposit-melting is that with which the depositor is credited and the melter and refiner charged. The bullion, if not of sufficient fineness and otherwise in condition to admit of being brought to the legal standard for coinage—nine parts pure metal and one of copper—is subjected to purification by melting and the use of protective and refining fluxes. If gold bullion contains silver, or silver bullion contains gold, in quantities sufficient to defray the expense of separating the two metals, it is subjected to the parting operation, which is based on the fact that silver is soluble in both nitric and sulphuric acid, while gold is not affected by either. If the metal to be parted is not present in quantity sufficient to equal the expense of the operation, it passes off in the coins, but without valuation. In the gold coins the law permits one-tenth of the alloying metal to be composed of silver. Tests made by the assay commission show that the silver in gold coins is almost inappreciable, amounting to but a trace, while out of five examinations made for gold contained in silver coins, the highest limit was 1 part in 5000. The most economical proportion of the two metals for the parting operation is 2 ounces of silver to 1 ounce of gold.

The bullion, having been freed from all foreign substances and base metals, or separated where gold and silver are associated in the same bullion, is alloyed with copper and brought to the legal standard for coinage. It is then cast into ingots and assayed, and if found to be sufficiently

FIG. 1.



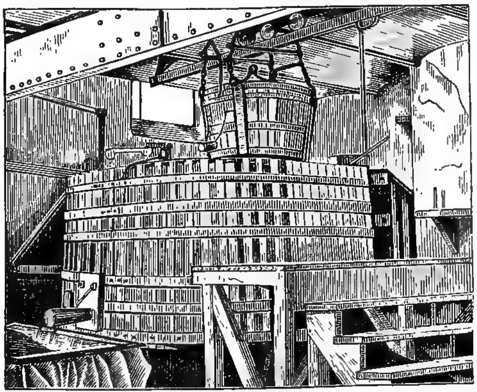
Parting-hood and vessels for the separation of the silver and gold by nitric acid; carboys of acid in front.

within the deviation from standard or "tolerance" allowed by law, is transferred to the coiner, who by a series of operations converts it into coin. In the case of gold coins, which are the standard of value and unlimited legal tender, each blank is adjusted by hand before being milled and stamped. The blanks for the dollar, which is a legal-tender coin, are also adjusted by hand, while those for the subsidiary or overvalued silver coin, the half dollar, quarter dollar, and dime, are not so adjusted, the drawbench being relied on to ensure the necessary uniformity as to thickness and correspondence of the blanks to their respective legal weights. The law allows a tolerance or deviation from the standard fineness of $\frac{1}{1000}$th in the gold coinage and $\frac{3}{1000}$ths in the silver. But in practice the assayer does not avail himself of even one-half the tolerance, as the aim is to have the coinage as near the exact standard as possible, which is not the practice followed by some foreign mints. The margin of fineness of gold coin in the English mint is placed at 2 parts in a thousand, though but a small part of this margin is actually used.

The following statement exhibits the standard weight of the gold and silver coins of the U. S., and the legal tolerance or deviation allowed on single pieces:

Denomination.	Standard weight, grains.	Legal deviation, grains.
Gold.		
Double eagle	516	½
Eagle	258	½
Half eagle	129	¼
Three dollar	77.4	¼
Quarter eagle	64.5	¼
Dollar	25.8	¼
Silver.		
Trade dollar	420	1½
Half dollar	192.9	1½
Quarter dollar	96.45	1½
Twenty-cent piece	77.16	1½
Dime	38.58	1½

FIG. 2.



Tank and apparatus employed in the precipitation and separation of the silver from the nitric acid solution from parting.

These deviations are intended for the protection of the mint officers, and are not taken advantage of in the preparation of the coins, which are made as close to the standard weight as practicable. In weighing a number of pieces together, when delivered by the coiner to the superintendent, and by the superintendent to the depositor, the law provides that the deviation from the standard weight shall not exceed in the case of gold coins $\frac{1}{100}$th of an ounce in $5000 in double eagles, eagles, half eagles, or quarter eagles, or in 1000 three-dollar pieces, or in 1000 one-dollar pieces; while on silver the deviation is $\frac{2}{100}$ths of an ounce in 1000 trade dollars, half dollars, or quarter dollars, and $\frac{1}{100}$th of an ounce in 1000 dimes. The uniform practice at the mints is, that each delivery of coin made by the coiner to the superintendent shall conform to the standard weight, no advantage being taken of the limit or tolerance allowed in weighing a large number of pieces together.

From each delivery of coins by the coiner to the superintendent a certain number of pieces are indiscriminately taken, sealed up, and placed in the pyx, for the annual trial or test of the coinage, which is made in February of each year by a commission constituted by law for that purpose; and if it appears by such examination and test that the reserved coins do not differ from the standard fineness and weight by a greater quantity than is allowed by law, the trial is considered and reported as satisfactory; but if any greater deviation from the legal standard or weight appears, the fact is certified to the President of the U. S., and if on a view of the circumstance he shall so decide, the officer or officers implicated in the error are thenceforward disqualified from holding their respective offices.

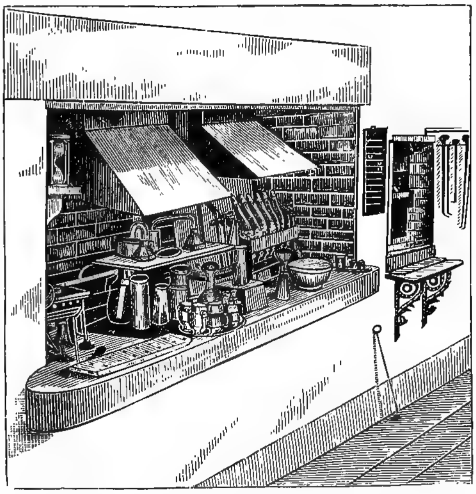
In the various processes to which bullion is subjected at the mints more or less loss occurs, particularly by volatilization in melting and refining, and is accounted for under the term "wastage." The operative officers are charged and credited with all bullion delivered to and returned by them, and are allowed a credit for actual "wastage" incurred, provided it does not exceed the legal allowance, which in the case of the melter and refiner is $\frac{1}{1000}$th of the whole amount of gold, and one and a half thousandths of the whole amount of silver delivered to him since the last annual settlement; and in the case of the coiner, one-half of $\frac{1}{1000}$th of the whole amount of gold and $\frac{1}{1000}$th of the whole amount of silver delivered to him by the superintendent. The actual wastage is, on the average, much within the limit fixed by law."

Great care is taken to recover from time to time all the minute particles of bullion remaining in the residuum fluxes, flues, etc. These are mostly recovered in the form of "sweeps," which are sold to bullion-smelters at about 60 per cent. of the value of the bullion contained.

A voucher is required to be taken for, and a record kept of, all transfers of bullion and coin and every transaction involving the receipt or disbursement of money. The bullion accounts are rendered quarterly, through the director, to the first auditor of the treasury for adjustment. At the close of each fiscal year a general settlement is made of the accounts of the operative officers, at which time all bullion in their possession respectively is delivered to the superintendent, and retained in his custody until the settlement is completed.

Gold is valued in the coinage at the rate of $25\frac{8}{10}$ths grains troy, nine-tenths fine, or $23\frac{22}{100}$ths grains of pure metal to the dollar. For silver the valuation in the trade dollar is at the rate of 420 grains troy, nine-tenths fine, or 378 grains of pure metal to the dollar. In the subsidiary silver coins it is valued at the rate of $385\frac{8}{10}$ths grains troy, nine-tenths fine, or $347\frac{22}{100}$ths grains of pure metal to the dollar.

FIG. 3.



View from the assay laboratory of the mint: the parting-chamber and hoods, showing the platinum and glass apparatus employed in the separation of silver from gold; on the right, front of muffle-furnace.

Charges which are estimated to equal but not exceed the average expense of each operation required to bring gold and silver bullion into a condition for coinage are fixed from time to time by the director of the mint, with the approval of the secretary of the treasury. The subjects of charge are deposit melting, parting, toughening, refining, copper alloy, coinage charge for trade dollars, bar charge. In the charge for deposit melting exceptions are made for standard gold bullion, fine gold bars, U. S. gold coin of less than legal weight, foreign coin of U. S. standard, or above, to be converted into coin, fine silver bars over 997½ fine, unless they contain gold, and mint or U. S. assay-office bars redeposited. Gold bullion, including foreign gold coin, is received at the mints at Philadelphia, San Francisco, and Carson, and the assay-office, New York, for coin or bars. Silver bullion is received only for trade dollars or bars. At the mint at Denver, operated as an assay-office, and the assay-offices at Boisé and Charlotte, the identical bullion is returned to the depositor in the form of unparted bars, bearing the U. S. stamp of fineness, weight, and value.

The subsidiary silver, as well as the minor or token coins (bronze one-cent and copper-nickel three and five cent pieces), are manufactured on government account only, the public treasury purchasing the bullion and metals required therefor, defraying the expense of manufacture, wastage, and transfer to the various treasury-offices, and realizing the seigniorage or gain on such coinage. Gold coins are receivable at the treasury of the U. S. at their denominational value, when not reduced in weight by natural abrasion, after a circulation of twenty years, as shown by the date of coinage, more than one-half of 1 per centum, and at a ratable proportion for any period less than twenty years. For the silver coins no legal limit of abrasion or wear is provided.

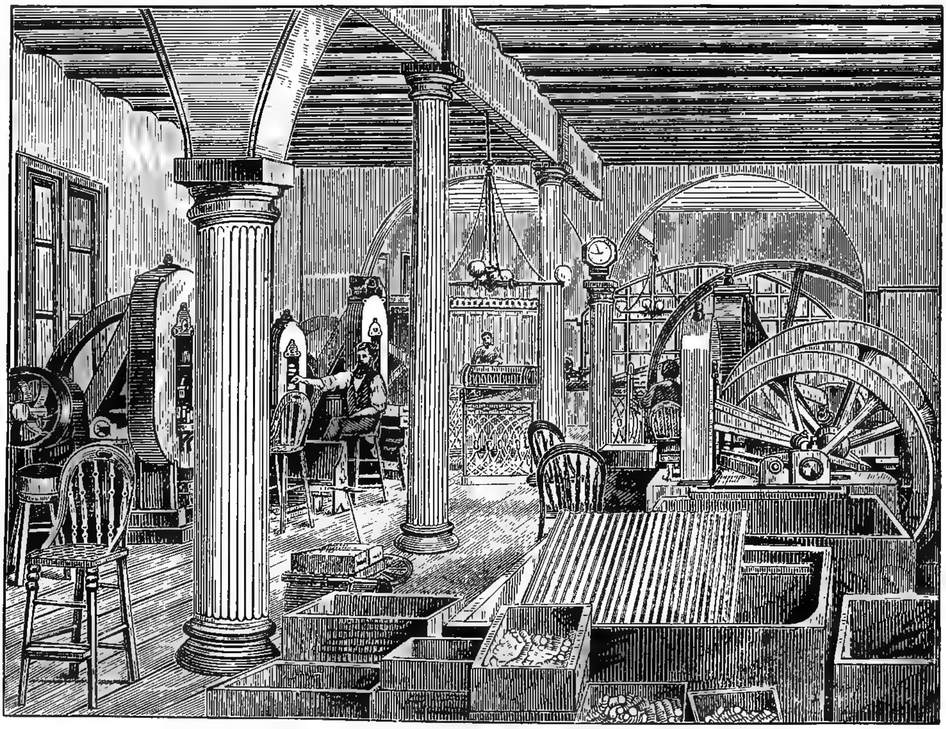
Under the title of "bullion fund" a part of the public moneys are placed at the different coinage mints and at the assay-office, New York, out of which depositors are paid for their bullion, in coin or bars, as soon as the value thereof has been ascertained by assay (generally a day or two thereafter), and on payment being made the bullion so deposited becomes the property of the U. S.

H. R. Linderman. Revised by A. Loudon Snowden.

Minting, the Mechanical Operations of. The principal operations and processes to which ingots of standard fineness are subjected in their manufacture into coin may be classified as follows:

(1) *The Rolling,* which reduces the ingots to strips or fillets of nearly a proper thickness for the denominated coins. (2) *The Annealing,* which is rendered necessary to preserve the ductility of the metal during the rolling operation. (3) *The Drawing,* whereby any want of uniformity in the thickness of the strips is corrected. (4) *The Cutting,* or forcing from the strips "planchets" or blanks of the size and shape of the coin. (5) *The Adjusting,* or weighing separately of each blank, and bringing those above standard within the working limit of deviation by filing. (6) *The Milling,* which presses up the edge of the blank in order to protect the surface of the coin. (7) *The Cleaning,* whereby all oxidation is removed from the face of the blank. (8) *The Coining,* or impressing upon the blanks the devices and inscriptions prescribed by law.

Fig. 1.



View of coining-room, showing machinery for striking and counting coins.

When ingots are received by the coiner from the melter and refiner, and the weight noted, they are taken to the rolling-room, and passed through heavy iron or steel rolls, each melt being kept and passed through separately. At each successive rolling the rolls are brought together by means of a screw, their adjustment or proximity to each other being indicated upon a dial which is regulated by the workman in charge. Successive rolling hardens or renders brittle the strips, and necessitates annealing in order to preserve their ductility. The length of time required to anneal gold is from one to one and a half hours, and for silver about twenty minutes. The first annealing having been completed, the strips are passed a few times through the finishing-rolls, and after a second annealing are ready for the drawbench. The pointed end of the strips are inserted between the drawplates, and drawn through a small pair of perpendicular steel rolls by means of a treadle and an endless chain. Two drawings are necessary for each strip. In the first a slight reduction is made, and in the last the drawplates are carefully adjusted to the thickness of the coin. A few strips are then passed through, from both ends of which blanks are cut and weighed, and if the weight is found to conform to the working tolerance, the drawing of the entire lot is proceeded with.

The strips are then taken to the cutting-press and planchets cut therefrom. This operation consists in passing the strip across a conical steel bed, while a punch just fitting the bed operates on the upper side of the fillet and forces a piece of the exact size and shape of the punch through the sharp bed beneath. The punch, operated by steam, moves with great rapidity, and cuts from 150 to 280 pieces a minute. The number of pieces that can be cut from ingots is as follows:

Gold.

From one double-eagle ingot	40	pieces.
" " eagle "	60	"
" " half-eagle "	75	"
" " three-dollar "	136	"
" " quarter-eagle "	100	"
" " dollar "	632	"

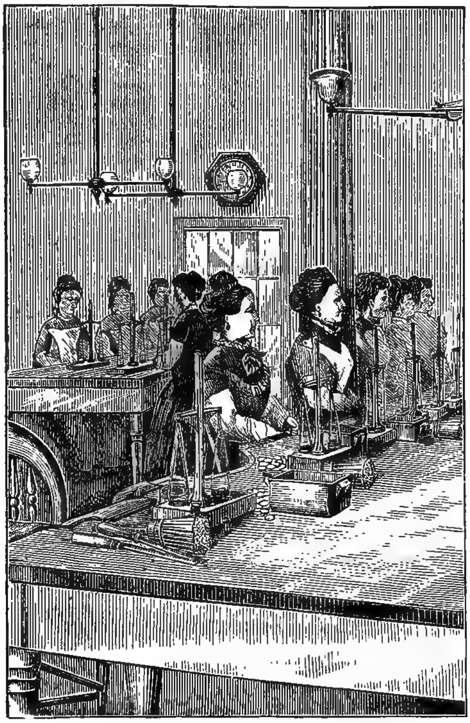
Silver.

From one standard-dollar ingot	33	pieces.
" " trade-dollar ingot	33	"
" " half-dollar ingot	60	"
" " quarter-dollar ingot	70	"
" " dime ingot	354	"

The perforated strips, denominated "clippings," and the blanks, are sent to the cleaning-room for the purpose of removing all dirt and grease adhering to them from previous operations. The clippings are returned to the melter and refiner, and remelted, and the planchets or blanks delivered to the adjusters.

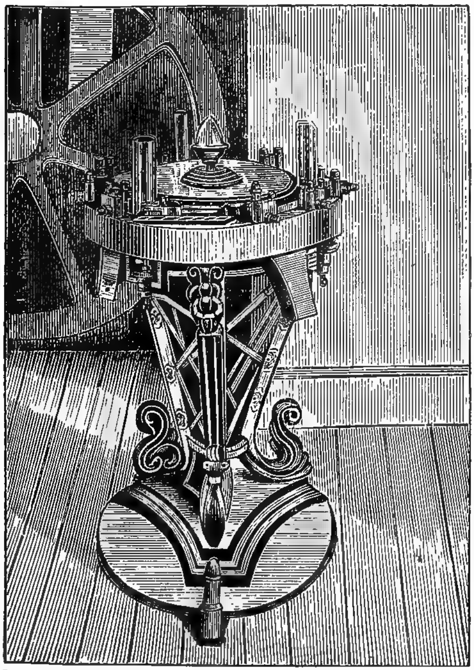
A blank, or counterweight, adjusted to a small fraction exceeding the legal weight of the coin, is furnished to each adjuster, with which the weight of all the blanks is tested, those heavier than the counterweight being carefully filed upon the edge until they are adjusted to a perfect counterpoise. The adjusted planchets are then returned to the forewoman, and under her supervision five of the most experienced adjusters prove the work, and if any planchet is found outside of the prescribed limit, it is readjusted. Those of less weight than the counterweight are kept in separate pans and tested by a second counterweight, which is a slight fraction *below* the standard weight of the coin.

FIG. 2.



Weighing-room, where the coins are tested, showing tables, scales, etc. in position and ready for work.

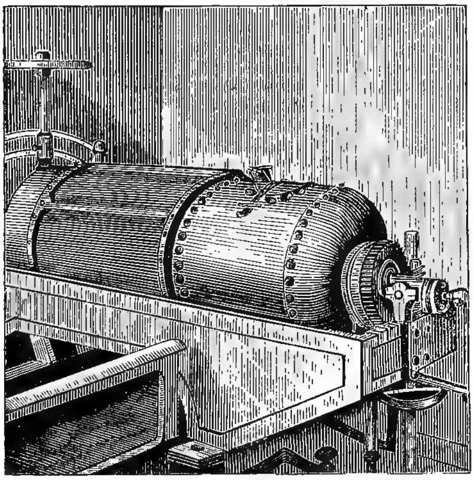
FIG. 3.



Edge-rolling or milling machine, in which the edges of the coin-disks are thickened and impressed.

The law allows on all coins a certain deviation from standard weight. This deviation, however, is seldom reached, the coiner fixing a limit within the legal deviation, which is known as the "working tolerance." All pieces found below the "working tolerance" are designated "condemned lights," and returned to the melter and refiner. The remainder, known as "heavies," "lights," and "standards," are kept separate until they reach the weigh-room as *coin*, when they are united in proper proportions, and made up into drafts for delivery by the coiner to the superintendent, who is acting treasurer. The subsidiary silver coins, half dollar, quarter dollar, and dime, are weighed separately, and all above or below the legal tolerance rejected.

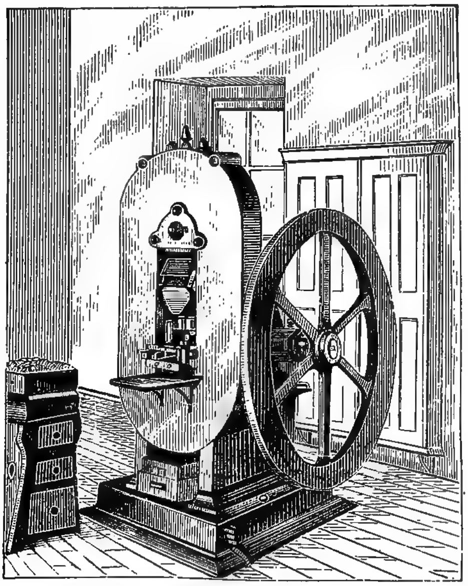
FIG. 4.



Rotating cylinder, employed for cleaning the blanks or coin-disks.

The adjusted blanks are now ready for the milling operation, which is done by a machine containing a circular plate, the outer edge being of steel, and which revolves within a strong band of the same material. The revolution of the inner disk carries the blank through the intermediate space between the working disk and fixed band, and which, being somewhat less than the diameter of the piece, presses up the edge of the planchet as it revolves. One revolution carries the piece through the mill and completes the operation. The milled planchets, more or less oxidized, before being brought to the proper condition for blanching must be entirely coated with oxide of copper. To ensure this, they are annealed to a cherry-red heat, and when removed from the furnaces are placed in a colander, dipped for a few moments into a diluted solution of sul-

FIG. 5.



View of coining-press in position for work.

phuric acid, and from thence into pure water in order to rinse off the acid. This leaves the blanks thoroughly cleaned, and after being dried by shaking in a large iron sieve or revolving riddle filled with sawdust, they are ready for the stamping operation.

This last and most important operation is performed by the coining-press. As each blank descends to the bottom of the tube, a pair of steel fingers seize it and carry it forward between the dies. While the dies are closing upon it, and stamping both the obverse and reverse inscriptions, the steel fingers return for another planchet, and, conveying it to the dies, push the coined piece into a box beneath the press. This operation is repeated *ad infinitum*. The coined pieces are collected from the presses and taken to the weigh-room, where they are made up in drafts for delivery to the superintendent. The speed of the coining-presses is estimated at from 75 to 120 pieces a minute, and the pressure exerted in stamping the coins ranges, according to their denomination, from 45 to 280 tons.

H. R. LINDERMAN. REVISED BY A. LOUDON SNOWDEN."

Min'to (GILBERT **Elliot**), FIRST EARL OF, eldest son of Sir Gilbert Elliot of Minto, b. at Edinburgh, Scotland, Apr. 23, 1751; entered Parliament 1774 as an adherent of Mr. Fox; succeeded to the baronetcy 1777; was ambassador at Copenhagen 1788–94; made a privy councillor June, 1793; acted as governor of Corsica during the English occupancy of that island, June, 1794, to Oct., 1796; created Baron Minto 1797; appointed ambassador to Vienna 1799; president of the board of control for Indian affairs 1806–07; was governor-general of India 1807–13; directed the conquest of the isles of France and Bourbon 1810; participated in the expedition which resulted in the occupation of Java 1811; was made earl of Minto and Viscount Melgund Feb.. 1813; and d. at Stevenage shortly after his return to England, June 21, 1814. (See his *Life and Letters* (1874), edited by his grandniece, the countess of Minto.)—His son, GILBERT ELLIOT MURRAY KYNYNMOND, second earl, b. Nov. 16, 1782, became ambassador to Berlin 1832–34, first lord of the admiralty 1835–41, and lord privy seal 1846–52, in the cabinet of his son-in-law, Lord John Russell. He was sent to Italy upon an important special mission 1847, and d. in London July 31, 1859.

Min'turn (ROBERT BOWNE), b. in New York City Nov. 16, 1805; received a good English education; lost his father at the age of fourteen, when he was obliged to leave school and enter a counting-house; became in 1825 a partner in the house of Charles Green, and in 1830 in that of Fish & Minturn, subsequently Grinnell, Minturn & Co., in which he achieved fortune and reputation, making it one of the great shipping-houses of the world. He was an active promoter of the city charities; one of the founders of St. Luke's Hospital; rendered patriotic service to the Union cause by a visit to Europe in 1861; was an earnest laborer in behalf of the freedmen, and president of the Union League Club to the day of his death, Jan. 9, 1866.

Minu'cius Felix (MARCUS), author of *Octavius*, one of the most elegant of the early Latin Christian apologies. He is generally spoken of as a Roman lawyer b. in Africa, but nothing is certainly known of his personal history. Even the date of his apology—whether as early as 180 or as late as 234 A. D.—is disputed. The best editions of the *Octavius* are by Oehler (1847) and by Halm (1867). There is an English translation by Richard James (1836).

R. D. HITCHCOCK.

Min'uet [Fr. *menuet*], in music, a species of dance-tune formerly in common use. Its movement was rather slow, graceful, and stately. The minuet was written in triple time, usually of three crotchets in a bar, and always commenced with a full bar. It consisted of two divisions or parts, each containing eight bars, and both divisions were repeated. Minuets also, not intended for dancing, and of considerable rapidity of movement, are now often found as constituent parts of overtures, symphonies, sonatas, and other formal pieces. In such cases the minuet generally comprises two strains of sixteen bars each, with repetitions. Another strain, called the "trio," follows directly, and after the trio the former part of the minuet is repeated.

Min'uit, or **Minnewit** (PETER), b. in Wesel, Rhenish Prussia, about 1580, belonged to a distinguished family, and had been deacon in the Walloon church at Wesel, but had resided some years in Holland when he was appointed by the Dutch West India Company first governor and director-general of New Netherlands. He landed on Manhattan Island May 4, 1626; purchased the island from the Indians for sixty guilders; built Fort Amsterdam, and governed the colony with energy and success until Aug., 1631, when he was recalled. Having put into the port of Plymouth, England, through stress of weather, on his homeward voyage. Apr., 1632, his ship was attached at the suit of the New England Council on an accusation of illegal trading, but was released in May. Minuit had lost favor with the West India Company through a charge of having countenanced land monopoly, and after unsuccessful efforts to regain his position offered his services to the Swedish government to found a colony in America. The great chancellor Oxenstiern having patronized the project, a Swedish West India Company was formed, and Minuit sailed from Gothenburg, Sweden, in 1637, with a body of Swedes and Finns; ascended Chesapeake Bay, and in Mar., 1638, began to build Fort Christiana, 2 miles from the confluence of Minqua's Kill with the South River, near the present city of Wilmington, and called the country New Sweden. This was the first permanent European settlement on the Delaware, and the colony remained in the hands of Sweden until captured by the Dutch in 1655. Peter Minuit, whose very name is now unknown to nine-tenths of the residents of New York City, was thus the founder of the metropolis of the New World and of the American colonial possessions of two European nations. He d. at Fort Christiana, New Sweden (Del.), in 1641.

Min'ute [Lat. *minutus*, "small," "diminished"], a measure of time, the sixtieth part of an hour. In the measurement of angles and of arcs of circles the minute is the sixtieth of a degree. Both kinds of minutes are divided into 60 seconds.

Mio, cap. of Oscoda co., Mich. (see map of Michigan, ref. 4–J, for location of county). Pop. not in census of 1880 or 1884.

Mi'ocene [Gr. μείων, "less," and καινός, "recent"], the strata of the Middle Tertiary period in geology. The miocene deposits abound in animal and vegetable remains. Those of the Atlantic and Gulf coasts are marine in their origin; those of the far West are fresh-water strata. The first contain remains of large cetaceans, the latter of Carnivora and Ungulata. Some Miocene species still exist.

Miohippus. See HORSE (FOSSIL).

Mi'ra, town of Northern Italy, province of Venice, pleasantly situated on the Brenta Canal, about 14 miles N. of the city of Venice. It contains many fine private houses belonging to the Venetian nobility. Pop. 8827.

Mirabeau' (HONORÉ GABRIEL RIQUETTI), COUNT, b. at Bignon, near Nemours, in Provence, Mar. 9, 1749. His father (b. Oct. 5, 1715, d. July 13, 1789) was one of the noisiest philanthropists of the eighteenth century, a loud propagandist of the physiocratic system, author of *L'Ami des Hommes* (5 vols., 1755), and used fifty-four *lettres de cachet* in order to maintain peace in his family. Young Honoré, with his herculean body, ugly face, violent passions, and turbulent manners, was a special subject of dislike to the father, in spite of the eminent power of intellect which he showed very early. He received a military education at Paris, and was a lieutenant of cavalry in his seventeenth year; but although he pursued his military and mathematical studies, like everything he undertook, with a furious energy, his life was so wild that in 1768 his father had him shut up in the island of Ré for six months. After serving for some time in Corsica, he left the military career altogether, and settled on one of the family estates in Limousin, where (June 22, 1772) he married the young Marie Émilie de Covet. After living in brilliant style for a couple of years, he was abandoned by his wife, very seriously embarrassed by creditors, and once more imprisoned by his father (Sept. 23, 1774), this time in the castle of If, in the Bay of Marseilles, whence he was removed some time after to Fort Joux, near Pontarlier, in the Jura Mountains. From this place he eloped with the young marquise Sophie de Monnier, and fled first to Switzerland, then to Amsterdam, where he engaged in literary pursuits in order to procure some means of subsistence, and published his *Essai sur le Despotisme* (1776). On May 14, 1777, he and Sophie were arrested, and he was confined in the dungeon of Vincennes till Dec. 13, 1780. While here he wrote *Essai sur les Lettres de Cachet* (Hamburg, 1782), a number of other works, and a multitude of passionate letters to Sophie, published at Paris (4 vols., 1792). Nevertheless, as soon as he was liberated he quarrelled with her, and he now tried by a lawsuit to compel his wife to return to him. He pleaded his case himself, and, although he lost it, he made a deep impression by his powerful eloquence. During a residence in London he published in 1784, *Considérations sur l'Ordre de Cincinnatus* and *Doutes sur la Liberté de l'Escaut*, the latter an attack on the policy of Joseph II., paid for by Dutch money. On his return he began his violent attacks on the financial system of Calonne, and in order to silence him he was sent on a secret mission to Berlin. The fruits of this mission were *De la Monarchie Prussienne sous Frédéric le Grand* and *Histoire Sécrète de la*

Cour de Berlin; but as he failed to obtain any further diplomatic appointment, he continued his attacks on the government by his *Dénunciation de l'Agiotage* (1787) and *Suite de la Dénunciation* (1788). On the convocation of the States General he first tried to be elected by the nobility, but being rejected because he possessed no fief himself, he bought a clothier's shop in Aix and entered the Assembly as a member of the third estate. From this moment and up to his death he was actually the ruler of the destinies of France. Although he was not the leader of any distinct party, he governed the Assembly absolutely by his brilliant logic and wonderful eloquence. It was he who established the third estate as the dominant power in the States General, and it was he who established the States General as the dominant power in the government of France. Thus he started the Revolution, and when it began to flow in rapids and leaps, he turned around and tried to stem its course, defending the royal prerogatives and the monarchical principle. Other men, more closely allied with the brooding instincts of the mass, arose beside him. His secret connections with the court became known—his conversation with the queen, the payment of his debts by the king. His popularity waned, but still when he spoke people swayed under his voice like reeds before a storm. The activity which he developed as leader of the Assembly and president of the Jacobin Club was enormous, but the exertion, in connection with his reckless life, suddenly broke his strength. On Mar. 27, 1791, he spoke for the last time; on Apr. 2 he died. He was buried in St. Geneviève, the Pantheon, whence his corpse afterwards was removed to his family estate, in order to give room for that of Marat. The most complete account of his life is found in *Mémoires biographiques, littéraires et politiques de Mirabeau* (8 vols., 1834), published by his natural son, Lucas de Montigny. The best edition of his works is that by Blanchard (1822, 10 vols.), but it does not contain his *Monarchie Prusienne.*

Clemens Petersen.

Mirabel'la Ecla'no, town of Southern Italy, province of Avellino. This town occupies the site of the ancient *Æclanum,* which was an independent town until it fell into the hands of Sulla (100 B. C.). It had various names during the Middle Ages, and, though it suffered cruelly from earthquakes in 1688, 1694, and 1732, interesting remains of the Roman period still exist. Pop. 6285.

Miracle-Plays. See Mysteries.

Mir'acles. I. *Meaning of the Term.*—A miracle is a sensible event wrought by God in attestation of the truth. It therefore must occur in nature, else it would not be apprehensible to our senses, and it must at the same time be beyond the power of nature to produce, else it would not disclose an agency which belongs to the Author of nature alone. A miracle is not simply an extraordinary event, which, however unfrequent, occurs through the regular action of the same forces that produce the ordinary events in nature, and which might be foreknown by one acquainted with its cause; but it is an event which nature by its own action never would have brought forth, and for which the power of God alone is adequate. It is not a new birth from nature's teeming womb, but a new beginning, which rises at once from an almighty fiat. It is not a development, but a creation. It shows a new force introduced into nature, by which nature is checked and changed. A miracle may be defined, therefore, as a counteraction of nature by the Author of nature.

II. *The Occasion for Miracles.*—Nature furnishes no revelation of God's mercy to sinners. In all the records of natural religion no mention is made of the divine love. While in the idolatrous sacrifices of the heathen there is doubtless indicated some vague notion of propitiation, some undefined conviction that in some such way God may be approached and pleased, yet that God is a being who approaches us in mercy before we make any attempt to draw nigh unto him neither the Mohammedan nor any pagan religion has ever revealed. And yet without this revelation the sense of sin—the strongest and saddest sense ever felt by the soul—finds nothing to dispel its terrors. If, therefore, God can pardon sin and purify the sinner, nothing can be so important to man as the communication of this truth in a way which shall show it to be indisputable. And if nature cannot declare it, and the human mind alone cannot reach it, how is this communication possible unless directly announced by God himself? And how shall this announcement be proved to be from God unless he shall irrefutably manifest himself in connection with the utterance? And how can this manifestation be except through that miraculous interference with nature already described? If God shall reveal his mercy to sinners, we may expect the revelation will come through a miracle.

III. *The Claim of the Bible to be a Miraculous Revelation.*—While the Bible is originally the only book which declares God's love to man, it differs also from all other books in that it claims to be a miraculous revelation. It declares that God has provided a perfect remedy for sin, and it professes to prove the doctrine by miracles which furnish God's test to its truth. In both the O. and N. T. miracles are continually adduced as a motive to faith. (Ex. iv. 5; vii. 5; ix. 29; xi. 7; xvi. 6; Num. xvi. 8: Josh. iii. 7; 1 Kings xviii. 24, 38, 39; Matt. xi. 3–5; Mark ii. 10, 11; John ii. 23; iii. 2; v. 36; vii. 31; xi. 41, 42; xx. 31; Heb. ii. 4.) No other book has ever professed to rest upon such a claim. Whether or not the claim be valid, it is at least unique.

IV. *Proof that the Miracles of the Bible actually occurred.*—If these miracles did occur, no evidence of the fact could be better than that which we actually possess. The miracles were not done in a corner. There was no effort to conceal them. They challenged scrutiny. They were done in many places, at many times, and by different persons. They were witnessed by thousands. They were of such a nature that they must actually have occurred as reported, or their reporters have fabricated the stories, knowing them to be false. But why fabricate them? and how carry out the deception? The apostles had nothing to gain, but everything to lose, by such an undertaking. Because of their report they suffered obloquy, persecution, and death, and, though they must have foreseen this result, they continued their declaration, ceasing not to teach and to preach that Jesus is the Christ and that these mighty works were wrought of God through him. To suppose that in all this they were only acting out a lie, would be only to suppose something much more difficult to believe than the miracles which they declare.

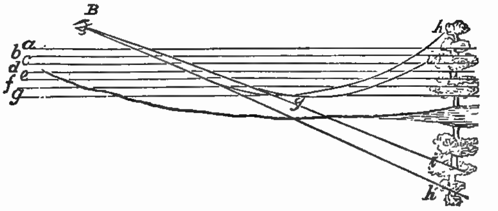
But more than this: the word of the apostles was believed, and this on the very spot where the miracles were declared to have taken place, and by thousands who could have at once disproved the story if it had not been true. It was believed by their enemies. The apostles furnished proof of their statements which no amount of argument or persecution could rebut. It does not appear that the miracles were ever denied at the time when they were held up as the reason why all the world should believe that Jesus is the Christ. They were actually admitted as facts by the opposers of Christianity. Celsus, and Hierocles, and Julian the Apostate, and the Jewish rabbis in the Talmud—all of whom wrote and argued even bitterly against Christianity—have yet all left their acknowledgment, which we still possess, of the actual occurrence of these events, accounting for them by magical arts, which Celsus affirms Christ must have learned in Egypt. No historical events could be established with a greater certainty than these possess, by any amount of testimony.

V. *Objection to Miracles.*—Many men are unwilling, and perhaps unable, to weigh considerately the argument from testimony, having the preconceived opinion that a miracle cannot be proved by any amount of testimony. Nature, they say, is fixed and orderly. To change an atom would change all the worlds. To increase or diminish, in the least degree, the exact amount of forces now constituting the universe would destroy the universe. Forces of nature may be dissolved and recombined, but always their exact equivalence will remain, and neither nothing new can be created nor nothing old destroyed. Hence, no such thing as a miracle can be. This objection, stripped of its verbiage, amounts to this: a miracle is unreasonable, and therefore impossible. But what do we mean by reasonable and unreasonable, this supreme potency which determines so easily whether aught be possible or impossible? Is it only a word without reality, and with which our thoughts cheat themselves? But, then, how idle all appeals to it must be! and how absurd this very objection becomes! If the reasonable has no reality, the objector to miracles because of their unreasonableness has no reality in the very groundwork of his objection. But supposing we admit that the reasonable is real, and confine its reality to what an individual man perceives and judges? In this case there is no universal standard of reason to which all our perceptions and judgments should conform; but the reasonable is in a man's consciousness alone, and it is unmeaning to talk of it as elsewhere or otherwise. But if this be so, what folly to talk at all! Why should a man ever say a word if there is no universal standard of reason according to which his words can be judged by another mind as truly as his own? And how does all argument—*i. e.* every attempt to make others think as we do—fall to the ground if there be not above and beyond us a standard to which we feel that not only our judgments, but those of every man, should conform? If the reasonable be only what I fancy to be so, I may not, indeed, ask the objector to miracles to relinquish his objections, but just as little may he require me to admit their force. Each man thus stands upon a ground which he can neither maintain against another nor be forced by another to abandon, and all argument between men is vain and all agreement among them hopeless.

But what if we suppose the unreasonable and impossible to mean only the unnatural? In this sense a miracle would be denied because a certain so-called order of nature forbids it. But what proof that there is such an order of nature? The moment we attempt to prove it we find ourselves stepping on a groundwork which lies back of nature, and which inevitably leads the thought into the living presence of the supernatural. Our natural science is fond of its generalizations, but no all-inclusive generalization is possible without the supernatural. It is an unmeaning babble to talk of comprehensive laws unless there be a comprehending reason and will, whose ideas and plans these laws express. The current notion, in some quarters, that we can gain—or have, perchance, got—such universal conclusions, that nature can be shut in upon itself, and God shut out, is exactly the absurdity of supposing that we see when we have closed our eyes and turned the very light of all our seeing into darkness. If we make comprehensive generalizations about nature which declare anything further than the facts which have been actually observed, it is because we see not that reason is limited by the order of nature, but that the order of nature is limited by reason; it is because we recognize that there is something reasonable beneath the facts, which also reaches beyond them, and which, instead of being made by the facts, has itself determined how they shall be made. The objector to miracles denies a miracle because it is different from nature, but he can only maintain that nothing different from nature can be by affirming a principle which is itself different from nature. A principle which can form the basis of a universal affirmation, and by which alone one is justified in affirming what is possible and what impossible, is not only beyond and above nature, and must control nature, but is recognized as such even by him who denies the supernatural, or else his denial has no more meaning, even to himself, than the chatter of a parrot or a monkey. We must have the supernatural; and it is alike the mystery and the majesty of the human soul that we cannot deny the supernatural except in terms which absolutely imply and affirm it. It is therefore a confusion of thought which identifies the reasonable and the unreasonable with the natural and the unnatural; the reasonable is supernatural, and on this ground the objection to miracles at once disappears. J. H. SEELYE.

Miraflo′res (MANUEL DE **Pando**), MARQUIS OF, and count of Villapaterna, b. at Madrid, Spain, Dec. 24, 1792; was educated for the public service, in which he spent more than fifty years; was ambassador at London 1834, at Paris 1838–40, and at Vienna 1860; seven times president of the senate, often a cabinet minister, and premier in 1846 and 1863. In 1868 retired to private life, and d. at Madrid Mar. 17, 1872. The marquis was decorated with nearly all the grand orders of merit in Europe, and was an active member of the Spanish Academy of History. He wrote several treatises in favor of Isabella's right of succession to the throne, a biography of Louis Philippe (1851), valuable *Memoirs* of his own life, and a *History of the First Seven Years of the Reign of Isabella II.* (2 vols., 1843–44), and published numerous speeches and fugitive writings.

FIG. 1.



Mirage of desert: *a*, *b*, *c*, *d*, *e*, *f*, reflecting surfaces where strata of air touch; *g*, angle of total reflection; *B*, eye of observer; *h*, *i*, pencils of rays from object; *h′*, *i′*, points where pencils focus in reflection.

FIG. 2.

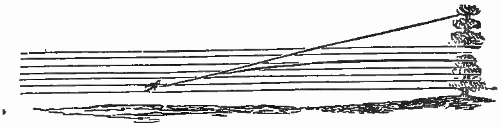
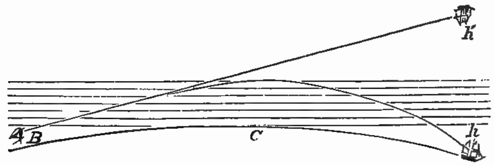


FIG. 3.



Mirage at sea: object *h* below horizon at *B*; *C*, curved surface of the earth.

Mirage′ [from *miror*, to "wonder"]. Under this head are included those aërial and marine reflections known as mirage, looming, and Fata Morgana. These are all analogous phenomena, due to the refraction of light, to its total reflection, or to a combination of both. These are—(1) mirage of the desert; (2) mirage at sea; (3) looming; (4) a combination of ordinary mirage at sea and looming; (5) Fata Morgana. The first, mirage of the desert, presents the appearance of reflection in a smooth surface of water, the inverted image of trees, etc. being seen beneath the real objects. It is due to the refraction, and finally to the total reflection, of the rays of irregularly reflected light, sent back to the eye from the object. The heated sand of the desert rarefies the lower strata of air, while the upper strata are condensed by the chilling due to the radiation of its heat. The strata of different densities mingle slowly in consequence of the stillness of the air. Fig. 1, *a*, *b*, *c*, *d*, *e*, *f*, *g*, represents the boundaries of strata of air, which decrease in density from above downward. Every point of the tree sends out divergent rays of irregularly reflected light, by means of which it is visible. The direct rays from the tree to *B* make it visible to the eye at *B*. The ray *h*, which under ordinary circumstances would never reach the point *B*, meets in its downward course strata of continually decreasing density, and becomes less and less inclined to the parallel layers of air (see REFRACTION), till at *g* the angle of total reflection is reached and the rays are bent upward (see REFLECTION), and enter the eye in the direction *h′B*; and so with *i* and all other rays. An object is always seen in the direction by which the rays sent from it enter the eye; an inverted image is therefore formed by the portion of each pencil of rays proceeding from the tree, which is bent back to the eye as by a mirror. Second, mirage at sea is explained in exactly the same way, except that the conditions are reversed. The lower strata of air are chilled by the waters of the ocean, and increase in density from above downward; the rays which produce the image curve convexly or in the opposite direction. (Fig. 2.) Third, looming is due to refraction alone; a portion of the pencil of rays which proceed from the point *h* (Fig. 3) reaches the eye direct, and produces the image of the real object, while another portion is refracted, and produces an erect image above the real one. Fourth, a real, inverted, and erect picture of the same object is sometimes projected upon the retina of the eye at the same time a portion of each pencil of rays proceeding from the body reaches the eye direct, producing the image of the real object; another portion is simply refracted, as in Fig. 3, producing an erect image; while a third portion is first refracted, and then totally reflected, forming an inverted image. In 1822, Capt. Scoresby recognized the ship Fame by her inverted image in the air, though she was seventeen minutes below the horizon. The whole of Dover Castle has been seen as if lifted over an intervening hill by the refraction of the rays of light from its surface, and in this case the image from the looming was so vivid as to obscure the hill which really lay between the castle and the observer's eye. Lateral images are sometimes formed by reflection of the rays from vertical columns of air having different densities. Two boats, one real, the other a reflection, have been seen side by side upon the Lake of Geneva at the same moment. Mirage is most common when there is a marked difference between the temperature of air and water; it is most frequent in the morning or in summer and autumn, when the air is laden with mist. It is seen oftener by an eye placed close to the surface of the water, less perfectly at a height of six or eight feet, and almost never at twenty-four feet or more above the level of the sea. Dr. Wollaston obtained three images of an object seen through a square glass vessel containing successive layers of syrup, water, and spirit. Fifth, the phenomenon called Fata Morgana, or castles of the fairy Morgana, is occasionally seen upon the Calabrian coast while looking westward toward the Straits of Messina. On still mornings, when the sun, rising behind the Calabrian mountains, strikes upon the sea at an angle of 45°, the air is rapidly heated; the strata slowly intermingle, and present a series of reflecting surfaces which multiply images on the opposite Sicilian shore. The water is supposed at the same time, by the action of the tides, to possess a slight convexity. There are three forms of this mirage—the marine Morgana, where each object is reflected again and again in an inverted position and at different angles on the surface of the water: the aërial Morgana, when they are thus reflected in the air; and a third form, in which the aërial images are fringed with prismatic hues. Gigantic reflections of men and animals are sometimes observed to flit over the scene. The Calabrians hail the appearance of this beautiful but short-lived spectacle with delighted cries of "Morgana! Morgana!" This phenomenon is not confined to the Calabrian coast, though the meteorological conditions, the topography of the ground, and the conformation of the coast in this place render its appearance more frequent and more beautiful than elsewhere. In all these reflections there is apt to be a wavering in the defining lines, and sometimes the whole image is tremulous like an object seen through a current of heated air. S. B. Herrick.

Miramichi' River, a large river of New Brunswick, discharges its waters by a deep estuary into Miramichi Bay, an arm of the Gulf of St. Lawrence. The river is navigable to Newcastle by large ships, and higher up by smaller vessels. Salmon and many other valuable fish are taken here in great quantities.

Mir'amon (Miguel), b. in the city of Mexico Sept. 29, 1832, son of Gen. Bernardo Miramon, a distinguished officer of the war of independence, of French descent; entered the military academy of Chapultepec in 1846; fought gallantly with his classmates in the defence of Molino del Rey and Chapultepec against the army of Gen. Scott, and was taken prisoner Sept. 13, 1847; completed his studies after the peace; received a commission in the army 1852; was actively engaged in suppressing several local revolts against Santa Anna, by whom he was sent with the rank of captain, in Oct., 1854, in an expedition against Alvarez in Southern Mexico; was distinguished in several engagements, and was made colonel for gallantry in the battle of Temajalco, July, 1855. The revolution having triumphed in September of that year, the regular army was placed under the control of its late enemies, and was naturally disloyal to the administrations of Alvarez and Comonfort. When Miramon was sent as second in command against the rebels of Zacapoaxtla, he seized the opportunity to imprison his superior (Dec., 1855), placed himself at the head of the force, joined the rebels, of whom he assumed the chief command, led them rapidly to Puebla, and occupied that city. When Puebla was taken by Pres. Comonfort (Mar., 1856), Miramon and his officers were degraded to the ranks, but a few months later he rose again and defended the city forty-three days against an overwhelming force; escaping with Col. Osollo, he captured Toluca in Jan., 1857; taken prisoner, he again escaped, joined the rebels in the S., and had just captured the city of Cuernavaca when the movement of Zuloaga occurred in the city of Mexico. With Osollo he hastened to Mexico, galloped through the lines of Comonfort, joined the forces of Zuloaga (Jan., 1858), and took by storm the Hospicio and the Acordada. Zuloaga made them brigadier-generals, and sent them against the formidable combination which supported the cause of Juarez in the central states. Miramon gained the important battle of Salamanca, which opened the way to Guanajuato and Guadalajara, and forced Juarez to withdraw temporarily from the country. Other victories speedily followed. Miramon was made major-general, and Osollo having mysteriously died in San Luis Potosi, he found himself at the age of twenty-six the chief military leader in Mexico and the idol of the "reactionary party." The forces of the liberal coalition were decisively routed at Ahualulco in September and at Atequiza in Dec., 1858, and news of the latter victory having reached the capital at the moment when Gen. Robles had overthrown Zuloaga by the "plan of Navidad," Miramon was chosen president by the electoral junta, then in session, Jan. 2, 1859. On hearing of this event Miramon hastened to the capital, declined the presidency, and reinstated Zuloaga Jan. 24; but a few days later it was arranged that the latter should voluntarily retire, which he did, after appointing Miramon as his substitute *ad interim*, Feb. 2. He then undertook the siege of Vera Cruz, where Juarez had established his government, but was unsuccessful; and hearing that Mexico was invested by the liberal forces under Degollado, he reached the capital on the day of the decisive victory of Tacubaya, gained by Marquez, Apr. 11, which was stained by the execution not only of the prisoners, but of many non-combatants—an act still execrated as the "massacre of Tacubaya," of which he divides the responsibility with Marquez. After a prolonged struggle of three years the "war of reform" terminated in favor of Juarez by the battle of Colpulalpam, Dec. 22, 1860, and Miramon was forced to flee from the country. He proceeded to Europe, visited the courts of France, Spain, and Italy, took part in the plans of Napoleon III. for founding a monarchy in Mexico, and arrived at the port of Vera Cruz early in 1862, when that city was held by the triple alliance, but was refused permission to land by the English admiral, and returned to Europe. On the accession of Maximilian to the nominal throne of Mexico, Miramon was honored with the appointment of grand marshal Sept., 1863, and with the embassy to Berlin 1864, being thus kept abroad in honorable exile through fear of his popularity. At the crisis of the Mexican monarchy, when the French forces were being withdrawn and Maximilian was apparently about to abdicate, Miramon arrived with Marquez in Mexico, doubtless with a view to obtain control of the situation. After several conferences at Orizaba (Dec., 1866), Maximilian, resolved to make a last effort to maintain his throne by an appeal to the reactionary party, returned to Mexico, and placed the army in the hands of the two generals. Marquez remained in command at Mexico, while Miramon, accompanied by the archduke, undertook the defence of Querétaro, which terminated by the capture of that city May 15, 1867. Along with Maximilian and Gen. Tomas Mejia, Miramon was subjected to a prolonged trial before a military commission, and was condemned to death, and shot on the Cerro de las Campanas, near Querétaro, June 19, 1867. In his last moments he denied the responsibility of the "massacre of Tacubaya," and met his fate bravely, occupying the post of honor between his two companions by express desire of Maximilian. His widow and children reside in Austria, receiving a pension from the emperor Francis Joseph. Porter C. Bliss.

Miran'da (Gen. Francisco), b. at Caraccas, Venezuela, in 1750; entered the Spanish army, and served in Guatemala, where he attained the rank of captain at the age of seventeen; accompanied the French forces in their campaign in aid of American independence; became acquainted with prominent American statesmen, and conceived a project for the emancipation of the Spanish American colonies: but on the discovery of his purpose he fled to Europe, presented his views to several courts, and received marked encouragement from Catharine II. of Russia, from William Pitt, and from the French revolutionary leaders; was appointed general of division in the French armies; displayed considerable military talent in Champagne under Dumouriez, and in Sept., 1792, was made commander-in-chief of the army of Flanders. Repulsed from the siege of Maestricht, Miranda commanded the left wing at the battle of Neerwinden (Mar. 18, 1793), the loss of which led to his imprisonment, trial, and acquittal. He went to New York and enlisted the support of American capitalists; fitted out an expedition; landed Aug. 2, 1806, at Vela de Coro near Caraccas; was forced to retreat to Trinidad. At the outbreak of the revolution of 1810, Miranda reappeared in Venezuela; was accepted by the insurgent leaders as their head 1811; drove the Spaniards from Valencia, Puerto Cabello, and nearly the whole of New Granada, and was elected to the insurgent congress. The earthquake of Mar. 26, 1812, enabled the Spanish forces to occupy several of the ruined cities, and Miranda evacuated Valencia. A month later (Aug. 26) he was arrested at La Guayra in violation of the capitulation, and taken to Puerto Rico, whence he was soon removed to Cadiz and confined in one of the dismal cells of the Inquisition, where he d. in Jan., 1816. (See James Biggs's *History of Miranda's Attempt, etc.,* New York, 1808.)

Miran'dola, town of Italy, province of Modena, comprising within its limits several small villages, the principal of which is well built, with broad streets, good churches, etc. This town played an important part in the mediæval history of Modena, and is immortalized as the birthplace of the illustrious Pico da Mirandola. Pop. 13,170.

Mira'no, town of Northern Italy, province of Venice, about 10½ miles N. of the city of Venice. It was considered of great strategic importance during the Middle Ages, and consequently suffered much from sieges. Pop. 7393.

Mirbel' (Lizinska Amée Zoë Rue), b. at Cherbourg July 26, 1796; married in 1820 the botanist Charles François Brisseau Mirbel (b. Mar. 27, 1776; d. Sept. 12, 1854); became one of the most celebrated miniature-painters of modern times, and d. at Paris Aug. 31, 1849. Her masterpieces are the portraits of Amy, Fitz-James, and Perronnet.

Mirecourt', town of France, department of Vosges, noted for manufactures of musical instruments. Pop. 5333.

Mir'field, a v. of England, in the county of York, has manufactures of woollen and cotton goods. Pop. 9263.

Mirgorod', town of Russia, in the government of Poltava, on the Khorol, has an ecclesiastical seminary and several other educational institutions, and carries on an active general trade. Pop. 7485.

Mir'iam, the sister of Moses, was, according to Josephus, the wife of Hur and the grandmother of Bezaleel, who built the tabernacle. Her name is the Hebrew form of Mary, and in the Arabic traditions she is often confounded with the Virgin Mary.

Mirkhond′, one of the most celebrated Persian historians, b. at Nishapur in 1433; d. at Herat in July, 1498. His great work, fantastically entitled *The Garden of Purity, containing the History of Prophets, Kings, and Caliphs*, gives the history of the world from the Creation nearly to his own times. Many MSS. of this work are found in the libraries of London, Paris, Berlin, and Vienna. Portions of it have been edited by Jaubert, Genisch, Mitscherlich, Wilken, and Vullers; translated into French by Silvestre de Sacy, Jourdain, Langles, and Defrémery; into Latin and German by numerous authors; and into English by David Shea (1832) and W. H. Morley (1848).

Mirrors [Lat. *mirari*, to "admire;" Fr. *miroir*]. Solids, usually in the form of plates having a smooth surface capable of reflecting light, have been a part of the furniture of the toilet from a period of very high antiquity. The earliest mirrors were formed of polished mineral substances or of metals, but after the invention of glass that substance naturally superseded most others in the construction of mirrors. It appears that the backs of glass mirrors were sometimes coated with lead, but about three centuries ago the process of covering glass with an amalgam of mercury and tin came into use in Venice, and has been since employed down to the present time. The process, substantially the same now as when first introduced, consists in spreading out upon a solid horizontal table a sheet of tinfoil, which is first rubbed and afterwards covered to a sensible depth with mercury, so that the superior surface may remain liquid. The mercury is prevented from flowing by means of slight ledges placed around the sheet. After having been scrupulously cleaned on its lower surface the glass to be coated is advanced horizontally along the layer of mercury, its lower edge being depressed below the surface, so as to exclude air and to remove impurities. When in proper position it is left resting on the mercury, and by tilting the table the superfluous fluid is allowed to flow off, being caught in a trough provided for the purpose at the margin of the table. A uniform pressure is then applied to the glass, and it is allowed to remain for some time in this condition, after which it is carefully lifted, the amalgam adhering to it, and is placed with the amalgamated surface uppermost. Some weeks' rest is required to allow the amalgam to harden, though it occasionally occurs that a mirror will not "dry" for months.

The preparation of mirrors by quicksilver is objectionable on many accounts, the principal of which is the injurious effect of the vapors on the health of the workmen. Quicksilvered mirrors are also liable to various faults, such as a flowing of the mercury in drops, carrying the amalgam with it, forming streaks (known as worms); also a crystallizing of the amalgam when exposed to light (called blindness). These disadvantages of the quicksilvering process have turned the attention of manufacturers to the use of pure silver for backing mirrors. Von Liebig in 1836 was the first to notice that aldehyde would reduce silver from ammoniacal solutions, depositing it upon glass or porcelain in a continuous film. Subsequently, other chemists proposed other reducing agents. The first application of the process on a large scale was made by Drayton, who patented it at Brighton, England, Nov. 25, 1843. He used different essential oils as reducing agents. But his glasses were used only for a short time; they soon became spotted. The next attempt was made by Petitjean, who obtained a patent in 1855; and this seems to have been more successful, his process with slight modifications being still in use. The materials and proportions required by one of the various modifications of Petitjean's process, used on large plates, are as follows: (1) 1 pound crystallized nitrate of silver to be treated, while stirring, with 12 liquid ounces of ammonia 26° B. After cooling and crystallization, 6½ pints distilled water are to be added, and the solution filtered. This solution will keep for any length of time. (2) The reducing solution is to consist of pure crystallized tartaric acid dissolved in four parts of water; and this is said to improve with age. Another process, which originated with Prof. Bothe, and has been modified by Dr. Boettger, is used on small glasses, and requires the following materials and proportions: ⅒th of an ounce of Rochelle salts (tartrate of soda and potash), dissolved in 1½ quarts distilled water, is brought to a state of active ebullition, and 1 ounce of an aqueous solution of nitrate of silver (⅛) is added. This is the reducing solution, and contains what is called by its discoverer oxytartaric acid. The silver solution is prepared by dissolving ⅛th of an ounce of crystallized nitrate of silver in 1 ounce of distilled water, and treating with ammonia until the precipitated oxide is nearly redissolved. This is diluted with ¾ths of a pint of water, and filtered. The two solutions being mixed in equal volumes, a precipitation of silver takes place very quickly in the cold, and a complete and beautiful mirror is formed in thirty minutes. The process is much employed for the mirrors of optical instruments.

The advantages claimed for the silver over the quicksilver process are: (1) Harmlessness to the workmen; (2) facility and expedition, the whole operation being completed in a few hours; (3) possibility of repairing damaged parts; and (4) superior power of reflection. A silver mirror reflects about 20 per cent. more light than one of quicksilver, and reflects objects more truly in their natural colors. But the durability of silver mirrors is still an open question. They are all liable, after a time, to become spotted, and unless this difficulty be overcome it is hardly probable that the silver process will ever completely supersede the quicksilver. (For the optical properties of mirrors see REFLECTION.) C. F. CHANDLER.

Mirzapoor′, town of British India, the capital of a district of the same name, on the right bank of the Ganges. The district of Mirzapoor, comprising an area of 5235 square miles, with 1,104,315 inhabitants, extends along the Ganges and the Sone between lat. 23° 50′ and 25° 30′ N., and between lon. 82° 11′ and 83° 39′ E., and belongs to the presidency of Agra. The city of Mirzapoor is a very busy and lively place, the most important cotton-market of India, with an extensive industry in cottons, woollens, and silks. From the river it looks very magnificent with its flights of marble steps leading from the temples down to the waters, but the interior consists mostly of mud huts. There are, however, many fine European residences. About 4000 persons are employed in the manufacture of shellac. Brass-ware and carpets of a very fine description are also made. Pop. 79,526.

Miscegenation. See MIXED RACES.

Misdemeanor. See CRIME, FELONY.

Misere′re [Lat., "have mercy"], the name applied in the Roman Catholic Church to Psalm li., from the first word of the Vulgate translation. This psalm is in great use on all penitential occasions, and especially on Wednesday, Thursday, and Friday of Holy Week, at the close of the office of the *Tenebræ*. Eminent musicians have composed "misereres;" the music by Allegri is annually sung on Good Friday evening in the Sistine Chapel at Rome.

Mishawa′ka, R. R. junction, St. Joseph co., Ind. (see map of Indiana, ref. 1–E, for location of county), 4 miles E. of South Bend, has waterworks, fine water-power, manufactures of wagons, carriages, windmills, brushes, furniture, ploughs and agricultural tools, barrels, flour, woollen goods, etc. Pop. in 1870, 2617; in 1880, 2640.

Mishna. See TALMUD, by SAMUEL ADLER.

Misilmèri [Arab. *Michelmir*], town of Sicily, province of Palermo, about 8 miles from the city of Palermo. Near this town are the ruins of a grand old castle. Marble of a very superior quality, especially that called red jasper, is quarried in the neighborhood. Pop. 7380.

Miskolcz′, town of Hungary, situated on the Szinva, in a beautiful and fertile valley which produces the finest wheat in the country. The town has many good educational institutions, a considerable trade in corn and wine, and some manufactures of snuff, porcelain, boots and shoes, and leather-wares in general. Pop. 24,319.

Mispick′el [Ger.], a mineral crystallizing in the trimetric system, and composed of iron 33.54 per cent., arsenic 33.42 per cent., sulphur 21.08 per cent. In color it is silver-white to steel-gray, with a grayish-black streak; hardness, 5.5 to 6. It occurs principally in crystalline rocks, especially associated with ores of silver, tin, lead, and zinc. It frequently forms a troublesome impurity, but has been largely used in Cornwall, England, for the manufacture of white arsenic. EDWARD C. H. DAY.

Misrepresenta′tion, a false or erroneous statement or representation, whether made from ignorance, carelessness, mistake, or with an intention to deceive or defraud. The subject of fraudulent misrepresentation is of great importance in law, it being a general principle that fraud has the effect to render voidable every contract and transaction into which it enters as a constituent element. But the legal rules and principles upon this subject have been already sufficiently stated under the topic FRAUD (which see). Mere innocent misrepresentation, also, made without knowledge of the falsity of the statement, may afford ground for the rescission of a contract when it has caused one or both of the parties to enter into the agreement under a mistake of fact which is subsequently discovered. When the mistake or misapprehension relates to the substance of the whole consideration, as if there is a complete difference in substance between the thing bargained for and that obtained, so as to constitute a failure of consideration, the promise resting upon it is not obligatory and will not be enforceable, or if it has been carried out may under appropriate circumstances be rescinded by a court of equity. An innocent misstatement as to material matters of fact in reference to which the parties are bargaining or negotiating prevents in reality the formation of a valid contract, since there is no mutuality of assent on their part, which is essential that their stipulations may be binding. But if the misrepresentation honestly made is immaterial in influencing the stipulations of the parties, or if the party who seeks to be relieved from the consequences of acting upon the statement was aware of its falsity when it was made, the contract into which they enter will not be rescinded or annulled. But no innocent misstatement, although it may deceive the person to whom it is made, and cause him injury or loss in consequence of his acting upon the faith of it, will afford a cause of action in tort and entitle the party injured to recover damages for the loss he has sustained. This form of remedy is only available when the representation resulting in damage has been fraudulently made. (For misrepresentation in the law of insurance see INSURANCE.)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Mis'sal [Lat. *liber missalis*, or *missale*, "mass-book"], the service-book of the Roman Catholic Church, a volume containing the prayers, hymns, etc. used in the performance of the mass. There are several missals in use. Each of the Eastern rites has one or more peculiar liturgical services, and in the Latin rite, up to the time of the Council of Trent, there were many variations in the celebration of the mass; but the council fixed the present Roman missal as the standard liturgy, permitting, however, a few local liturgies to be retained, but at present the Roman missal is almost universally employed. The earliest specimens of this kind of books were the so-called *Libri Sacramentorum*, or *Sacramentaria*, which date back to the time of Gelasius I. The missal, such as it was finally fixed for the Roman Catholic Church by the Council of Trent, is nothing but a revision of those *Libri Sacramentorum*. Editions of the missal in the original Latin have often been printed; as, for instance, in Paris 1739 and Berlin 1841.

Missions [Lat. *missio*, from *mittere*, to "send"]. Christian missions are founded on the command of Christ to publish the gospel in all the world. The apostles and their associates acted on this command, and imperial Rome, in less than three centuries, raised the standard of the cross. From that time to the Reformation efforts to diffuse a knowledge of the Christian religion form so much a part of ecclesiastical history that it will suffice here merely to advert to some of the more important of them. (1) The Nestorian missions to Central and Eastern Asia, begun in the fourth century, and extending—it may be with protracted interruptions—through several centuries. (See Asseman's *Bibliotheca Orientalis Clementino-Vaticana;* Mosheim's *Historia Tartarorum Ecclesiastica;* and Neander's *History.*) (2) The Irish missions, between the fifth and ninth centuries. Ireland being the remotest of European islands then known, with England and Scotland serving as ramparts against the Goths, Huns, and Northmen, was a refuge for the Church in an unsettled period of the nominally Christian world, and for ages was a fountain of scriptural instruction and scholarship in the intellectual night following the downfall of the Roman empire. The seed of the Lutheran Reformation was sowed in Germany by Irish missionaries. (See Neander's *History;* Dr. James Todd's *St. Patrick;* and a chapter on "Irish Missions" in Anderson's *Relations and Claims of Foreign Missions.*) (3) Another of the more interesting missions in the early ages was the one from Rome to the Anglo-Saxons of England at the close of the sixth century.

The Reformation of the sixteenth century is the grand epoch for both Roman Catholic and Protestant missions, since both may be said to have had their rise in events growing out of the Reformation.

The most remarkable period of the *Roman Catholic missions* was the sixteenth and seventeenth centuries. And there can be no doubt that the Church of Rome prosecuted missions, during those centuries and part of the eighteenth, on a scale exceeding anything yet witnessed in the Protestant Church. They had a grand stimulating and sustaining influence in the hearty co-operation of the French, Portuguese, and Spanish kingdoms, then in the height of their prosperity. Rome had a mission in India for the space of two centuries and a half; another in China, for 144 years; another in Japan, for nearly 100 years; another in the African kingdom of Congo, for more than 200 years; another in Paraguay, for 117 years; and she has maintained her present ascendency in the Philippine Islands for more than two centuries. The Jesuit missions among the native tribes of the American continent, both North and South, have had a wide extension.

At the opening of the present century Portugal and Spain had become, in a measure, paralyzed, and France was otherwise fully occupied; and these missions then had more or less the aspect of failure. But several of them have since been revived, and the papal Church has a large force now in the field.

The Roman Catholics have a distinct organization for missions, a department by itself. The Propaganda is a missionary society, and has charge of everything relating to the preservation of the Catholic faith in the different parts of the world. "It sends missions, assigns the several missions to the religious corporations devoted to the apostolate, presents to the Holy Father nominations to the bishoprics, vicarates, and prefectures apostolic, and settles all difficulties with regard to the spiritual and temporal administration of the missions." The receipts of the Propaganda in 1874 were $1,100,000, of which considerably more than half was contributed in France.

Below are the names of the principal *Protestant* missionary societies and the annual income available for their foreign work—generally as reported in the year 1883 or 1884. In the case of a few of the societies the funds are expended on domestic as well as on foreign missions.

Time of formation.	*In Great Britain.*	Annual receipts.
1701.	Society for Propagating the Gospel	$547,860
1792.	Baptist Missionary Society	298,915
1795.	London Missionary Society	512,815
1800.	Church Missionary Society	1,036,435
1809.	London Jews' Society	185,279
1816.	General Baptist Missionary Society	40,581
1817.	Wesleyan Missionary Society	758,787
1824.	Church of Scotland	134,266
1840.	Irish Presbyterian Church	34,133
1840.	Welsh Calvinistic Methodist	32,980
1843.	Free Church of Scotland	332,780
1844.	English Presbyterian Church	51,085
1844.	South American Missionary Society	58,195
1847.	United Presbyterian Church	198,620
1860.	Primitive Methodist Missionary Society	176,128
1860.	United Methodist Free Church	86,625
1860.	Methodist New Connection	28,139
1866.	China Inland Mission	56,168
		$4,569,791
	American Societies.	
1810.	American Board of Com. for For. Missions	$590,995
1814.	American Baptist Missionary Union	342,443
1819.	Methodist Episcopal Missionary Society *	410,000
1821.	Protestant Episcopal Board of Missions	158,930
1832.	Board of the Reformed Church	70,955
1833.	Free-will Baptist Foreign Missionary Society	23,838
1833.	Presbyterian Board of Foreign Missions	693,122
1837.	Evangelical Lutheran Missionary Society	34,724
1844.	Board of Ref. Presbyterian Church	16,422
1844.	Board of United Presbyterian Church	102,975
1845.	Southern Baptist Board	56,805
1845.	Baptist Free Missions	23,838
1845.	Methodist Episcopal Church, South †	160,273
1853.	United Brethren Church	60,100
1853.	Southern Presbyterian Church	70,167
	Evangelical Association	17,303
	Disciples of Christ	35,869
	Baptists of Canada	23,878
	Presbyterian Church of Canada	56,429
		$2,949,066
	Societies in Continental Europe.	
1732.	Moravian Missionary Society	$98,930
1797.	Netherlands Missionary Society	40,000
1816.	Bâle Evangelical Mission	234,180
	Leipsic Missionary Society	53,560
1822.	Paris Evangelical Society	61,983
1828.	Rhenish Missionary Society	95,000
1833.	Berlin Missionary Society	71,195
1836.	North German Missionary Society	23,500
1842.	Norwegian Missionary Society	55,000
1852.	Hermansburg Missionary Society	72,000
1858.	Netherlands Missionary Society	12,000
1860.	Danish Missionary Society	7,500
1860.	Utrecht Missionary Society	17,500
		$844,148
	Total	$8,355,005

It will be observed that only two of these societies date farther back than 1792. The oldest is the English Society for the Propagation of the Gospel, and the Moravians come next. Prior to these was the mission sent by Gustavus Vasa, king of Sweden, to Lapland in 1559. In 1705, Frederick IV., king of Denmark, sent a mission to the coast of Coromandel in the East Indies. This mission, with pecuniary aid from England, was conducted by men generally of great longevity, some of them distinguished for character and usefulness. This uprising of so many churches is the more remarkable when it is considered that contemporaneous with it was the opening to their efforts of a very large portion of the heathen world. Thus, India, with its 250,000,000, was opened to Christian missions by an act of the British Parliament in the year 1813. China opened its five principal ports in 1842, and in 1858 its 400,000,000 were thrown open by a treaty with England,

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* Six-elevenths of entire receipts. † Entire receipts.

France, Russia, and the U. S. And so was Japan, with its 30,000,000, within the past few years, by treaties with Christian powers. Turkey was made available to Protestant missions chiefly by means of the care of England for the safety of its valuable possessions in India. Turkey lay on its route thither, and France and Russia were not far off. She therefore kept her ablest diplomatists at the Porte; and the war with Egypt in 1840, with Russia in 1855 (called the Crimean war), and with Persia in 1856, grew more or less out of care for its Indian empire. Moreover, as Russia claimed the right of protecting Greek Christians in Turkey, and France of protecting the Roman Catholics, England claimed the right of protecting the Protestant Christians, then multiplying in these regions. Without such protection neither Turkey nor Persia would have been really open to Protestant missionaries. One thing more was needed. The death-penalty in Mohammedan law for abjuring the Moslem faith was virtually abolished through the efforts of Lord Stratford de Redcliffe, and native Christians in the empire, of every name, were recognized by the sultan as a distinct body, entitled to protection in their persons and religious privileges. All this was mainly owing to the fact, under God, that England had an empire in India.

The earliest of the modern Protestant missions was sent from Geneva to Brazil in 1556–57. Next in order was the mission to Lapland in 1559 by Gustavus Vasa, king of Sweden. The Dutch missions in Ceylon and the Indian Archipelago grew out of the Dutch conquests early in the seventeenth century. The charter granted by Charles I. in 1628 to the Massachusetts colony expressed the hope that the colony would "win the natives of the country to the knowledge and obedience of the true God and Saviour of mankind," and the colonial seal had the device of an Indian upon it, with a label in his mouth containing the words, "Come over and help us." John Eliot began his labors among the Indians of Massachusetts in Oct., 1646, and continued them until his death in 1690 at the age of eighty-five. He translated the Bible into the language of the Indians, and 3500 copies were printed at Cambridge in 1663 and 1685. Only a few copies are now known to exist. Thomas Mayhew was really the first missionary to the Indians, having begun his labors on Martha's Vineyard as early as 1643; and the Mayhew family supplied missionaries for Martha's Vineyard and Nantucket during five generations, until 1803. Eliot had worthy co-laborers and successors, and in 1675 there were twenty-four regular congregations of "praying Indians," and as many Indian preachers. King Philip's war was a blow to the missions from which they never wholly recovered. Twenty years later there were thirty Indian churches in Massachusetts. The well-known mission of David Brainerd was commenced in 1743. The war of the Revolution had the effect to unsettle, for a long time, the relations between the Indians and the whites.

The number of Indians in the territory of the U. S. at the opening of the present century is supposed to have exceeded 400,000, and Bancroft, in the third volume of his *History*, states the number E. of the Mississippi River, before the removal westward of the Cherokee and other tribes, at 180,000. Divided and scattered over a vast wilderness, the aborigines were easily forgotten, and the spirit of Eliot, the Mayhews, and Brainerd slept for a long time. Yet it is doubtful whether many instances are on record in the history of the Church since the apostolic age in which the same amount of labor and expense was more successfully employed in the conversion of heathens than resulted from the labors of those men. Where the Indians have been protected in their homes, property, and rights they have generally been found among the more impressible of the pagans. The missions to the Cherokees and Choctaws between the years 1817 and 1860 furnish materials for an interesting history. The Rev. Cyrus Kingsbury began his mission among the Cherokees in 1817, and the first station received the name of Brainerd. Mr. Monroe, President of the U. S., unexpectedly visited this station with Gen. Gaines in 1819, and left substantial evidence that he was pleased with what he saw. The Choctaws having expressed a desire for a mission, Mr. Kingsbury was transferred to them in 1818, and called his first station Eliot. It was 400 miles S. W. of Brainerd. So much interested were the Choctaws that they devoted generous sums from their annuities to the schools, and one of their official letters relating to these grants expressed an earnest hope of their "taking a place among the enlightened nations of the land."

There is not space for even a condensed history of these missions, nor of those to the Chickasaws, Creeks, Seminoles, Osages, Dakotas (or Sioux), Ojibwas, Ottawas, Iroquois, or others on this side of the Rocky Mountains, nor to the Cayuses, Walla-Wallas, Nez Percés, and others beyond those mountains. Each had its mission and its history—some portion of it tragical, but more a matter for grateful recollection. There are not the means of stating the aggregate cost of the Indian missions to all the societies. The three largest will be specified. That of the Presbyterian Board of Foreign Missions was $886,156, of which $419,856 was from the U. S. government towards the expenses of Indian schools. That of the American Baptist Board of Missions was $357,967, of which $173,167 was from the government. That of the American Board of Foreign Missions exceeded $1,100,000, not including receipts from the government, and the aggregate number of the laborers of this board among the Indians, male and female, was more than 500.

About the year 1825 a half-breed Cherokee, named George Guess, who could neither write nor speak English, but knew that a mark could be made to represent a sound, set himself to gather the number of distinct syllables in the Cherokee language, and found them to be eighty-six. With the English letters and modifications of them, and some characters of his own, he made out an alphabet for the language. The whole was so simple that in three or four years half the nation was able to read, and was actually reading a portion of the New Testament translated into their language and printed with this syllabic type. It appeared, however, that the Cherokees within the limits of Georgia were living upon a volcano. The white man desired their lands, and resolved to have them. As the result, in the summer of 1838, 16,000 Cherokee men, women, and children were assembled at Brainerd by a military force, and from thence, though under the lead of their own rulers, they removed to territory which had been assigned them beyond the Mississippi. Being ten months on the way, including a winter, more than 4000 died as a consequence of what was inevitable in such a removal. The Choctaws made the change under less constraint and with less of suffering. The missionaries followed and resumed their labors, though with impaired success, but were helped by the incoming of Baptists, Moravians, and Methodists. In the year 1860 both nations had claims, considering their circumstances, to be regarded as Christian nations; so, also, had the Seneca nation within the State of New York.

The Dakotas (or Sioux) have since attracted much attention. They were among the most powerful tribes on the continent, numbering probably from 30,000 to 40,000, and traversing vast hunting-grounds. A mission was commenced among them in 1835, and there were early successes, with occasional trials from drunken, thieving war-parties. At length, when the great civil struggle came on between the North and the South, the heathen portion of the Dakotas, hoping for success and stimulated by their medicine-men and war-prophets, attempted to regain their hunting-grounds by the massacre of every white; and they actually murdered some hundreds of persons. A large body of U. S. troops pushed up the Minnesota Valley and routed the Indians, scattering them to the W. and N. Four or five hundred Dakotas were taken captive or surrendered, and were on the verge of severe treatment when Pres. Lincoln directed that none be executed except such as were proved guilty of murder or rape. Thirty-eight were hung in one day; and it should be stated that only three of these could read, and none had ever attended a mission school. The surviving prisoners, broken and humbled, listened to instruction; and when they joined their families on the Missouri the professors of religion numbered several hundreds, and there are supposed to be at present ten or twelve Dakota churches, with a membership of over 1000.

A very summary view will now be taken of missions in other parts of the world. The fact of there being in the Turkish empire and Persia more than 100 ordained missionaries, 140 churches, 234 native pastors and preachers, over 500 stations and outstations, and from 9000 to 10,000 communicants, shows that a strong footing has been gained in the religious centres of the Greek, the Armenian, Bulgarian, Syriac, and Nestorian churches; not with a view to the subversion of those churches, but for the revival of scriptural knowledge and influence among them.

Passing into British India, and down through the 120,000,000 in the valley of the Ganges, we find a large number of important districts more or less occupied by different missionary societies, English, German, and American. The vast system of railways recently introduced into India has added immensely to the facility of evangelizing the country. The enterprise appears to have originated in the offer of the government to guaranty a certain percentage of profit to the companies building the roads, which embrace an extent of more than 5000 miles. Calcutta is now connected with Delhi by 1000 miles of railway; and the road proceeds thence, through Lahore, to Mooltan on the Indus. From Allahabad, 500 miles above Calcutta, it crosses the Deccan to Bombay, and thence to Madras. From Madras it crosses to the Malabar coast. Other routes, more or less completed, are from Madras, through Madura and Tinnevelly, to Travancore, and from Bombay to the mouth of the Indus. Thus, Bombay becomes the gateway through which the postal communications of Europe, America, and India must pass. And these railways, costing some hundreds of millions, are as important in a missionary point of view as they are in their relations to the social, civil, political, and commercial interests of India. Henceforward, Bombay, and not Calcutta or Madras, will be the great landing-place and point of departure for missionaries to India, saving immensely in travel, labor, time, expenditure, health, and life. Protestant missions in India, Burmah, and Ceylon are carried on by 40 missionary societies, in addition to local agencies, which employ 658 foreign missionaries and occupy 716 principal, besides many subordinate, stations. The following table shows the progress of the work at intervals of ten years, as reported to the Calcutta Conference, 1882:

	1851.	1861.	1871.	1881.
Chief mission stations	262	394	522	716
Foreign missionaries	373	537	548	658
Native ordained agents	29	185	381	574
Native lay-preachers	551	1,779	2,528	2,988
Communicants	17,306	47,274	78,494	145,097
Native Christian population	102,951	213,370	318,363	528,590
Pupils in mission schools, males	63,855	74,875	111,372	168,998
Pupils in mission schools females	13,995	21,024	31,580	65,761

The 25 mission-presses in India during the ten years between 1862 and 1872 issued 3410 new works, in thirty languages, and circulated 1,315,503 copies of books of Scripture, 2,375,040 school-books, and 8,375,120 Christian books and tracts. During the next ten years the five principal publication societies of Southern India issued 9,623,020 publications, chiefly in Tamil, Telûgû, Canarese, Malayalam, Urdu, and Mahratti. The greatest apparent local successes have been among the peasantry S. of Calcutta, and among the Coles, Telûgûs, Shanars, and Karens.

Mission work in Japan began with the opening of four ports to foreign commerce and permanent residence in 1859. Eighteen societies are represented there, and in 1883 there were said to be 6598 communicants. The statistics for 1882 report 89 ordained missionaries, at 37 stations and 83 outstations, 49 native pastors and 100 assistant pastors and catechists, and 93 churches, of which 21 received no foreign aid. The contributions of the natives for church purposes in the year were 12,064 yen. Some beginnings were made in China early in this century, but with little progress until after 1830. In 1884 there were in China 259 ordained missionaries, representing 26 different societies of the U. S., Great Britain, and the Continent. The whole number of foreigners engaged in the evangelization of China, including laymen and women, is not far from 650. The statistics for 1877 report 92 stations and 532 outstations, 73 native pastors and 519 assistant preachers, 318 churches (of which 18 were wholly and 264 partly self-supporting), 246 church buildings for worship and 457 chapels and preaching-places, and 13,515 communicants. The contributions of native Christians in 1876 were $9571.

The islands of the Pacific have been largely Christianized. It would be difficult to find a professed idolater in the islands of Eastern or Central Polynesia where Christian missions had been established. The Sandwich Islanders have been recognized as a Christian nation since 1863, and even longer. The Cherokee Indians were thus recognized in 1860, and the Choctaws were not far behind them. Still more recently, tens of thousands in Madagascar have surprised the world by embracing the Christian faith after a persecution of twenty-five years not exceeded in severity by any of the persecutions in primitive ages.

The shortness of the time should be considered since the oldest of the foreign missions now under consideration began to operate. Many persons are living who remember when there was no missionary in Turkey; when missionaries were excluded from the greater part of India; when no missionaries were in Burmah, none in China, none in the Indian Archipelago, none in Africa, except Sierra Leone and the southern extremity of the continent, and none in the great island-world of the Pacific Ocean, except a small group in the south.

According to tables printed in the *Missionary Review*, the number of Protestant ordained missionaries laboring in pagan, Mohammedan, and nominally Christian countries in 1882 was 2829; of laymen, 608; of female missionaries, 2013; of native pastors, preachers, and catechists, 24,929; and of native communicants, 618,657. The copies of the Holy Scriptures issued by Bible societies since 1804 exceed 180,000,000, and they have been translated, printed, and distributed, in whole or in part, in 277 languages and dialects. The receipts of the Protestant missionary societies in one year have been previously stated at $8,355.005. The ordained missionaries are already outnumbered by the native pastors and preachers, and the gospel is taking root in thousands of places beyond the bounds of Christendom. Persecution cannot arrest this work. It would rather stimulate its progress. Nor will the wars of Christendom. Missions had their rise when Christendom was in arms. In no way can their progress be materially arrested, except by a general decline in the evangelic spirit among the churches; and it is undoubtedly true that the missions themselves, vigorously prosecuted, will ensure against the possibility of such a decline.

Literature.—Full details of missionary work may be found in monthly magazines which are issued by most of the societies, and in their annual reports. Dr. Rufus Anderson, between 1864 and 1874, published several volumes containing histories of particular missions: Dr. J. M. Reid, in 1879, *Missions and Missionary Society of the Methodist Episcopal Church;* Dr. A. C. Thompson, in 1882, *Moravian Missions.* Christlieb's paper on *Protestant Foreign Missions*, presented to the Evangelical Alliance at Basle, 1879, has been republished in English, French, and Dutch. *The Ely Volume*, Dr. Thomas Laurie (1881), exhibits "the contributions of foreign missions to science and human well-being." Essays and discussions on missions may be found in the published records of conferences held at Allahabad 1872, Shanghai 1877, Mildmay, London, 1878, Calcutta 1882, and Osaka, Japan, 1883. Grundemann's *Allgemeiner Mission Atlas* and the *Church Missionary Atlas* (6th ed. 1879) are worthy of mention.

RUFUS ANDERSON,
REVISED BY E. W. GILMAN.

Missisquoi River rises in Orleans co., Vt., makes a détour northward into Canada, and, returning to Vermont, falls at last into Missisquoi Bay, the N. E. portion of Lake Champlain.

Mississa'gas, an Algonkin tribe which resided, when first brought into notice about 1650, on the N. shore of Lake Huron, at the mouth of a river of the same name. They were allies of the Hurons, upon whose dispersion by the Iroquois in 1648 they fled to Lake Superior, but returned a few years later, when Catholic missionaries labored among them with indifferent success. Subsequently, they were engaged in hostilities with the Sioux, and made treaties with the Iroquois, by virtue of which they settled along the N. of Lakes Erie and Ontario; were adopted in 1746 as a seventh nation into the Iroquois confederacy; were allies of the English in the first French war 1743–48, of the French in the second or Seven Years' war, and again of the English in the war against Pontiac in 1763; joined the Miami confederacy against the U. S. 1792–93, and aided the Canadian forces in the war of 1812. At one time they had a settlement on the present site of Erie, Pa., but are now found only at four villages in Ontario—at Rice and Scugog lakes, Alnwick, and Grand River—and numbered in 1873 about 700. Protestant missions have been maintained among them for half a century; most of them have embraced Christianity, practise agriculture, live in comfortable houses, and have received an English education.

Mississip'pi, a S. W. State of the U. S. (see map of Ark., Miss., and La., in article ARKANSAS), in the Miss. Valley, bounded W. by Ark. and La., E. by Ala., N. by Tenn., and for 108 miles the 31st degree of N. lat. forms the boundary on the S., separating it from East Louisiana, leaving to the eastward a strip of territory 78 miles broad, stretching down to the Gulf and Mississippi Sound, and

THE GREAT SEAL OF THE STATE OF MISSISSIPPI

Seal of Mississippi.

including all islands within 6 leagues of shore-line: area, 46,810 square miles, or 29,958,400 acres.

Mississippi, by census of 1880, ranked 18 among the States in population, 13 in value of agricultural products, and 35 in value of manufactures.

Topographical Features and Soil.—From the N. E. corner, where there is a marked limestone formation with a rugged country, the surface slopes gradually toward the Mississippi River and the Gulf of Mexico, leaving a broad low ridge running nearly N. and S. through the centre of the State, which divides the waters which fall into the Mississippi from the affluents of the Tombigbee, Pearl, and Pascagoula rivers. On the W. this ridge extends at Vicksburg to the Mississippi, terminating in bold high bluffs. To the E. of this watershed are broad tracts of gently-rolling prairies of exceeding fertility, yielding large crops of cotton and corn, while to the W. the surface is broken by a system of valleys and low, narrow ridges that start at right angles from the spinal ridge and drop off into the great basin of the Yazoo delta—a basin embracing some 4,000,000 acres, the very heart of the cotton-zone of Mississippi. On the central ridge there are large tracts of rolling arable land, either in cultivation or covered by heavy forests. About Pontotoc there is a considerable breadth of fair upland. In the S. stretches a rolling region of open pine-woods down to the Gulf shore. Thus the larger part of the State has a broken, rolling surface, but nowhere mountainous, or with ridges, at the highest, of greater elevation than 800 feet. The Yazoo basin is subject to overflow at times of extreme high water. The N. upland section is diversified by small valley-areas of highly productive soil. In the S. the soil is indifferent. Even the bottom-lands of the Big Black, Tallahatchie, and Yalobusha rivers, though covered by a luxuriant growth of trees and underbrush, are not productive under tillage, but on some of these streams there is found a bench or "second bottom" of exceeding richness. The prairie-region, on the other hand, found so productive in Lowndes and on the tributaries of the Tombigbee, prolonged S. and W. between the head-waters of Pearl and the Big Black rivers, comparatively loses its fertile character. Below the Yazoo delta, along the Mississippi, except where interrupted for short distances by bold bluffs, a broad belt of low thickly-timbered land of extreme fertility lines the river, but, like the Yazoo basin, is subject to overflow.

Rivers, etc.—The State is mainly drained by the Mississippi River and its affluents, the Homochitto, Big Black, Yazoo, and its tributaries the Sunflower and Tallahatchie; the Pearl River, with its principal branch the Bogue Chitto, and the Pascagoula, with the Chickasawha, and other tributaries, drain the S. E., and the Tombigbee and its affluents drain the E. In the extreme N. E. the Tennessee River forms the boundary for 15 miles.

Geological and Mineralogical Features.—The small streams which fall into the Tennessee River in the N. E. corner of the State are bordered by massive walls of limestone. W. of this the Cretaceous formations crop out. W. of these, Tertiary formations prevail. The bottom-lands on the Mississippi, the Sunflower, and the Yazoo, and the tributaries of the latter, as well as the Gulf coast for about 30 miles back, belong to the Quaternary or alluvial era. To this era belongs the Orange sand, the most striking feature of the State's geology, for its presence on the surface is so general as to make its absence exceptional. It is chiefly made up of rounded, silicious sand, colored, and more or less indurated, by the hydrated peroxide of iron. On the Pontotoc ridge it is either of a glaring deep red, as in Itawamba co., or of a dull iron-rust color: in the region of the long-leaf pine it is of a delicate rose tint, and sometimes of a bright yellow, crimson, or purple; elsewhere it becomes white, and even bluish. With a large increment of iron, in some places the tendency is to concrete into a ferruginous sandstone, occasionally in such masses and solidity as to afford good building material. These indurations are generally found capping hills and ridges, some of which rise in steep isolated hillocks from the level surrounding country as high as 150 feet, forming curious landmarks which indicate the former surface-level. In some places these conglomerates are tubular, of singular regularity of dimension and mould, with the appearance of newly-made iron castings, often 4 to 5 feet in length, and with a bore from a quarter of an inch to 4 inches in diameter. Such hills are further crowned, generally, with clumps of the short-leaved pine, not visible elsewhere in the same vicinity. The average thickness of this Orange sand-stratum varies from 40 to 60 feet, but 100 is not at all infrequent, and it has been found as thick as 200 feet. The useful materials of this formation are the ferruginous sandstone, much of which can be used in rough masonry, and large beds of pipe-clay of great purity, and potter's and crucible clays. The Tertiary beds afford lignite or brown coal to some useful extent, mineral fertilizers of value and convenience, potter's and fire-brick clays, and limestone (rotten), chiefly for burning. The mineral deposits of Mississippi are relatively of small consideration, however, in the sum of its natural advantages. Waters of decided mineral and medicinal character are of wide occurrence, such as alkaline and saline chalybeates, containing iron, lime, magnesia, and often soda. Of these medicinal springs that of Cooper's Wells is of highest repute.

Climate.—The summer season is long and hot, but generally healthy away from the low, dank bottom-lands of the watercourses. The winters, comparatively short, are damp and somewhat colder than in the same latitude on the Atlantic coast. At the same time, from October to June no climate can be more temperate and agreeable. The rainfall, averaging 64 inches at and near the coast, ranges between 44 and 56 inches for the greater part of the State, distributed throughout the year in the most favorable manner for the agriculture of the country.

Vegetation.—A large portion of Mississippi is yet covered with primitive forests. Over the Tertiary and a part of the Quaternary formation deciduous trees, and especially numerous species of oak, are the prevailing forest-trees. In the N. and central portions of the State the Spanish or red oak, the scarlet Spanish, the true black, or quercitron oak, the chestnut, willow, and water oaks abound on the lowlands and swamps: the rock-chestnut oak is found on ridges in the Yazoo bottom. The black-jack oak is found on poor soils, and occasionally, with the long-leaf pine, in better land. The other deciduous trees of the State are four species of hickory, black walnut, butternut, dogwood, black gum, sweet gum or liquidambar, beech, sycamore, cottonwood, *Magnolia grandiflora*, *M. acuminata* or cucumber tree, and *M. glauca* or sweet bay, red maple, ironwood, locust, black locust, papaw, black and white mulberry, alder, and cinquassia. Of evergreens, there are 4 or five species of pine—viz. the long-leaf, the short-leaf, the white, and the pitch or bottom pine, the cypress, and in the extreme S. the live-oak. Of fruits, there are several species of indigenous grapes, of which the muscadine (2 varieties) is decidedly the best; apples do well in the N. E., and grapes, peaches, quinces, pears, apricots, and plums nearly all over: while in the S. counties figs, oranges, lemons, olives, and bananas or plantains flourish.

Zoology.—Bears, foxes, wolves, wild-cats, the cougar or panther, the raccoon, opossum, and skunk, are found in wooded districts, and deer, as well as the smaller game—rabbits or hares, 7 species of squirrels, gophers, wood-rats, etc.—are plentiful; wild-turkeys, pigeons, quails, and mocking-birds, and in their season the rice-bird, and on the coast many species of wild-ducks, brant, and teal, are found in great numbers. Paroquets are seen as far N. as Natchez. Other birds of gay plumage or of melodious song are numerous, as are also many species of hawks, vultures, and gulls. The alligator is found in the bayous of the Mississippi as far as the mouth of the Arkansas River. Lizards and water-snakes abound in the swamps and bottom-lands. Rattlesnakes, moccasin snakes, as well as many of the harmless snakes, are common; the batrachians—frogs, horned frogs, toads, etc.—are plentiful. Mississippi Sound, the Mississippi, and the other rivers abound in fish, of which the most common are the giant catfish, pickerel, black bass, the buffalo-fish, and the usual fresh-water fish of more northern rivers. Excellent oysters and other shellfish are found in Mississippi Sound.

Agricultural Productions.—The most valuable crop is cotton, of which the production in 1879 (census 1880) was 963,111 bales, exceeding the cotton raised in any other State. Number of acres planted, 2,106,215. Rice crop, 1879, 1,718,951 pounds; Indian corn, 21,340,800 bushels; oats, 1,959,620 bushels; wheat, 218,890 bushels. The sugar-cane production yielded, in 1879, 18 hogsheads of sugar and 536,625 gallons of molasses.

*Farm Animals.**—Horses (census 1880), 112,309; mules, 129,778; cattle, 717,335; sheep, 287,694; swine, 1,151,818.

Manufacturing Industry.—Mississippi has comparatively few factories, her main interest being agriculture. No iron and steel products are returned by the census of 1880. There were employed in cotton manufactures 748 persons, running 704 looms, 26,172 spindles, and using 6411 bales of cotton.

Finances.—The assessed valuation of taxable property was, in 1879, real estate, $79,467,530; personal, $31,158,599; rate of State tax, 35 cents on $100, producing $444,326; total taxation, State and local, $2,384,375. The public debt of the State was $3,090,155, but school funds, etc. owned by the State on which interest only is to be paid reduce the net debt to $379,485. The total State and local indebtedness is $2,013,190 net.

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* On farms only.

Education.—Number of children of school-age (five to twenty-one years) in 1880, 426,689, of whom there were enrolled in public schools 237,065, with average attendance of 156,824. Total expenditure for public schools, $679,475, of which $653,351 was for teachers' salaries. Number of teachers, 5473. There are 4 colleges and universities with 35 instructors, 977 students, and $7100 receipts from tuition. The University of Mississippi and the college of agriculture and mechanics, with Alcorn University, are the principal colleges. In 1882, Mississippi had 116 newspapers and periodicals, 3 of which were daily.

COUNTIES.	* Ref.	Pop. 1870.	Pop. 1880.	COUNTY TOWNS.	Pop. 1880.
Adams	8–E	19,084	22,649	Natchez	7,058
Alcorn	3–H	10,431	14.272	Corinth	2,275
Amite	9–E	10,973	14,004	Liberty	426
Attala	6–G	14,776	19,988	Kosciusko	1,126
Benton	3–G	......	11,023	Ashland	174
Bolivar	5–E	9,732	18,652	Rosedale.	
Calhoun	5–G	10,561	13,492	Pittsborough	206
Carroll	5–F	21,047	17,795	Carrollton	394
Chickasaw	5–H	19,899	17,905	Houston	480
Choctaw	6–G	16,988	9,036	Chester	163
Claiborne	8–E	13,386	16,768	Port Gibson.	
Clarke	7–H	7,505	15,021	Quitman.	410
Clay	5–H	......	17,367	West Point	1,786
Coahoma	4–F	7,144	13,568	Friar's Point	676
Copiah	8–F	20,608	27,552	Hazlehurst	463
Covington	8–G	4,753	5,993	Williamsburg ‡	1,164
De Soto	3–F	32,021	22,924	Hernando	583
Franklin	8–E	7,498	9,729	Meadville †	1,791
Greene	9–H	2,038	3,194	Leakesville ‡	455
Grenada	5–G	10,571	12,071	Grenada	1,914
Hancock	10–G	4,239	6,439	Bay St. Louis	1,978
Harrison	9–H	5,795	7,895	Pass Christian	1,410
Hinds	7–F	30,488	43,958	Jackson Raymond	5,204 488
Holmes	6–F	19,370	27,164	Lexington	798
Issaquena	6–E	6,887	10,004	Mayersville	355
Itawamba	4–H	7,812	10,663	Fulton	249
Jackson	9–H	4,362	7,607	Scranton	1,052
Jasper	7–H	10,884	12,126	Paulding	229
Jefferson	8–E	13,848	17,314	Fayette	369
Jones	8–G	3,313	3,828	Ellisville	37
Kemper	6–H	12,920	15,719	De Kalb ‡	3,146
Lafayette	4–G	18,802	21,671	Oxford	1,534
Lauderdale	7–H	13,462	21.501	Meridian	4,008
Lawrence	8–F	6,720	9,420	Monticello.	
Leake	6–G	8,496	13,146	Carthage	285
Lee	4–H	15,955	20,470	Tupelo	1,008
Le Flore	5–F	......	10,246	Greenwood	308
Lincoln	8–F	10,184	13,547	Brookhaven	1,615
Lowndes	5–H	30,502	28,244	Columbus	3,955
Madison	6–F	20,948	25,866	Canton	2,083
Marion	9–G	4,211	6,901	Columbia ‡	1,659
Marshall	3–G	29,416	29,330	Holly Springs	2,370
Monroe	5–H	22,631	28,553	Aberdeen	2,339
Montgomery	5–G	......	13,348	Winona	1,204
Neshoba	6–H	7,439	8,741	Philadelphia	101
Newton	7–G	10,067	13,436	Decatur	47
Noxubee	6–H	20,905	29,874	Macon	2,074
Oktibbeha	5–H	14,891	15,978	Starkville	1,500
Panola	4–F	20,754	28,352	Sardis	986
Perry	9–H	2,694	3,427	Augusta	52
Pike	9–F	11,303	16,688	Magnolia	567
Pontotoc	4–G	12,525	13,858	Pontotoc	447
Prentiss	3–H	9,348	12,158	Booneville	603
Quitman	4–F	......	1,407	Belen.	
Rankin	7–F	12,977	16,752	Brandon	864
Scott	7–G	7,847	10,845	Forest.	
Sharkey	6–E	......	6,306	Rolling Fork	91
Simpson	8–G	5,718	8,008	Westville.	
Smith	7–G	7,126	8,088	Raleigh ‡	2,603
Sunflower	5–F	5,015	4,661	Indianola.	
Tallahatchie	5–F	7,852	10,926	Charleston	368
Tate	3–F	......	18,721	Senatobia	935
Tippah	3–H	20,727	12,867	Ripley	637
Tishomingo	3–H	7,350	8,774	Iuka	845
Tunica	4–F	5,358	8,461	Austin	252
Union	4–G	......	13,030	New Albany	250
Warren	7–E	26,769	31,238	Vicksburg	11,814
Washington	6–E	14,569	25,367	Greenville	2,191
Wayne	8–H	4,206	8,741	Waynesborough	156
† Webster	5–G	.....	9,534	Walthall	101
Wilkinson	9–E	12,705	17,815	Woodville	965
Winston	6–H	8,984	10,087	Louisville	418
Yalobusha	5–G	13,254	15,649	Coffeeville	749
Yazoo	6–F	17,279	33,845	Yazoo City	2,542
Total		827,922	1,131,597		

Railroads.—There were in Mississippi, in 1882, 1231 miles of railroads, costing $8,948,560, with net earnings of $401,628, and paying $277,321 interest on bonds, etc. Two or three of these roads are trunk lines.

Commerce.—The foreign exports of Mississippi in 1881 were $444,852 (direct), and the internal commerce by R. R. and by the Mississippi and other rivers is extensive.

Banks, etc.—There were in Mississippi in Oct., 1881, 17 State banks and trust companies, with capital of $675,293, and deposits of $1.311.167; national banks, none; private bankers, 11, with deposits of $833,326.

Churches.—The Baptist is the largest denomination, having 1530 churches and 146,185 members; the Methodist Episcopal Church South has 221 ministers and 51,702 members; Methodist Episcopal proper, 94 ministers, 26,251 members; colored Methodists, 250 churches, 13,060 members; Presbyterians, 180 churches, 7209 members; Cumberland Presbyterians, 122 churches, 3931 members; Roman Catholics, 41 churches, 25 priests; 8 other denominations have from 4 to 45 churches and from 100 to 2000 members each.

Population.—In 1860, 791,305: 1870, 827,922: 1880, 1,131,597 (white 479,398, colored 652,199, including 51 Chinese and 1857 Indians).

Principal Cities and Towns, Pop. 1880.—Vicksburg, 11,814: Natchez, 7058; Jackson (cap.), 5204; Meridian, 4008; Columbus, 3955; Yazoo City, 2542: Holly Springs, 2370: Aberdeen, 2339; Corinth, 2275; Greenville, 2191; Canton, 2083; Macon, 2074; Bay St. Louis, 1978; Grenada, 1914.

History.—The first European who is known to have traversed the soil of the present State of Mississippi was Fernando de Soto, who with his band of Spanish adventurers penetrated into what was known as the Chickasaw country in 1539, and remained in that part of the State now known as the Great Yazoo Bottoms for somewhat more than a year. In Apr. or June, 1541, he had reached the Mississippi River. A hundred and thirty-two years later, in 1673, Joliet and Marquette, two French explorers, passed down the Mississippi, and touched at several points within the present limits of the State. In 1682, De la Salle and the Chevalier de Tonti visited the Natchez Indians, and spent some time among them. The first attempt to establish a colony was made by Iberville, who in Mar., 1699, founded a colony of 200 immigrants from France on the eastern shore of the Bay of Biloxi. This was the first French colony in the lower Mississippi Valley, and was the germ of the subsequent settlement at New Orleans. Iberville returned to France, whence he sailed again for Louisiana, in the company of Bienville and the Chevalier de Tonti, with a large body of immigrants and a sufficient military force, and under the guidance of De Tonti ascended the Mississippi to the present site of Natchez, where (about 1716) they founded a fortress and established a colony, both named Rosalie, in honor of the countess of Pontchartrain. Biloxi was eventually abandoned, but Fort Rosalie prospered for a time, though this colony, with all the rest, came in 1718 under the control of the company formed by the notorious speculator John Law. After the bursting of the Louisiana Bubble, as it was called (during the existence of which Bienville, as governor of the province, had made attempts to plant colonies at St. Peter's (now Haynes's Bluff) on the Yazoo, at the Bay of St. Louis, at Pascagoula, and other points), the whole territory of Louisiana or Orleans fell into the hands of the Company of the Indies. Under their management the tendency was to concentrate population at New Orleans, and the small colonies in Mississippi grew but slowly. The Indians of this region were very numerous and powerful. The Chickasaws, a warlike tribe, had formed amicable relations with the English settlers in the Carolinas, and were hostile to their French neighbors; the Choctaws, at that time so numerous that they could bring 20,000 warriors into the field, had been, under Bienville's judicious management, friendly to the French; while the Natchez, a tribe of much higher civilization and intelligence, and probably of Aztec origin, were peaceful and cordial to the new-comers. These were the principal tribes, but there were small bands along the Gulf shore and the lower Mississippi, most of whom, judging from their names, may have been remnants of Aztec tribes. In 1728, Bienville's successor, Perrier, by bad management alienated the confidence of the Choctaws, who had hitherto been warm friends of the French, and a conspiracy followed in which all the Indian tribes united to drive out the French from the entire region. Their first attack was made on Fort Rosalie Nov. 29, 1729, and the other settlements in Mississippi were assaulted almost simultaneously. Many of the settlers were tortured and afterward butchered in the smaller settlements, and at Fort Rosalie 200 persons were killed and more than 500 made prisoners; but this triumph was short. The French commander of New Orleans, rallying his troops, pursued the Indians early in 1730, recaptured the prisoners, and, following the aborigines to their strongholds, after extensive slaughter and destruction of their property, brought 427 prisoners, among them several chiefs, to New Orleans, where they were sold as slaves and sent to Santo Domingo. The province was soon after abandoned by the Company of the Indies to the king of France, who sent Bienville back in 1733 as governor. On his arrival he found the colonists again involved in war with the Chickasaws—a war which lasted with varying fortunes for several years. From 1743 to 1752 the Indians were peaceful, but in 1752 another Indian war commenced, instigated, the French said, by English adventurers. An attempt was made by the French commander, the Marquis de Vaudreuil, to invade the Indian country, but he accomplished little. In 1763, E. Louisiana, including most of the present States of Mississippi and Alabama, was ceded to Great Britain by France, and soon after a considerable immigration commenced from the English colonies on the Atlantic. In 1798 the U. S., having succeeded to the rights of the English government in this region, established the Territory of Mississippi, comprising all of Alabama and Mississippi between the 31st and 35th parallels. In 1811 the portion of Mississippi below the 31st parallel, being a part of the land ceded by Spain, was added to the Territory. During the Indian war which preceded and accompanied the war of 1812, Mississippi was not the scene of any important conflict. In Mar., 1817, Alabama was set off from Mississippi Territory as a separate State, and in Dec., 1817, Mississippi was admitted into the Union as an independent State under a constitution previously formed. In 1832 a new constitution was adopted. The slave population of the State had been for thirty years in excess of the whites, and when Pres. Lincoln was elected in Nov., 1860, Mississippi, deeming her interests bound up with those of slavery, was one of the earliest of the Southern States to proclaim her secession from the Union. On the formation of the Confederacy, she supplied its first and only President. During the civil war she furnished with great promptness her quota of troops to the Confederate armies, and suffered severely from the ravages of war. The battle of Pittsburg Landing (or Shiloh) was fought near her border, and the pursuit was prolonged into her territory. Subsequently, the important battles of Iuka and Corinth, the capture and recapture of Holly Springs, the several attacks on Vicksburg, and the series of battles which terminated in the siege and final surrender of that city, the capture of Jackson, and the numerous raids which occurred, including the two which had Meridian for their objective, kept the State in a condition of apprehension throughout the war. At the close of the war, in Apr., 1865, measures were adopted by the legislature looking to the acceptance of the situation. The government appointed Hon. William L. Sharkey provisional governor, and a State convention was assembled which repealed the ordinance of secession and formally abolished slavery in the State. The State formed with Arkansas the fourth military district, placed under the command of Gen. E. O. C. Ord and others until 1869. A convention held in June, 1868, adopted a new constitution. The State was restored to the Union in Feb., 1870.

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* Reference for location of county. See map of Arkansas, Mississippi, and Louisiana in Vol. I., article ARKANSAS.

† Name changed since census of 1880, from Sumner.

‡ Township.

Governors.

TERRITORIAL.	
Winthrop Sargent	1798-1802
Wm. C. C. Claiborne	1802-05
Robert Williams	1805-09
David Holmes	1809-17
STATE.	
David Holmes	1817-19
George Poindexter	1819-21
Walter Leake.	1821-25
David Holmes	1825-27
Gerard C. Brandon	1827-31
Abraham M. Scott	1831-33
Hiram G. Runnels	1833-35
Charles Lynch	1835-37
Alexander G. McNutt	1837-41
Tilghman M. Tucker	1841-43
Albert G. Brown	1843-48
Joseph W. Matthews	1848-50
John A. Quitman	1850-51
John J. Guion (acting)	1851
James Whitfield	1851-52
Henry S. Foote	1852-54
John J. MacRae	1854-58
William McWillie	1858-60
John J. Pettus	1860-62
Jacob Thompson	1862-64
Charles Clarke	1864-65
W. L. Sharkey (prov'l)	1865-66
Benj. G. Humphreys	1866-70
James L. Alcorn	1870-71
Ridgley C. Powers	1871-74
Adelbert Ames	1874-76
John M. Stone	1876-82
Robert Lowry	1882-90

REVISED BY A. R. SPOFFORD.

Mississippi City, cap. of Harrison co., Miss. (see map of Mississippi, ref. 9–H, for location of county), 70 miles E. N. E. of New Orleans, on R. R. and on Mississippi Sound. Pop. in 1870, 252; in 1880, 265.

Mississippi River, the great river of North America. With its tributary, the Missouri, it is the longest river in the world. It was discovered by De Soto in 1541. In 1673, Marquette and Joliet descended it almost to its mouth, and, in 1682, La Salle passed through it to the Gulf of Mexico and took possession of the country in the name of the king of France. Its main tributary, the Missouri, is formed by the junction of the Madison, Gallatin, and Jefferson in the Rocky Mountains. The Wisdom River, a tributary of the Jefferson, has its source within a mile of that of Clark's Fork of the Columbia (lat. 44° 20′ N., lon. 112° 14′ W.). The Madison, the largest of these three tributaries, is called, by the Indians, Fire Hole River, because on each side of it are located the wonderful geysers of the Yellowstone Park. From the junction of the Madison the Missouri and Mississippi have a combined length of 4194 miles to the Gulf of Mexico. The length of the Lower Mississippi, from the mouth of the Missouri to the Gulf, is 1286 miles. The river is navigable for steamboats to the Great Falls, about 3786 miles from the Gulf of Mexico.

The Mississippi proper has its source at Lake Itasca, a beautiful sheet of clear water 1 to 3 miles wide and 7 miles long, lat. 47° 14′ N., lon. 95° 2′ W.; its surface is about 1575 feet above the sea. At the outlet of the lake the river is only 10 or 12 feet wide and 18 inches deep. It flows over little falls and rapids and through a series of small lakes and marshes until it reaches Lake Travers, its most northern point. From this it flows S. The first 25 miles is broken into a series of rapids and enters Cass Lake, which has an area of about 120 square miles; thence S. its course lies through prairies and lakes to the Falls of Peckagama, where it is contracted into a channel 25 yards in width. Here it falls 20 feet in 300 yards. Below these falls its width averages about 120 feet. These rapids interrupt its flow between Swan and Sandy Lake Rivers. The Savannah River enters the Sandy Lake and constitutes part of the canoe-route between the Mississippi and Lake Superior. From the outlet of Sandy Lake to Pine River, 100 miles, many rapids and islands occur. In this distance it receives a number of small tributaries, the Crow Wing being the largest above the Falls of St. Anthony. The Elk River, Little Falls, Big Falls, Prairie Rapids, and St. Francis rivers are passed, and finally the Falls of St. Anthony are reached. Here the river is precipitated over a perpendicular sandstone cliff 20 feet high. Including the rapids above and below the falls, the descent of the river is about 65 feet within less than a mile. From thence to the Gulf the distance by the river is 2200 miles. St. Anthony's Falls is the head of steamboat navigation, although many small vessels ply regularly above the falls during high water. In the vicinity of Dubuque it receives Fever River, and lower down the Maquoketa and Wabsepinicon. Below these the Rock Island Rapids occur, extending from Leclair to Davenport, a distance of 14 miles, in which the river falls 24 feet. Here it receives Rock River. The Iowa and Illinois are its chief tributaries below, after which it receives, at a point 20 miles above St. Louis, its mighty tributary the Missouri, by which its characteristics are totally changed. From a comparatively clear stream with a placid current it becomes, like the Missouri, a turbid, rapid, and mighty river, whose waters have at this point already traversed 1000 leagues before absorbing the transparent stream we have been tracing from Lake Itasca—miscalled the Mississippi, for it is simply a tributary of the parent-stream, whose source in the Rocky Mountains is so near that of its gigantic mate the Columbia, the waters of which flow to the Pacific. The next important tributary, the Ohio, is received 200 miles below the junction of the Missouri and the Upper Mississippi, after which the St. Francis, White, Arkansas, and Red rivers pour their vast volumes into its channel.

The whole drainage-area of the Mississippi is 1,246,000 square miles: the average rainfall is $30\frac{4}{5}$ inches. Its mean annual discharge has heretofore been reckoned at $21\frac{3}{10}$ trillion cubic feet; the recent and more careful measurements of the Mississippi River Commission, however, indicate that this has been largely underestimated. According to this authority, the maximum discharge of the river at Red River is estimated at 2,200,000 cubic feet per second. Only 1,200,000 cubic feet per second of this amount is shown by its measurements to be discharged through the main river 220 miles below Red River. The remaining hundred thousand cubic feet per second escapes in great part through the Atchafalaya, an outlet which occurs immediately below the mouth of Red River, and which during the past four or five years has enormously enlarged, the discharge through it in flood being estimated at 600,000 cubic feet per second. The remainder of the loss occurs in smaller outlets and through breaks in the levees below the mouth of Red River.

One of the most important physical characteristics of the river is the abundance of sedimentary matters carried in suspension in its waters. The various tributaries, flowing through different soils with different velocities, vary greatly in their sedimentary discharge. During high floods, when the volume of the main river is about 1,210,000 cubic feet per second, it is estimated that 2000 cubic feet of solid earth are held in suspension. The approximate annual discharge of this suspended sediment is estimated at 276,718,933 cubic yards, equivalent to a prism 1 mile square and 268 feet high.

The alluvial basin of the Mississippi extends from Commerce, Missouri, to the Gulf of Mexico. Its average width is 60 miles, and its length about 600. It contains about 34,000 square miles. At its upper end a spur of the Ozark Mountains has been cut through by the river, and through this gap, over a rocky bottom 8 or 10 miles long, it enters the alluvial basin 40 miles above Cairo; on the Ohio River the same spur has been cut through by that tributary. Throughout the entire basin, bounded by high lands on each side, there once undoubtedly existed an estuary of the Gulf of Mexico similar to the Rio de la Plata, with a gigantic waterfall over the Ozark spur. The floods of the Mississippi, being highly charged with sedimentary matters, have filled this ancient estuary with alluvial deposits. The upper end of this alluvial plain is 300 feet above the sea, toward which it has a comparatively regular inclination, being about 140 feet above the sea midway to the Gulf. Its surface is covered with extensive forests and vegetation. Through this plain the river flows in a tortuous channel about 1150 miles long. On each side, at irregular intervals, lie crescent-shaped lakes, which once constituted the main channel of the river. The immense quantity of solid matter transported by its flood-waters is chiefly held in suspension. During floods the quantity which the water carries increases and diminishes with the slightest change in the velocity of the current: therefore, whenever the floods escape over the banks, the loss of current in the escaping water causes the sandy or heavier portions of the solid matter to settle almost immediately on the submerged banks, while the argillaceous and lighter portions, which settle more slowly, are carried back by the feebler current to the lower lands, where they are deposited over much more extensive areas. These lighter matters constitute the blue- and yellow-colored clay strata which are found in all parts and at all depths of the basin. The river's shores, before being dyked, were by these overflows built up from 10 to 15 feet higher than the lands 1000 or 2000 yards back from the river.

As the volume or mass of the water flowing in a river constitutes one of the elements of its current, any loss of volume by these escapements of the flood-water results in a loss of velocity in the channel below such point of overflow. Therefore, deposits in the channel invariably occur below such places. These deposits raise the bottom of the stream. Thus, by these overflows, both the shores of the river and its bed were finally raised so much above the lands on either side that some important breach or crevasse occurred in one or other shore, and through it the whole river found a new channel through the lower lands; and over these this land-building was continued. The dyking —or, as it is called, "leveeing"—of the river of course stops this land-building process. Illustrations of it are not wanting, however, at this time, in the lower part of the basin where it is not dyked. Sixty miles above the mouth of the river its flood-surface is 7 or 8 feet higher than the mean level of the Gulf, and through this distance it flows to the sea between narrow banks that have been elevated by repeated overflows above the sea-level. From time to time the river has broken through these narrow embankments and found a steeper and shorter route to the salt water. Through such new route its heavily-laden waters bear immense quantities of sediment, which are deposited in the Gulf at the mouth of the outlet. About 36 miles about the river's mouth one of these outlets—known as "The Jump," or "Wilder's Bayou"—occurred about forty-five years ago. It has already formed about 100 square miles of sub-delta in the Gulf, and upon this, rice-plantations now exist, and on it are growing trees larger than a man's body. The gradual enlargement of the sub-delta thus formed causes bifurcations of the outlet, and the river-water reaches the sea through many channels, until, finally, these become so lengthened that their surface-slope fails to produce the velocity necessary to carry their sedimentary burdens to the sea even in flood-time. The heavier particles therefore fall at the upper entrance of the outlet, and it is finally closed up and cut off from the main river. In this way the river finally heals the wounds made in its side after building many square miles of territory beyond the gap. The Coast Survey charts of the territory adjacent to the passes show such a multitude of channels that have been thus separated from the river that they give to these charts a vermiculated appearance. When these channels become completely separated from the main river, the overflow water ceases to reach them, and they remain deep bayous of clear water for many years. During this land-building process such outlets were doubtless formed from time to time in the river's side throughout the entire 600 miles of the basin, by which its whole vast area has been filled and built up with deposits to its present height above the sea. Occasionally the conditions were such as to cause the entire stream to forsake its old channel, and in this way it was enabled to distribute its deposits throughout the whole width of the basin from bluff to bluff. Cut-offs and crevasses facilitated this distribution, while the continual elevation of the bed and the banks of the stream caused by the overflows gave it the ability to acquire a sufficient height above the adjacent lands to send its earthy matters many miles from its channel, while the unstable character of its bank enabled it to change its location from time to time, and thus to cover every part of the basin with its deposits. This natural process was, of course, incompatible with the use of this region by man. Levees restrain the floods within the defined channel of the river, and so long as they do this it is impossible for the river to elevate its banks or its bed. The popular error that the beds of streams are raised in consequence of dyking their sides has frequently been disproved. By concentrating the waters within the channel the dykes conserve its scouring-force and keep the channel deeper.

The repeated breaks in the present levees by which these floods are partially restrained have long been a source of disaster and anxiety to the people occupying the land, and many appeals have been made to the government to protect it against the floods. In 1858, under authority of Congress, an elaborate survey of this part of the river was made by Messrs. Humphreys and Abbott, U. S. A., and many important facts were collected and published by them regarding the phenomena. In generalizing upon these facts they, however, fell into several grave errors, which have been corrected by the Mississippi River Commission. (See its reports.) Humphreys and Abbott declare that their investigation proved that the river flowed over a bed of hard blue clay of much more ancient formation than the present deposits of the river, and through this the river was not able to erode. Hence they assumed that the dykes would cause the water to rise between them, and thus require them to be of great height. They declared that the quantity of sediment held in suspension by the water bore no relation whatever to the velocity of the current, and that deposits would not fall in the channel as a result of the loss of velocity by outlets. Hence, if a part of the floods were carried off by outlets to the sea, a lowering of the flood-line would occur. They thought outlets were correct in principle, but that no favorable location existed for their construction.

In 1874 a commission of four military engineers and one civilian was authorized by Congress for the purpose of determining the best means of preventing the overflow and for estimating the cost of such means. This commission in 1875, adopting these errors, recommended raising the present levees from 3 to 11 feet above the great flood of 1858, at an estimated cost of about $46,000,000. The writer soon after controverted the recommendations of this committee, and declared that by a proper system of improvement of the channel the flood-line would be so much lowered that the levees would finally become comparatively needless. This method was outlined by the writer in 1874 in a letter addressed to Senator Windom, of the U. S. Senate, at the time the question of the improvement of the mouth of the Mississippi was under consideration. It was afterward urged by him in several essays and by addresses delivered at the chief cities on the river and before several Congressional committees, and was finally adopted by Congress in 1880, for the improvement of the river throughout its alluvial basin. The work is now being carried out under a commission of engineers appointed under an act of Congress prepared by the writer. This plan is the first one ever applied to a river which recognizes an apparently insignificant phenomenon in silt-bearing streams, but which is the chief agent by which their most important phenomena are produced, such as shifting channels, cut-offs, caving banks, shoals, etc. This is the sensitive relation which exists between the quantity of matter carried in suspension in the water and the velocity of the current of the river, which was denied by Humphrey and Abbott, as above stated. The plan differs also from any other ever applied to a silt-bearing river of which the writer has knowledge in the fact that it consists in the correction of the *high-water* channel of the river.

The three controlling principles upon which this plan is based may here be stated: 1. The intimate relation existing between the velocity of the current and the quantity of sediment suspended in the water; 2. The descent of the water from a higher to a lower level, by which the current is created; 3. The friction of the river-bed, by which the current is resisted.

The fall or descent of a river is called its surface-slope or flood-line. Without slope of surface the current cannot exist. (The slope of the bottom is therefore not an element in the problem.) One end of the slope is fixed by the Gulf of Mexico; other points in it may be raised by natural or artificial causes. Friction of the bed increases and diminishes just in proportion as the surface in contact with the water increases and diminishes; thus, where the width is doubled the friction will be doubled. The slope is quite irregular, being much steeper where wide places and islands have increased the frictional resistance to the current. Here extensive deposits of sediment in the bed have been made by the river to acquire steeper slopes to produce the necessary velocity of current to transport its burden of sediment through these places. For instance, from the Gulf to Red River, 330 miles, the slope is 1.85 inches per mile; in the next 69 miles it is nearly twice as great, being 3.20 inches. Below Red River it is of comparatively uniform width, averaging about 4000 feet; above that point, to the upper end of the basin, its width is very irregular, extending in some places to 3 miles and embracing many islands.

The relation between the velocity of the current and the quantity of suspended matter which the water carries gives the river an ability which seems but little short of instinct to adjust its slope of surface to suit its needs. If we consider the 1150 miles of which we are treating as a grand trunk discharging the vast volume of sediment annually poured into it by the Missouri, Upper Mississippi, Ohio, St. Francis, Yazoo, White, Arkansas, and Red rivers, with their several great tributaries, it is plain that this trunk must discharge all this sediment into the sea, or some part of it must remain to clog its channels and so raise its flood-line. Conversely, if it discharges more than it receives, the excess must be taken out of its own bed, and its flood-line will then be lowered. A certain velocity of current must therefore be required to maintain its power of discharge, and this the river secures through the action of the sensitive relation existing between the current and its sedimentary burden. If, from any cause, the current be reduced too much at any part of the route, a portion of the sediment falls into the channel and continues to fall until it is built up, so that a steeper slope produces such velocity that further deposition ceases at that locality and the burden is carried on then without loss; but such steeper slope involves higher levees in the reaches above that locality to prevent overflow. On the other hand, if, from any cause, the current at any part of the route is too rapid for the river's needs, more sediment is taken up by the water from the river-bed at that place, and the channel grows deeper and deeper, until the slope is so lowered that a slower current results and the deepening ceases. A lower slope thus makes levees so much less necessary above such locality.

As volume is an important element of the current, it must be slower if a loss of volume occurs through an outlet, crevasse, or by overtopping the levees. Hence, by conserving all of the flood-waters we retain all of the scouring-force which nature gives us, and by utilizing it we not only deepen the channel for commerce, but we lower the flood-line for agriculture, and thus in effect lift above inundation a district as large as the State of Indiana and of incomparable fertility. In flood-time deposition instantly follows a checking of the current, because large particles of sand and gravel are carried in suspension by it. The water can act only upon their superficies, and these only increase with the *squares* of their diameters, while their solidity or weight increases with the *cubes* of their diameters. Hence, large particles require strong currents to keep them in suspension, and they are the first to fall with the slightest diminution of velocity.

Reasoning upon these facts, the writer thus briefly urged in *Van Nostrand's Magazine*, in 1878, the plan of improvement now being executed by the Mississippi River Commission: "If the quantity of suspended matter is regulated by the current, then it is entirely practicable to lower the flood-line or slope and deepen the channel by simply constructing light willow or brush dams during low water on the shoals, which are then dry, or nearly so, at the various wide places in the river where the bars always exist. In this way the high-water channel will be brought to a comparative uniformity of width by gradually encouraging from year to year the deposition of sediment over the wide expanses, and thus uniformity of width will produce uniformity of depth, which in turn will ensure uniformity of current; and this will practically stop the caving of the banks. Uniformity in the width of the high-water banks will do more, however, than all this, for it will lower the flood-line, and thus practically dispense with the use of levees." (See LEVEE.)

The following extracts are from the address of Mr. Taylor, a member of the Mississippi River Commission, made in 1883, giving the results of the first year's flood at Plumb Point and Lake Providence reaches, 25 and 35 miles long respectively, after constructing the first works on this plan:

"The Yazoo front is now substantially closed, as is also a good part of the Tensas. The good effects of the concentration of water thus produced are already apparent. It sent the flood of 1883 from Vicksburg to Red River in undivided volume, and with such velocity and power as to scour out the channel with marked effect. The least depth reported between those two points during the past season was 10½ feet. Plumb Point reach embraces eleven bars, some of them heretofore among the worst on the river. It contains five chutes, which are to be closed, varying from 600 feet to 3400 feet in width. The effect produced by these structures has exceeded all anticipations. While the closure of these chutes is as yet only partially complete, it has produced a large concentration of water in the main channel, which has been followed by marked and gratifying results. The bars which formerly obstructed navigation have been cut down from 6 feet to 10 feet throughout the reach. The last season was one of unusually low water—the lowest within ten years. In other parts of the river 5-foot or 6-foot depths were not uncommon, but here was a 12-foot channel throughout the season. Lake Providence reach contains eleven bars and nine chutes, in seven of which permeable dykes have been built. Its improvement, as now projected, comprises the revetment of seven caving banks varying from 1½ miles to 8 miles in length, and making a total of 22½ miles. In Skipwith chute a fill of 30 vertical feet has occurred, and the total fill in that chute measures 10,300,000 cubic yards. In Stack Island chute a fill of 47 vertical feet has been secured since last September. In Baleshed chute 5½ miles of permeable dyke has been built, and the deposit produced measures 33,000,000 cubic yards. The aggregate deposits in the Lake Providence chutes cover over 3000 acres. The building up of such areas of solid land from particles as minute as a pin-point, carried by the flowing water and laid down a speck at a time, is a phenomenon which fairly staggers the imagination. By means of these works a channel depth of 15 feet was maintained in Lake Providence reach during the low water of the last season."

Permeable willow screens were first used at the jetties of the Mississippi in 1875, and raised the bottom during one flood over a large area at the head of the passes from 12 to 16 feet deep almost to the surface of the water. The method of constructing such permeable works admits of great modification. The principle is, of course, the same in all of them, and has since been adopted throughout the whole Valley of the Mississippi in works of river improvement, and in several harbors on the Gulf and Atlantic coasts. (See JETTIES, RESERVOIR; also Corthell's *History of Mississippi River Jetties.*) JAMES B. EADS.

Mississippi Scheme, the title of a banking and commercial scheme which ended in a wild speculation and collapse. It was started in Paris in 1719 by John Law (see LAW, JOHN) in identification with the regent and financial officers of the government. Its primary object was to relieve the French finances from the burdensome debt and disorder consequent on the expensive wars of Louis XIV. A royal bank was first established, of which Law was director-general. Then a commercial company was chartered entitled "The Company of the West," of which also Law was director-general. To this company the whole province of Louisiana, watered by the Mississippi and its branches, was granted. Subsequently, it was entrusted with the collection of the taxes and of the king's revenues, and thus it had a monopoly of almost the entire commercial and financial operations of the nation. Meantime, the bank issued its notes freely till the paper currency amounted to 2,700,000,000 livres. The shares of the company were increased to 624,000, and sold only for bank-notes. This increase of currency, with a promise of large dividends, rapidly advanced the price of shares, and the whole nation was possessed with a frenzy of speculation. All classes, prince and peasant, clergy and laity, men and women, were affected alike. The rush of stock-jobbing business in the streets of Paris was enormous. The speculations culminated at the close of the year 1719, when the company's shares sold for more than 10,000 livres each, and money was so abundant that the bank loaned at 2 per cent. There was, however, apparent a drain of specie from the bank, as the shrewd ones attempted to put their new-made fortunes into forms of fixed value. To check this, ineffectual edicts were passed to restrict payments in coin, to limit the amount of specie which one might hold, and to fix the value of the notes. The royal bank was incorporated with the company Feb. 23, 1720, and on the 21st of May a government edict was issued reducing the value of bank-notes and of company shares one-half. This burst the bubble at once, and universal bankruptcy and distress ensued. This scheme stands a striking illustration of the fallacies that a nation's debt can be paid or its prosperity increased by a mere increase of its money-circulation, and that paper money can be made stable and safe on some general security without respect to its convertibility. The leaders of the scheme were probably deluded with the rest. A. L. CHAPIN.

Mississippi Sound washes the Gulf coast of Mississippi and part of that of Alabama, extending from Mobile Bay nearly to the mouth of Pearl River. It is divided from the main waters of the Gulf by the chain of Dauphin, Petit Bois, Horn, Ship, and Cat islands—of sand and generally wooded. It affords fine harbors under protection of Ship and Cat islands (the former fortified), and its waters are generally moderately deep, affording a tranquil navigation to the numerous steamers and coasting vessels running between Mobile and New Orleans (*viâ* Lake Pontchartrain). Grant's Pass, a narrow and partly artificial channel between Dauphin Island and the mainland, forms the connection between the sound and Mobile Bay; Lake Borgne, toward the W., is entered at St. Joseph's Island.

Missolon'ghi, or **Mesolonghi,** the most important town of Western Greece, in the government of Ætolia, on the Gulf of Patras. It is well fortified, and famous for the valor with which it twice met the besieging Turks during the war of independence in 1822 and 1826. Lord Byron died here, Apr. 19, 1824. Pop. about 6000.

Missoula, on Northern Pacific R. R., cap. of Missoula co., Mont. (see map of Montana, ref. 2–B, for location of county), is situated on one of the principal forks of the Columbia River and on the Mullan stage-road from Fort Benton to Walla-Walla. It has a flouring-mill and a hospital. There are extensive mines and good grazing advantages in the vicinity. Pop. about 500; is not in census.

Missouri, mis-soo're, one of the central States of the Mississippi Valley, lying wholly W. of the Mississippi River, and including a small tract between the Mississippi and the St. Francis rivers in the S. E., extending from the parallel of 36° to that of 40° 30′, and from the meridian of 89° 2′ to 95° 44′ W. lon. from Greenwich; greatest length from N. to S., about 309 miles; greatest breadth from E. to W., 318 miles; average breadth, nearly 244 miles. Bounded N. by Iowa, E. by Illinois, Kentucky, and Tennessee, S. by Arkansas, W. by Indian Territory, Kansas, and Nebraska; area, 69,415 square miles, or 44,425,600 acres.

THE GREAT SEAL OF THE STATE OF MISSOURI
UNITED WE STAND DIVIDED WE FALL
SALUS POPULI SUPREMA LEX ESTO
MDCCCXX

Seal of Missouri.

Missouri, by census of 1880, ranked 5 among the States in population, 7 in value of agricultural productions, and 8 in value of manufactures.

Face of the Country.—The State is divided into two unequal portions by the Missouri River, which crosses it from W. to E., and forms also its N. W. boundary. The portion S. of the Missouri is of very varied surface, the S. E. portion being very low and swampy; above this, on the Mississippi, the highland bluffs commence, and extend up to the mouth of the Missouri. In the S. W. portion of the State the Ozark Mountains occupy the greater part of the country; these mountains—or, rather, hills—render the whole region exceedingly broken and hilly, the isolated peaks sometimes rising from 500 to 1000 feet above their bases, and then sinking into very beautiful and sometimes fertile valleys. The numerous river-bottoms and valleys formed by the tributaries of the Osage and Missouri rivers are moderately fertile, but they are generally subject to overflow. Farther N., in the basin of the Osage and above it, the land is mostly rolling prairie, with occasional forests; the immediate valley of the Missouri has a rich alluvial soil and abounds in large forest-trees.

Rivers, Lakes, etc.—The principal rivers of the State are the Mississippi, which bounds the State on the E. and has a shore-line of 470 miles, and the Missouri, which forms the W. boundary of the State for nearly 200 miles, and, turning eastward at the mouth of the Kansas River, flows in an E. S. E. direction across the State, then, flowing N. E., enters the Mississippi 15 miles N. of St. Louis. The Little River, which crosses the S. boundary of the State before entering the Mississippi, and the Meramec, are the only considerable streams discharging their waters into the Mississippi S. of the Missouri River. N. of that river Salt River is the largest of these tributaries, but the Cuivre or Copper River, Perruque Creek, Bardenne Creek, Fabius, Wyaconda, and Little Fork rivers are streams of moderate size. The Missouri receives numerous large affluents in the State: on the S. side are Lamine River, Osage River and its tributary the Little Osage, Sac River, Grand River, Pomme de Terre River, Big Niangua, Auglaize, Maries Creek, and Gasconade River; on the N. side, the Nishnabatona, Nodaway, Platte, Grand, Chariton, Rocher, Percé, and Cedar rivers and Yellow Creek. There are few lakes in the State.

Geology and Mineralogy.—The geology of Missouri may be briefly summed up as follows: Quaternary (alluvium, bluff, and drift) deposits in the S. E., extending over a triangular tract from the point where the Current River (an affluent of the White) crosses the southern boundary of the State to the Mississippi River, and comprising the counties along and near the river in the whole swamp-region to a point near Benton: the same formation extends through the immediate valley or bottom lands of the Missouri to and beyond the point where it enters Dakota. There are no Tertiary, Cretaceous, Triassic, or Jurassic rocks in the State; the next in order is the Carboniferous or coal-measures, which either as Upper or Lower Carboniferous cover 23,100 square miles of the surface of the State, occupying in general the W., N. W., and N. portions of the State. These include not only the four subdivisions of the Upper Carboniferous formation—viz. Upper, Middle, and Lower coal and Clear Creek sandstone—but six successive deposits of the Lower Carboniferous, comprising an unclassified sandstone, and the St. Louis, Keokuk, and Chouteau groups of limestones and sandstones, most of them rich in fossils. Adjoining these coal-measures we have two considerable tracts of Devonian rock, one in the S. W., the other in the N. E., portion of the State; a narrow belt of it also follows the eastern edge of the Carboniferous deposits in all their devious lines, and extends S. E. to the immediate vicinity of St. Louis. The Hamilton and the Onondaga groups, both mainly limestones, are the only strictly Devonian rocks in the State; the Upper and Lower Silurian formations come next in order; they occupy a tract almost 200 miles in width, and extending from the Missouri River to the southern line of the State, and also crop out in the immediate bottom-lands of the Mississippi above the mouth of the Missouri. Four groups of the Upper Silurian are found here—viz. Oriskany sandstone, Lower Helderberg or Delthyris shale, Niagara group, and Cape Girardeau limestone. Of the Lower Silurian formation there are three groups, belonging to the Trenton period—viz. the Cincinnati group, represented mainly by Hudson River shale; the Galena group, receptaculite limestone; and the Trenton group, composed of Trenton, Black River, and Birdseye limestones. There are also three groups of the magnesian limestone series, consisting of magnesian limestones, saccharoidal and other sandstones, and Potsdam limestones, sandstones, and conglomerates. Below these, and around the head-waters of the affluents of the St. Francis and White rivers, there are frequent outcrops of Eozoic or archaic rocks—greenstone, porphyry, and granite. Much of the limestone of the coal-measures, as well as some of the other formations, is cavernous, and there are numerous caves of great extent and beauty in the central and western portions of the State. In the richness and variety of its mineral productions Missouri is surpassed by no State in the Union. Gold is found only in the drift sands of North Missouri, and silver only in combination with lead in the galena and other ores; but iron is found in some form in every county—bog ores in S. E. Missouri; limonite or brown hæmatite in most of the counties of South Missouri; gœthite, a variety of the brown hæmatite, in Adair co.; red hæmatite throughout the coal-measures, red and yellow ochres in many counties; spathic ores in the coal-measures and in Phelps co.; the specular oxide in vast masses, such as the Iron Mountain, Shepherd Mountain, Pilot Knob, Simmon Mountain, Meramec mines in Phelps co., and numerous other deposits in eight or ten other counties; sulphurets (iron pyrites) throughout the coal-measures; and sulphate of iron (copperas) in the coal-measures and abandoned coal-mines. Zinc in the form of blende is abundant in S. W. and S. E. Missouri, and the silicates and carbonates also in the same region, while zinc bloom sometimes occurs. The sulphate of cadmium (greenockite) is associated with the zinc blende. Copper in the form of blue and green carbonates (green malachite) and sulphurets is found in large quantities in Shannon, Crawford, Jefferson, Franklin, and Madison, and in smaller quantities in a dozen other counties. Copper-mining was carried on extensively for many years in the State, but the Lake Superior ores and native copper have now rendered it unprofitable. Nickel and cobalt are found in paying quantities at Mine La Motte in Madison co. and the St. Joseph mines, and the beautiful hair-like crystals of sulphuret of nickel (millerite) in the vicinity of St. Louis. After iron, lead is the greatest mineral product of Missouri, the mines of that State producing a larger quantity of lead than all the rest of the U. S. There are two great lead-fields—one in S. E. and the other in S. W. Missouri, in the porphyry and magnesian limestones of the former and the Lower Carboniferous rocks and magnesian limestones of the latter. It is also found in smaller quantities in many other counties; galena, or sulphuret of lead, and cerussite, or the carbonate, are the principal ores, though the phosphate (pyromorphite) is sometimes found. Wolfram is found in Madison co., and manganese and manganiferous iron in Iron and other counties. Of minerals not ores there are great numbers. Carbonate of lime (calcite), arragonite pearl-spar, fluor-spar, quartz in all forms; heavy spar (sulphate of baryta), largely used in the adulteration of white lead: gypsum, mainly in the form of selenite: pickeringite, feldspar, mica, hornblende, asbestos (only in Madison co.), bitumen or mineral tar (throughout the coal-measures), fireclays, potter's clay, and kaolin; an excellent glass-sand from the saccharoidal sandstone: lime of several qualities; hydraulic lime and cement; polishing-stone, saltpetre, building-stone, granite, sandstones, limestones and marbles, grindstones, millstones, slates, and numerous fine varieties of colored marbles, are the principal of these. We have already spoken of the great extent of the Missouri coal-fields, occupying about one-third of the area of the State. The coal is of various qualities, some being common bituminous, some very rich in carbon, and developing excellent results under the coking process, while some will not coke; some is in quality equal to the Liverpool cannel coal. The percentage of fixed carbon varies from 30 per cent. to 59,75, or possibly 60, per cent., the average being not far from 50 per cent. Among the coal-beds already worked are many which are well adapted to smelting purposes, though perhaps a greater number have too much volatile matter, sulphur, etc. Most of the coals are well adapted to the use of locomotives and stationary engines. There are many mineral springs in the State—sulphurous, saline, and chalybeate—and in Howard co. salt-springs containing from 1000 to 1200 grains of salt to the gallon.

Zoology.—Bears, cougars or panthers, wildcats, wolves, foxes, raccoons, and opossums are found in the mountains in considerable numbers. Deer of several species, rabbits, hares, squirrels, and perhaps also antelopes, are abundant, as well as gophers and other small rodents. Wild-turkeys, quails, pigeons, prairie-hens, and other grouse abound; eagles, vultures, hawks, owls, etc. are found; song-birds and birds of beautiful plumage are very numerous, and wild geese, ducks, brant, and teal, and herons, swans, and divers, are found in their season on the Mississippi and in the swampy regions. Snakes, lizards, toads, frogs, turtles, etc. are plentiful.

Climate.—The climate of Missouri is generally healthy, except in the river-bottoms and the swampy districts of the S. E., but it is a climate of great extremes. The summers are long and hot, the winters cold and icy, with strong and piercing winds. Annual mean temperature: Jefferson Barracks (lat. 38° 28′ N., lon. 90° 18′ W., elevation 472 feet), 55.46°; St. Louis (lat. 38° 37′ 28″ N., lon. 90° 15′ 16″ W., elevation 544 feet), 54.5°. Total rainfall of year: Jefferson, 37.83 inches; St. Louis, 42.32 inches.

Soil and Vegetation.—The soil of the State may be divided into five classes or districts. The alluvial deposits of South-eastern Missouri and of the first bottoms of Missouri River are exceedingly rich and fertile. Much of the S. E. region is covered with swamps, but where these are drained they will compete in productiveness with the richest lands in the world. The reclaimed lands of this section yield enormous crops of cotton, and from 75 to 90 bushels of corn to the acre. The next class of lands in point of fertility are the black-soil prairies of North-western Missouri, which are underlaid by the upper coal-measures. After thirty years of cultivation the lands yield quite as large crops as at first; corn-crops of from 50 to 75 bushels to the acre, and wheat of 25 bushels, are the usual yield of this region; blue grass, apples, and most of the small fruits do well here. Eastern Missouri, N. of the Missouri River, may be considered as the next class. A part of this is prairie, and a part rolling lands. The soil yields better crops of wheat, though it is not so well adapted to corn. Some of the best tobacco-lands in the State are in this region; all kinds of fruits do well. A region somewhat less fertile is found in South-western Missouri. This is a good fruit-region, grapes, peaches, pears, and apples being especially successful. It yields also good crops of wheat and corn. The poorest land in the State is the extensive tract lying between South-western Missouri and the swampy lands of the S. E. This region is not sterile, but most of the hills are heavily timbered, and some of the valleys are very rich. From 20 to 35 bushels of corn or 15 to 20 of wheat are produced on this soil, and near the S. boundary of the State cotton is raised successfully. Most of Northern and North-western Missouri is prairie, though with belts of timber along the streams. The prairies are decked with numerous flowers of great beauty during the spring and summer seasons. The Missouri bottoms are generally heavily timbered with cottonwood, hickory, black walnut, hackberry, burr, and red oak. W. of Howard co. the Missouri River counties have heavy bodies of fine timber, but interspersed with prairies. E. of Howard co. there are belts of hardwood timber from 10 to 20 miles wide, including ash, oak, walnut, sugar-maple, hackberry, hickory, elm, etc. A similar belt, 15 to 20 miles wide, runs parallel to the Mississippi. Along the Osage River and in all the S. counties are heavy tracts of good timber, chiefly white, black, yellow, and post-oak, black jack, black hickory, sassafras, dogwood, cedar, etc., and nearer the Arkansas border extensive tracts of pine. Yellow poplar, sweet gum, cypress, oak, catalpa, tupelo, black gum, and black walnut are the principal forest-trees of the S. E.

Agricultural Productions.—Missouri is one of the great grain-growing States, producing, by the census of 1880, of Indian corn, 202,414,413 bushels; wheat, 24,966,627 bushels; oats, 20,670,958 bushels; rye, 535,426 bushels; buckwheat, 57,640 bushels; barley, 123,031 bushels. The yield of tobacco was 12,015,657 pounds. The clip of wool was 7,313,924 pounds, standing sixth in yield of this staple in the U. S. Of cotton there was produced, in 1880, 20,318 bales.

*Farm Animals.**—By the census of 1880, Missouri had 667,776 horses, 192,027 mules and asses, 2,080,932 cattle, 1,411,298 sheep, and 4,553,123 hogs.

Manufactures.—Missouri is a heavy manufacturing State in certain commodities. In 1880 the number of manufacturing establishments was 17,806, employing 101,952 hands; amount of wages paid, $49,688,712; capital invested, $130,016,735; aggregate value of products manufactured, $300,252,157. The value of glassware manufactured in Missouri in 1880 reached nearly $1,000,000. In 1880 there were 22 iron and steel establishments; capital, $9,152,472; total wages paid, $734,575. Total value of products, $4,660,530. Coal mined in 1881, 1,750,000 tons. Pig iron produced in 1880, 95,050 tons.

Railroads.—Missouri had in operation, in Jan., 1882, 4211 miles of R. R., costing, for roads and equipment, $239,530,162, with net earnings of $13,499,373; interest paid on bonds, etc., $7,335,625; dividends paid, $2,299,977. Half a dozen of these are great trunk lines, embracing the Wabash St. Louis and Pacific, Chicago Rock Island and Pacific, Missouri Kansas and Texas, Missouri Pacific, St. Louis Iron Mountain and Southern, etc. The S. and W. connections of these and other roads are most important, and they do an enormous business.

Finances.—The assessed valuation of Missouri in 1881 was: real estate, $381,555,564; personal property, $147,662,910; R. Rs. and telegraphs, $29,143,969; total, $558,361,443. Rate of State tax, 40 cents on the $100, producing $2,129,512: total taxation, State and local, 1880, $10,269,736; State debt, $16,259,000, chiefly contracted in aid of R. Rs., against which the State holds in sinking fund $3,031,000. Total indebtedness State, county, and town, $57,431,322.

Commerce.—Missouri has little direct foreign trade, but her interior commerce is enormous, including heavy shipments of all the cereal crops, pork, beef, live animals, manufactures, and merchandise, by both railway and rivers. St. Louis alone received, in 1879, of wheat, 17,093,362 bushels, and shipped 7,302,076 bushels; receipts of corn, 13,360,636 bushels; shipments, 8,311,005; barrels of flour shipped, 3,045,035; hogs packed in Missouri in 1879–80, 926,931.

Banks, etc.—In Oct., 1881, Missouri had 22 national banks, with a capital of $4,050,000; circulation, $2,317,340; U. S. bonds to secure circulation, $2,620,000; aggregate deposits, $10,371,055. There were 120 State banks and trust companies, with capital of $8,747,582 and $39,624,525 deposits; 3 savings-banks, with deposits of $506,510; 92 private bankers, with capital of $1,381,546 and $7,148,243 of deposits. There were 17 American fire and marine insurance companies in Missouri in 1881; total fire losses in 1881, $3,218,100. Life insurance companies, 2.

Education.—The number of children of school-age (six to twenty years) in 1880 was 723,484, of whom 486,002 were enrolled in public schools, with an average attendance of 260,540. Total expenditure for public schools, $3,092,332, of which teachers' salaries required $2,261,058; number of school-houses, 10,329: value of school property, $7,810,924: number of teachers, 10,802. There is a normal school at Kirksville, with over 500 pupils, and 2 others, besides 7 medical colleges, 2 law schools, and 4 theological schools. Missouri has 14 universities and colleges, with 201 instructors and 2429 students, paying tuition, in 1880,

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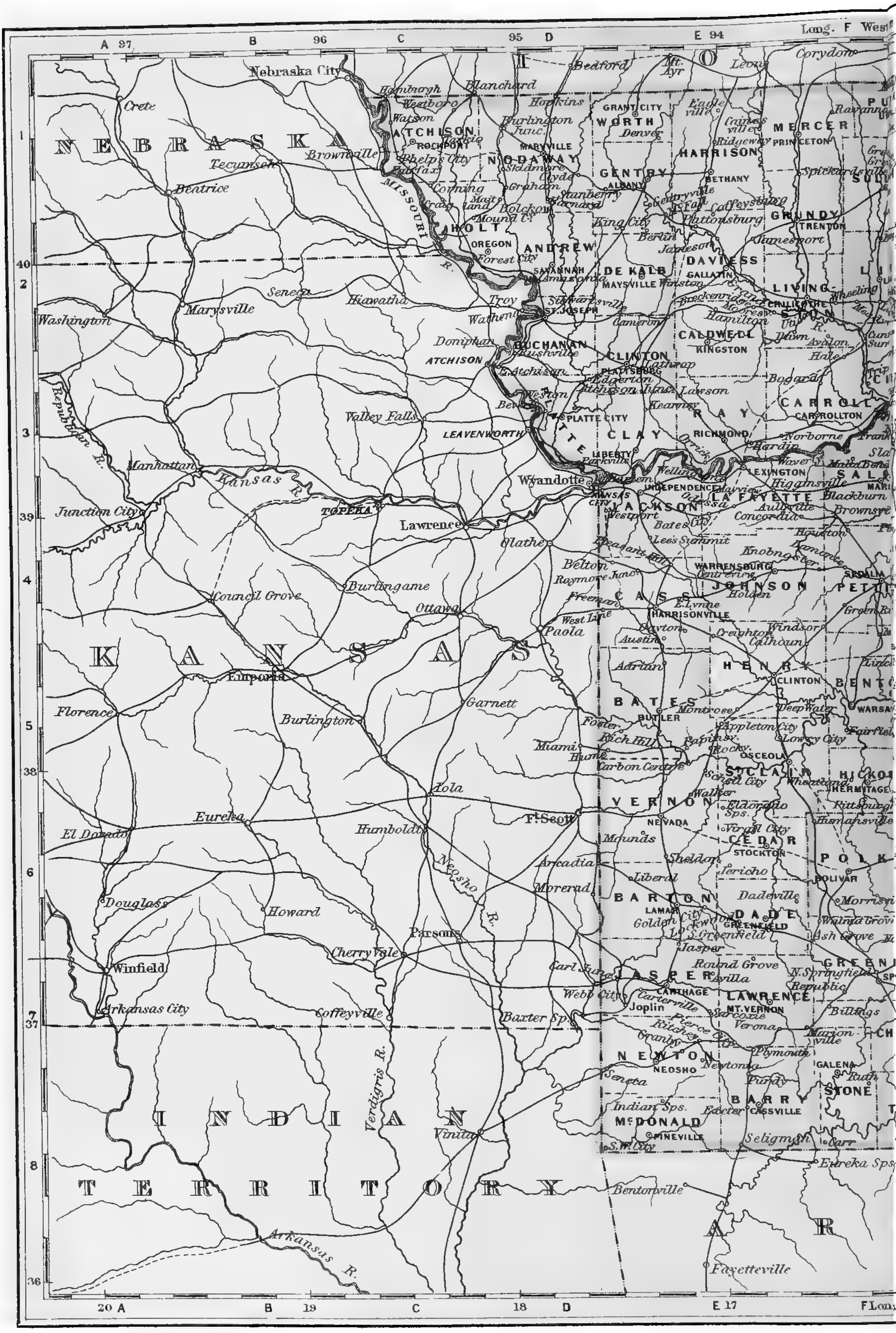
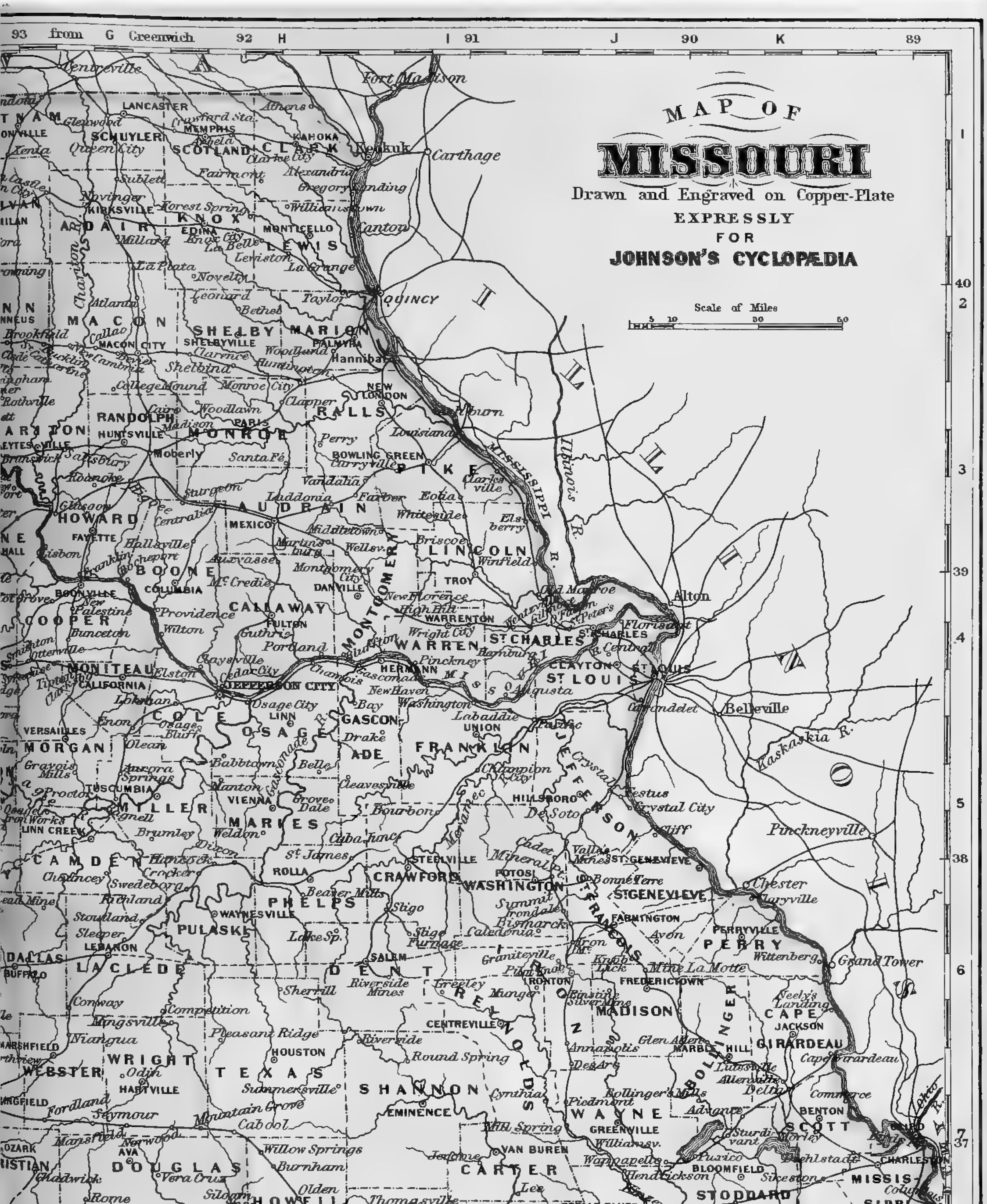
* On farms only.



A 97
B
96
C
95
D
E 94
Long. F West
1
2
3
4
5
6
7
8
40
39
38
37
36
20 A
B
19
C
18
D
E 17
F Long.
NEBRASKA
KANSAS
INDIAN
TERRITORY
I O
A R
Nebraska City
Crete
Tecumseh
Brownville
Beatrice
Seneca
Hiawatha
Marysville
Washington
Troy
Wathena
Doniphan
ATCHISON
Republican R.
Valley Falls
LEAVENWORTH
Manhattan
Kansas R.
TOPEKA
Junction City
Lawrence
Olathe
Wyandotte
KANSAS CITY
Burlingame
Council Grove
Ottawa
Paola
West Line
Emporia
Florence
Burlington
Garnett
Miami
Iola
Eureka
Humboldt
Ft Scott
El Dorado
Neosho R.
Arcadia
Moreland
Douglass
Howard
Parsons
Cherry Vale
Winfield
Arkansas City
Coffeyville
Baxter Sps.
Carl Junc.
Webb City
Joplin
Verdigris R.
Vinita
Seneca
Arkansas R.
Bentonville
Fayetteville
Hamburgh
Westboro
Watson
ATCHISON
ROCKPORT
Tarkio
Phelps City
Fairfax
MISSOURI R.
Corning
Craig
Maitland
HOLT
Mound C.
OREGON
Forest City
Blanchard
Bedford
Mt. Ayr
Leon
Corydon
Hopkins
Burlington Junc.
MARYVILLE
NODAWAY
Skidmore
Clyde
Graham
Bolckow
Stanberry
Barnard
GRANT CITY
WORTH
Denver
Eagleville
Cainesville
Ridgeway
MERCER
PRINCETON
HARRISON
BETHANY
GENTRY
ALBANY
King City
Gentryville
McFall
Coffeysburg
Pattonsburg
GRUNDY
TRENTON
Jamesport
Berlin
Jameson
DAVIESS
GALLATIN
ANDREW
SAVANNAH
Amazonia
DE KALB
MAYSVILLE
Winston
Stewartsville
ST. JOSEPH
Cameron
Breckenridge
Mooresville
Hamilton
LIVINGSTON
CHILLICOTHE
Wheeling
Utica
Dawn
Avalon
Hale
Grand R.
BUCHANAN
Rushville
E. Atchison
CLINTON
PLATTSBURG
Lathrop
Edgerton
Edgerton Junc.
CALDWELL
KINGSTON
Lawson
Kearney
Weston
Beverly
PLATTE CITY
PLATTE
CLAY
LIBERTY
Parkville
RAY
RICHMOND
Orrick
Hardin
CARROLL
CARROLLTON
Bogard
Norborne
Wellington
Waverly
Harlem
LEXINGTON
INDEPENDENCE
Higginsville
Odessa
LA FAYETTE
Blackburn
JACKSON
Westport
Bates City
Aullville
Concordia
Brownsville
Lee's Summit
Pleasant Hill
Houston
Knobnoster
WARRENSBURG
Centreview
SEDALIA
Belton
Raymore Junc.
Freeman
CASS
E. Lynne
HARRISONVILLE
JOHNSON
Holden
PETTIS
Green Ridge
Dayton
Austin
Creighton
Calhoun
Windsor
Adrian
HENRY
CLINTON
BENTON
WARSAW
BATES
BUTLER
Montrose
Deep Water
Appleton City
Lowry City
Fairfield
Foster
Rich Hill
Rockville
Rapids Sv.
OSCEOLA
Hume
Carbon Centre
ST. CLAIR
Schell City
Wheatland
HICKORY
HERMITAGE
Pittsburg
Humansville
Walker
VERNON
NEVADA
Eldorado Sps.
Virgil City
CEDAR
STOCKTON
Mounds
Sheldon
POLK
BOLIVAR
Jericho
Liberal
BARTON
LAMAR
Golden City
Lockwood
Dadeville
DADE
GREENFIELD
S. Greenfield
Morrisville
Walnut Grove
Ash Grove
Jasper
Round Grove
GREENE
N. Springfield
Republic
JASPER
Avilla
CARTHAGE
LAWRENCE
MT. VERNON
Carterville
Sarcoxie
Verona
Billings
Marionville
Pierce City
Ritchey
Granby
Plymouth
NEWTON
NEOSHO
Newtonia
GALENA
Ruth
STONE
Purdy
BARRY
CASSVILLE
Exeter
Indian Sps.
McDONALD
PINEVILLE
S.W. City
Seligman
Carr
Eureka Sps.


MAP OF
MISSOURI
Drawn and Engraved on Copper-Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPÆDIA
Scale of Miles
5 10 30 50
93 from G Greenwich 92 H I 91 J 90 K 89
W.16 from G Washington 15 H I 14 J 13 K
1 40 2 3 39 4 5 38 6 7 37 8 36
Centreville
Fort Madison
Keokuk
Carthage
Lancaster
Glenwood
Queen City
Schuyler
Scotland
Clark
Memphis
Kahoka
Athens
Alexandria
Gregory Landing
Williamstown
Canton
Sublett
Novinger
Kirksville
Adair
Knox
Edina
Lewis
Monticello
La Belle
Lewiston
La Grange
Millard
La Plata
Novelty
Leonard
Bethel
Taylor
Quincy
Macon
Atlanta
Callao
Macon City
Shelby
Shelbyville
Clarence
Shelbina
Marion
Palmyra
Hannibal
Woodland
Huntington
Brookfield
Bucklin
New Cambria
College Mound
Monroe City
New London
Ralls
Randolph
Huntsville
Cairo
Madison
Woodlawn
Paris
Monroe
Moberly
Santa Fé
Perry
Louisiana
Bowling Green
Curryville
Pike
Clarksville
Saulsbury
Roanoke
Glasgow
Howard
Fayette
Sturgeon
Centralia
Audrain
Mexico
Laddonia
Vandalia
Farber
Eolia
Whitesides
Elsberry
Middletown
Wellsv.
Martinsburg
Auxvasse
Briscoe
Lincoln
Winfield
Troy
Boone
Columbia
Hallsville
Rocheport
Franklin
Boonville
New Palestine
McCredie
Montgomery City
Danville
Montgomery
New Florence
High Hill
Warrenton
Wright City
Callaway
Fulton
Guthrie
Portland
Providence
Wilton
Cooper
Bunceton
Otterville
Moniteau
California
Tipton
Elston
Jefferson City
Cole
Osage City
Linn
Osage
Gascon
Gasconade
Drake
Hermann
Bay
New Haven
Chamois
Warren
St Charles
Pinckney
Old Monroe
St Peter's
Florissant
Alton
Clayton
St Louis
Augusta
Washington
Labaddie
Union
Pacific
Carondelet
Belleville
Kaskaskia R.
Versailles
Morgan
Enon
Olean
Gravois Mills
Aurora Springs
Tuscumbia
Miller
Linn Creek
Brumley
Vienna
Maries
Belle
Babbtown
Gasconade R.
Cleavesville
Bourbon
Franklin
Meramec
Hillsboro
De Soto
Jefferson
Festus
Crystal City
Pinckneyville
Camden
Hancock
Crocker
Swedeborg
Richland
Dixon
Rolla
St James
Cuba
Steelville
Crawford
Potosi
Washington
Mineral Pt.
Cadet
Bonne Terre
Ste. Genevieve
Chester
Claryville
Waynesville
Pulaski
Phelps
Beaver Mills
Stigo
Summit
Irondale
Bismarck
Farmington
Caledonia
Avon
Perry
Perryville
Lebanon
Laclede
Dallas
Buffalo
Lake Sp.
Salem
Dent
Riverside Mines
Sherrill
Greeley
Graniteville
Pilot Knob
Ironton
Munger
Iron
Knob Lick
Fredericktown
Mine La Motte
Wittenberg
Grand Tower
Madison
Bollinger
Cape Girardeau
Neely's Landing
Jackson
Conway
Competition
Marshfield
Niangua
Webster
Wright
Hartville
Houston
Texas
Pleasant Ridge
Centreville
Reynolds
Riverside
Round Spring
Annapolis
Des Arc
Glen Allen
Marble Hill
Lutesville
Allenville
Delta
Commerce
Benton
Scott
Summersville
Mountain Grove
Cabool
Seymour
Fordland
Shannon
Eminence
Cynthia
Piedmont
Bollinger's Mills
Advance
Wayne
Greenville
Williamsv.
Mill Spring
Van Buren
Carter
Mansfield
Norwood
Ava
Douglas
Vera Cruz
Willow Springs
Burnham
Olden
Siloam Sps.
Howell
Thomasville
West Plains
Wappapello
Hendrickson
Bloomfield
Stoddard
Sikeston
Charleston
Mississippi
Columbus
Belmont
Cairo
Ohio R.
Poplar Bluff
Butler
Lee
Pleasant Grove
Dexter City
Ash Hill
Ozark
Christian
Chadwick
Rome
Forsyth
Bradleyville
Rockbridge
Ozark
Brandsville
Oregon
Alton
Mary Sps.
Koshkonong
Ripley
Doniphan
Barfield
Neelyville
Malden
Paw Paw
Como
New Madrid
Hickman
Point Pleasant
Island No. 10
Taney
Protem
Gainesville
Somerset
Thayer
Mammoth Spring
Knobel
Pocahontas
Black R.
White R.
Dunklin
Kennett
Cottonwood
St Francis R.
Pemiscot
Gayoso
Stewart
Mississippi R.
Missouri R.
Illinois R.
Grand R.
Chariton
ARKANSAS
ILLINOIS
KENTUCKY
TENNESSEE

$73,765. The State University, at Columbia, includes an agricultural college and a school of mines. In 1882 there were 509 newspapers and periodicals in Missouri, of which 43 were daily.

Churches.—The Baptists are in the majority here, as in most Southern States, numbering 1381 churches, 823 ministers, and 88,491 members; Christians (Disciples of Christ), 565 churches, 395 ministers, 60,950 members; Methodist Episcopal (South), 273 churches, 53,483 members; Roman Catholics, 246 churches, 286 priests, and a worshipping population of 163,872: Lutherans, 202 churches, 24,430 members; Methodist Episcopal, 222 churches, 257 ministers, 19,821 members; Cumberland Presbyterians, 371 churches, 16,129 members; and about 30 other denominations, having from 10,000 down to 20 members each.

Population.—In 1860, 1,182,012: 1870, 1,721,295; 1880, 2,168,380 (white 2,022,826, colored 145,554, including 91 Chinese and 113 Indians).

Principal Cities and Towns, Pop. 1880.—St. Louis, 350,518; Kansas City, 55,785; St. Joseph, 32,431; Hannibal, 11,074: Sedalia, 9561; Joplin. 7038; Springfield. 6522; Moberly, 6070; Jefferson City (cap.), 5271; Carthage, 4167.

COUNTIES.	* Ref.	Pop. 1870.	Pop. 1880.	COUNTY TOWNS.	Pop. 1880.
Adair	1-G	11,448	15,190	Kirksville	2,314
Andrew	2-D	15,137	16,318	Savannah	1,206
Atchison	1-C	8,440	14,556	Rockport	715
Audrain	3-H	12,307	19,732	Mexico	3,835
Barry	8-E	10,373	14,405	Cassville.	
Barton	6-D	5,087	10,332	Lamar	907
Bates	5-E	15,960	25,381	Butler	2,162
Benton	5-F	11,322	12,396	Warsaw	515
Bollinger	6-J	8,162	11,130	Marble Hill	265
Boone	4-G	20,765	25,422	Columbia	3,326
Buchanan	2-D	35,109	49,792	St. Joseph	32,431
Butler	8-J	4,298	6,011	Poplar Bluff	791
Caldwell	2-E	11,390	13,646	Kingston	470
Callaway	4-H	19,202	23,670	Fulton	2,409
Camden	5-G	6,108	7,266	Linn Creek.	
Cape Girardeau.	6-K	17,558	20,998	Jackson	795
Carroll	3-F	17,446	23,274	Carrollton	2,313
Carter	7-I	1,455	2,168	Van Buren.	
Cass	4-D	19,296	22,431	Harrisonville	1,113
Cedar	6-E	9,474	10,741	Stockton	407
Chariton	3-F	19,136	25,224	Keytesville	737
Christian	7-F	6,707	9,628	Ozark	235
Clark	1-H	13,667	15,031	Kahoka	704
Clay	3-D	15,564	15,572	Liberty	1,476
Clinton	2-D	14,063	16,073	Plattsburg	1,344
Cole	5-G	10,292	15,515	Jefferson City	5,271
Cooper	4-G	20,692	21,596	Boonville	3,854
Crawford	5-H	7,982	10,756	Steelville	410
Dade	6-E	8,683	12,557	Greenfield	712
Dallas	6-F	8,383	9,263	Buffalo	437
Daviess	2-E	14,410	19,145	Gallatin	1,141
De Kalb	2-D	9,858	13,334	Maysville	418
Dent	6-I	6,357	10,646	Salem	1,624
Douglas	7-G	3,915	7,753	Ava	134
Dunklin	8-J	5,982	9,604	Kennett	171
Franklin	5-I	30,098	26,534	Union	402
Gasconade	5-H	10,093	11,153	Hermann	1,314
Gentry	1-D	11,607	17,176	Albany	979
Greene	7-F	21,549	28,801	Springfield	6,522
Grundy	2-F	10,567	15,185	Trenton	3,312
Harrison	1-E	14,635	20,304	Bethany	994
Henry	5-E	17,401	23,906	Clinton	2,868
Hickory	5-F	6,452	7,387	Hermitage	167
Holt	2-C	11,652	15,509	Oregon	862
Howard	3-G	17,233	18,428	Fayette	1,247
Howell	8-H	4,218	8,814	West Plains	351
Iron	6-I	6,278	8,183	Ironton	759
Jackson	3-E	55,041	82,325	Independence	3,146
Jasper	7-D	14,928	32,019	Carthage	4,167
Jefferson	5-J	15,380	18,736	Hillsborough.	
Johnson	4-E	24,648	28,172	Warrensburg	4,049
Knox	1-H	10,974	13,047	Edina	1,156
Laclede	6-G	9,380	11,524	Lebanon	1,419
Lafayette	3-E	22,623	25,710	Lexington	3,996
Lawrence	7-E	13,067	17,583	Mount Vernon	527
Lewis	1-H	15,114	15,925	Monticello	324
Lincoln	3-I	15,960	17,426	Troy	839
Linn	2-F	15,900	20,016	Linneus	860
Livingston	2-F	16,730	20,196	Chillicothe	4,078
Macon	2-G	23,230	26,222	Macon City	3,046
Madison	6-J	5,849	8,876	Fredericktown	
Maries	5-H	5,916	7,304	Vienna.	
Marion	2-H	23,780	24,837	Palmyra	2,479
McDonald	8-D	5,226	7,816	Pineville	147
Mercer	1-F	11,557	14,673	Princeton	1,240
Miller	5-G	6,616	9,805	Tuscumbia	157
Mississippi	7-K	4,982	9,270	Charleston	1,028
Moniteau	4-G	11,375	14,346	California	1,427
Monroe	3-H	17,149	19,071	Paris	1,253
Montgomery	4-I	10,405	16,249	Danville	239
Morgan	5-G	8,434	10,132	Versailles	578
New Madrid	7-K	6,357	7,694	New Madrid	712
Newton	7-D	12,821	18,947	Neosho	1,631
Nodaway	1-D	14,751	29,544	Maryville	3,485
Oregon	8-I	3,287	5,791	Alton	127
Osage	4-H	10,793	11,824	Linn †	1,804
Ozark	8-G	3,363	5,618	Gainesville	165
Pemiscot	8-K	2,059	4,299	Gayoso	148
Perry	6-K	9,877	11,895	Perryville	754
Pettis	4-F	18,706	27,271	Sedalia	9.561
Phelps	6-H	10,506	12,568	Rolla	1,582
Pike	3-I	23,076	26,715	Bowling Green	1,067
Platte	3-D	17,352	17,366	Platte City	670
Polk	6-F	12,445	15,734	Bolivar	516
Pulaski	6-G	4,714	7,250	Waynesville	64
Putnam	1-F	11,217	13,555	Unionville	772
Ralls	3-H	10,510	11,838	New London	502
Randolph	3-G	15,908	22,751	Huntsville	1,527
Ray	3-E	18,700	20,190	Richmond	1,424
Reynolds	7-I	3,756	5,722	Centreville.	
Ripley	8-I	3,175	5,377	Doniphan	157
Saline	3-F	21,672	29,011	Marshall	2,701
Schuyler	1-G	8,820	10,470	Lancaster	528
Scotland	1-H	10,670	12,508	Memphis	1,418
Scott	7-K	7,317	8,587	Benton	109
Shannon	7-I	2,339	3,441	Eminence	91
Shelby	2-H	10,119	14,024	Shelbyville	619
St. Charles	4-I	21,304	23,065	St. Charles	5,014
St. Clair	5-E	6,742	14,125	Osceola	373
St. François	5-J	9,742	13,822	Farmington	808
Ste. Genevieve	5-J	8,384	10,390	Ste. Genevieve	1,422
St. Louis (city)	4-J	310,864	350,518	St. Louis	350,518
St. Louis	4-J	40,325	31,888	Mt. Olive.	
Stoddard	8-K	8,535	13,431	Bloomfield	389
Stone	8-F	3,253	4,404	Galena	85
Sullivan	1-F	11,907	16,569	Milan	1,117
Taney	8-F	4,407	5,599	Forsyth.	
Texas	7-H	9,618	12,206	Houston	191
Vernon	5-E	11,247	19,369	Nevada	1,913
Warren	4-I	9,673	10,806	Warrenton	299
Washington	5-I	11,719	12,896	Potosi	715
Wayne	7-J	6,068	9,096	Greenville	100
Webster	7-G	10,434	12,175	Marshfield	655
Worth	1-D	5,004	8,203	Grant City	493
Wright	7-G	5,684	9,712	Hartville	248
Total		1,721,295	2,168,380		

History.—The present State of Missouri was known as Upper Louisiana. Under this name its lead-mines began to be known as early as 1720, and settlements were made not long after at St. Louis, Cape Girardeau, and (probably about 1755) at St. Genevieve. In 1763 it was ceded to Spain with the rest of the Louisiana or Mississippi River country, while all E. of the river came into the possession of the English. In 1775, St. Louis had attained some reputation as a fur-dépôt and trading-station, and had about 800 inhabitants, and St. Genevieve about half as many. New Madrid had been founded some time before. In 1800, Spain ceded her provinces on the Mississippi to France, and the French government sold them to the U. S. in 1803. The U. S. government divided the purchased region into the Territory of Orleans and the district of Louisiana, the latter including most of Arkansas, Missouri, Iowa, Minnesota, and Dakota, and most of Kansas and Nebraska. In 1805 this region was erected into the Territory of Louisiana, and St. Louis made the capital. In 1810 the population of the Territory was 20,845, of which all but 1500 were in the present limits of Missouri. In 1812, Louisiana becoming a State, the name of the Territory was changed to Missouri Territory. In 1817 the Territorial legislature applied to Congress for liberty to prepare a State constitution preliminary to admission into the Union. This application led to a protracted struggle in Congress on the question of the admission of Missouri as a slave State. It was finally settled by the MISSOURI COMPROMISE (which see). A convention met at St. Louis June 12, 1820, and agreed upon a constitution; the State was admitted to the Union by Presidential proclamation Aug. 10, 1821. Its subsequent progress was very rapid. The people of the W. portion of the State had taken sides in the Kansas troubles, and armed bodies of men known as Missouri "border ruffians" had penetrated into Kansas and committed many outrages there. A convention was called on Feb. 28, 1861, which decided in favor of remaining in the Union. Another constitutional convention met at St. Louis Jan. 6, 1865, and adopted a new constitution, providing for emancipation and the changes induced by it. This constitution was further modified in 1870, and a still newer one adopted Oct. 30, 1875.

Governors of the State.

Alexander McNair	1820–24
Frederick Bates	1824–26
John Miller	1826–32
Daniel Dunklin	1832–36
Lilburn N. Boggs	1836–40
Thomas Reynolds	1840–44
John C. Edwards	1844–48
Austin A. King	1848–53
Sterling Price	1853–57
Trusten Polk	1857
H. Johnson (acting)	1857
R. M. Stewart	1857–61
Claiborne F. Jackson	1861
Hamilton R. Gamble	1861–64
Thomas C. Fletcher	1865–69
Joseph W. McClurg	1869–71
Benj. Gratz Brown	1871–73
Silas Woodson	1873–75
Charles H. Hardin	1875–77
John S. Phelps	1877–81
Thomas T. Crittenden	1881–85
John S. Marmaduke	1885–89

REVISED BY A. R. SPOFFORD.

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* Reference for location of county. See map of Missouri.

† Townships.

Missou′ria Indians, a tribe originally of Dakota stock, settled on a fine reservation in Nebraska, in company with the Otoes.

Missouri Compromise, a name given to a law of Congress which may be regarded as one of the principal landmarks of the history of the U. S. during the nineteenth century. Upon the introduction into Congress, in the session of 1818–19, of a bill providing for the admission of Missouri as a State, but prohibiting slavery therein, the opposition on the part of the Southern members became violent and menacing, and after long and brilliant debates a compromise was effected, chiefly by the influence of Henry Clay. Missouri was admitted as a slave State, and at the same time an ordinance was enacted (Feb. 28, 1821) that from all the territory W. of Missouri and N. of the parallel of 36° 30′ (the southern boundary of the new State) slavery should be for ever excluded. This agreement subsisted until virtually repealed by the bills which established the Territories of Kansas and Nebraska in 1854, when the question, thus reopened, became the occasion of civil war in Kansas between the respective partisans of liberty and slavery. This measure determined the formation of the Republican party (1854), precipitated the anti-slavery issue, and led to the civil war of 1861–65, by which the whole question was set at rest. (See Douglas, Stephen A., by Hon. Alex. H. Stephens, LL.D.)

Missouri River. See Mississippi River.

Missouri Valley, R. R. junction, Harrison co., Ia. (see map of Iowa, ref. 5–D, for location of county), 21 miles N. of Council Bluffs. Pop. in 1880, 1154; in 1885, 2305.

Mist. See Fog, by Prof. Joseph Henry, LL.D.

Mistake′ [from prefix *mis*, and the verb *take*], an unintentional act or omission or error, arising from ignorance, surprise, imposition, or misplaced confidence. Mistakes are of two kinds—mistakes in law and mistakes in fact. The general rules of law appertaining to these two classes severally are essentially diverse. It is a fundamental legal principle, maintained both in courts of law and in courts of equity, that mistake or ignorance of law will furnish no excuse for a violation or disregard of legal duty, and will afford no ground of relief against the consequences of acting upon the erroneous belief. Every citizen is placed under an absolute obligation to know the subsisting rules of law when his action would be governed or affected by them, however limited may be his opportunities for acquiring such knowledge, and although from defective training or from natural incapacity (not amounting to mental unsoundness) he may be incompetent to understand legal principles and distinctions. This rule is established in order that the uniform and efficient execution of the laws may be practically secured, and that persons may be induced to acquaint themselves with their legal rights and duties, and be vigilant in the observance of legal obligations. It is therefore founded upon considerations of public policy, and is necessary for the proper administration of justice. This rule prevails both in civil and in criminal procedure. If a criminal offence be committed, and the perpetrator act in ignorance or misapprehension as to the prohibition imposed by law, he will nevertheless be punishable to the same extent as if he offended knowingly; it is sufficient that he designed the commission of an act which the law forbids. If an agreement be entered into in good faith, but under a misapprehension as to its legal effect or construction, it will, notwithstanding the error, be sustained as valid and obligatory upon the parties. The same is true of other transactions which involve an observance of special rules of law. If, for example, a creditor should execute a release to one of two joint debtors on the erroneous supposition that the other would still remain responsible, the legal rule would still be applied that a release to one redounds to the benefit of all, and the debt would be discharged. The jurisdiction of courts of equity in reference to cases of mistake is very extensive and of especial importance, but no relief will be granted when contracts are made or acts done under a pure mistake of law, unmingled with other causes of error or delusion. If, however, the mistake be attributable to fraud or imposition practised upon one of the parties, to undue influence, mental imbecility, misplaced confidence, or to misleading surprise, relief will generally be decreed in equity against the enforcement of the contract or the consequences of the transaction. So, when a person has entered into an agreement or executed some conveyance in respect to his property in entire ignorance of his title thereto, founded in the mistake of a plain and settled principle of law, the obligation assumed or interest transferred will not usually be deemed valid, but may be set aside as unjust. In some cases there may be a mistake of fact founded upon a mistake of law, and relief may be awarded on the former ground. Compromises of doubtful claims or disputed rights are generally sustained when the misapprehension or uncertainty in point of law is shared by both parties and no fraud is practised. Such mutual engagements must be entered into in good faith by all the parties concerned, and no unwarrantable advantage gained by one over another. Courts of equity favor the settlement of contested claims, if this be done fairly, and especially sustain family compromises and arrangements when there are conflicting interests in the disposition of property and mutual controversy as to the legal rights of the parties.

In regard to mistakes in fact a different rule prevails. It is a general principle that contracts made or acts done in mistake or ignorance of a material fact may be invalidated or rescinded. The law presumes that an acquaintance with all the matters of fact involved in every transaction cannot be acquired by the exercise of reasonable diligence, and therefore will not hold a party responsible for such knowledge. The application of this rule is not confined to cases where the mistake has been occasioned by fraud or surprise, but also extends to many cases where the parties act in mutual ignorance or misapprehension as to the facts involved in their transaction, but innocently and in good faith. Thus, a contract of sale entered into under the mutual mistake that the article sold was still in existence, whereas in fact it had been destroyed, would be annulled both at law and in equity. The same principle will apply to all other cases where the parties, upon the erroneous supposition of an existing right, bargain for its transfer or enter into other dealings in regard to it. But a sale will not be rescinded at law on the ground of common mistake of fact when steps have been taken to carry it into effect by the delivery of the article sold, unless this can be returned to the vendor, so as to restore him to the condition in which he was before the contract was made. If this be not possible, the purchaser will only be entitled to compensation in damages for the deficiency in the value of the goods. In order that relief may be given in any case of mistake of fact, the fact must be of a material character. The test of materiality is whether the parties, if the truth had been known, would have engaged in or completed the transaction. When the mistake is not mutual, but upon one side only, relief will not generally be granted unless it be occasioned by fraud or surprise practised upon the ignorant party by the one who is acquainted with the circumstances of the case. When the parties deal fairly, and there is no legal obligation incumbent upon the one to make a disclosure of his knowledge about the subject of their dealings to the other, the transaction between them will be sustainable. When the means of information are equally open to all parties, it is presumed that each relies upon his own vigilance, experience, skill, and enterprise. Thus, if a purchaser is aware that the real value of the commodity is considerably greater than the price demanded, and knows that the vendor is unacquainted with the circumstances which enhance the value, he is nevertheless under no obligation to communicate these facts to the vendor. But whenever confidence is justly reposed by one party in the other, if there be undue concealment, relief will be decreed in favor of the party misled. It is also an important branch of equity jurisprudence to reform written agreements and other instruments which by reason of a mistake of facts do not adequately or accurately express the intentions of the parties. If the error or defect be clearly proved to exist, and be material in its effect upon the rights and interests of the parties, the instrument will be corrected so as to be conformable to their real purpose. This is true whether the mistake be established by written or by parol evidence. For while it is a general rule of interpretation that oral evidence shall not be admitted to vary the terms of a written instrument, yet this is not to be applied to cases where the existence of the written instrument itself is the subject of controversy. The mistake may consist in embodying too many or too few provisions in the instrument, or in erroneously expressing the substance of the agreement or transaction. But if the language adopted expressed the intention of the parties at the time when the instrument was drawn, though its legal effect proves to be different from what was anticipated, relief will not be granted, since the mistake is one of law. Nor will the court interfere when the parties to the instrument purposely omit certain clauses, leaving them to depend on an oral understanding. A written agreement may be set aside or cancelled when it is founded upon a mistake of fact, and the enforcement of it would be unconscientious and unjust. In all such cases a court of equity will grant relief only as between the original parties to the transaction or those representing them. Geo. Chase. Revised by T. W. Dwight.

Mis′tletoe [Ang.-Sax. *mistletan*], a popular name for the parasitical, exogenous shrubs of the order Loranthaceæ, only a few of which are not true parasites. Of the three European species, the best known is the true mistletoe of tradition, the *Viscum album*, which grows upon apple, pear, linden, poplar, and other trees, but not very often upon the oak. This plant was revered by the ancient Teutons and Celts, and is still hung up at Christmas, and the old custom of kissing under it still exists. *Loranthus Europæus* is a common mistletoe in Southern Europe. The most common North American mistletoe E. of the Rocky Mountains is *Phoradendron flavescens*, but several other species of *Phoradendron* and *Arceuthobium* exist within the limits of the U. S., and many more of the former in Mexico. The whole order, which is not very clearly distinguished from Santalaceæ, contains some 25 genera and about 400 species, mostly tropical and largely American and Asiatic. The fruits of many contain a viscid substance from which bird-lime is sometimes made. This substance doubtless fixes the seeds to the bark of the tree upon which the future plant grows. The radicle pierces the bark, and draws nourishment from the sap of the tree. In some places the mistletoe seriously injures the growth of timber trees.

Mis'tral [Fr.; Provençal, *mistraou;* It. *maestro*, the "master"], a violent, gusty, and very dry N. W. wind that blows in winter over the western basin of the Mediterranean, often causing great damage by sea and land.

Mi'tau, or **Mittau,** town of Russia, the capital of the government of Courland, is situated on a sandy plain watered by the Buller-Aa. It is mostly built of wood, its houses either forming narrow, crooked streets or lying separately, surrounded by gardens. Its castle is a fine building, restored, or rather rebuilt, in 1739 by Biron. Its manufactures and trade are of no consequence. Pop. 23,847, most of whom are Germans.

Mitch'el (John), b. at Dungiven, county Derry, Ireland, Nov. 3, 1815, his father being a Unitarian clergyman; graduated at Trinity College in 1836; studied law and practised for several years; contributed to the local newspapers and the Belfast *Chronicle;* was editor of the Dublin *Nation* for several years; wrote *Hugh O'Neil* (1844), which brought him to public notice; in 1847 started the *United Irishman* in the interests of the advanced "Young Ireland party," and with the leaders was arrested in 1848, convicted of felony, and transported for fourteen years, but escaped in 1853; went to New York City, where he started the *Citizen*, advocating slavery, but gave it up, and started the *Southern Citizen* at Richmond, which failed; resided at Paris till the war broke out; returned to Richmond, edited the *Enquirer* in the interests of the South, and also lost two sons in its forces; returned to New York and established the *Irish Citizen*, which soon failed; went to Ireland in 1874, where, unmolested, he was elected and returned to Parliament from Tipperary; being declared ineligible, he was again returned to Parliament, but further action was rendered unnecessary by his death on Mar. 20, 1875. Also wrote *Jail Journal* (1854), *The Last Conquest of Ireland—Perhaps* (1861), edited the poems of Thomas Davis and James C. Mangan, and added a continuation of McGeoghegan's *History of Ireland.*

Mitchel (Gen. Ormsby McKnight), LL.D., b. in Union co., Ky., Aug. 28, 1810; resided in early childhood at Lebanon, O.; became clerk in a store at Miami, O., when twelve years old; obtained in 1825 an appointment to a cadetship at West Point, where he graduated in 1829 in a class which included Robert E. Lee and Joseph E. Johnston. He was assistant professor of mathematics at West Point until 1831; studied law, was admitted to the bar, and practised in Cincinnati until 1834, when he was elected professor of mathematics, natural philosophy, and astronomy at Cincinnati College. In the spring of 1842 he gave a course of public lectures on astronomy, which resulted in the formation of a society for the purpose of procuring a telescope and the erection of an observatory. Prof. Mitchel was commissioned to procure the necessary apparatus in Europe, where he contracted for the telescope with Merz and Mahler of Munich. The cornerstone of the observatory was laid by John Quincy Adams Nov. 10, 1843, on Mount Adams, within the city limits, and the building was formally opened with the new telescope Apr. 14, 1845. He afterward engaged in astronomical observations, the delivery of popular lectures on astronomy, and railroad surveys. He served as adjutant-general of Ohio 1848–49, and made two voyages to Europe (1853 and 1854) as chief engineer and agent of the Ohio and Mississippi R. R. The great work of Prof. Mitchel's life was the stimulus given to astronomy by his popular lectures, which were the direct cause of the establishment of observatories at Albany, Clinton, and Allegheny City. He established in July, 1846, a popular scientific journal entitled *The Sidereal Messenger;* in it, and in a school edition of Burritt's *Geography of the Heavens* which he prepared in 1849, Prof. Mitchel published his observations upon double stars. In 1848, acting upon a suggestion of Prof. Sears C. Walker, he invented a chronograph for automatically measuring and recording right ascensions by electro-magnetic mechanism, nearly at the time a similar apparatus was constructed by Mr. Locke. In 1849 he devised a declinometer, or apparatus for the accurate measurement of large differences of declinations. During the ensuing five years (1854–59) many zones of faint stars were observed by its means, and nearly 50,000 observations were accumulated. Among the other achievements of Prof. Mitchel may be mentioned his discovery of the duplicity of certain stars, notably Antares; his numerous unpublished observations of nebulæ, solar spots, double stars, and comets (chiefly made in 1848–49); and the invention of an apparatus for personal equation. In Aug., 1859, Prof. Mitchel accepted the post of director of the Dudley Observatory at Albany, N. Y., which had been erected in accordance with plans furnished by him five years before. In 1861 he tendered his military services to his country, was made brigadier-general of volunteers Aug. 9, and ordered to the department of Ohio. He distinguished himself by a forced march into Northern Alabama, seizing the railway between Corinth and Chattanooga, was made major-general Apr. 11, 1862, and given the command of the department of the South in September; but while making energetic preparations for the coming campaign was seized with yellow fever, and d. at Beaufort, S. C., Oct. 30, 1862. In November of the same year his name was conferred upon the observatory he had created at Cincinnati, which has since been rebuilt at Mount Lookout, and its support assumed by the city of Cincinnati. His principal publications were *The Planetary and Stellar Worlds* (1848) and *The Orbs of Heaven* (1851). A memoir was published in 1865 by Rev. P. C. Headley. Cleveland Abbe.

Mitch'ell, post-v. of Perth co., Ont., Canada, on the Goderich branch of the Grand Trunk Railway, 32 miles S. E. of Goderich. It has manufactories and a good trade in agricultural products. Pop. in 1881, 2284.

Mitchell, R. R. junction, cap. of Davison co., Dak. (see map of Dakota, ref. 7–F, for location of county), has Dakota University. Pop. in 1880, 320; in 1884, about 3000.

Mitchell, Ind. See Appendix.

Mitchell (David Bradie), b. in Scotland Oct. 22, 1766; removed in 1783 to Savannah, Ga., where he had become heir to an estate, his uncle, Dr. David Bradie, having been made a prisoner at Savannah, and having died from close confinement in an unhealthy, fever-stricken dungeon; was chosen solicitor-general of Georgia 1795; major-general of militia 1804; governor of Georgia 1809–13 and 1815–17; made a treaty with the Creeks 1818. D. Apr. 22, 1837.

Mitchell (Donald Grant), LL.D., "Ik Marvel," b. at Norwich, Conn., Apr., 1822; graduated at Yale in 1841; passed three years on a farm; travelled in Europe; studied law in 1846 in New York; published *Fresh Gleanings* (1847), *The Battle Summer* (1849), a record of his observations in 1848 in Paris; *The Lorgnette* (1850), *Reveries of a Bachelor* (1850), *Dream Life* (1851); was U. S. consul at Venice 1853–55; *Fudge Doings* was published in 1854; in 1855 he settled upon his farm near New Haven, Conn.; published (1863) *My Farm of Edgewood; Wet Days at Edgewood* (1864), *Seven Stories* (1865), *Doctor Johns* (1867), *Rural Studies* (1867), *Pictures of Edgewood* (1868), *About Old Story-Tellers* (1876). He is one of the most graceful and pleasing of American authors.

Mitchell (Elisha), D. D., b. in Washington, Conn., Aug. 19, 1793; graduated at Yale 1813; was a tutor there 1816–18; professor of mathematics in the University of North Carolina 1817–25, and afterwards professor of chemistry; was ordained to the Presbyterian ministry in 1821; State surveyor, and lost his life, June 27, 1857, on Black Dome, or Mitchell's High Peak, the highest point E. of the Rocky Mountains. He was buried upon its top.

Mitchell (Isidore Hyacinthe Marie Louis Robert). See Appendix.

Mitchell (John), M. D., F. R. S., b. in England; settled at Urbanna, Va., about 1700. Devoting himself to botany, his information was of value to Linnæus, who named for him the *Mitchella repens;* prepared a *Map of the British and French Dominions in North America* (1755); wrote *Contest in America between Great Britain and France, etc.* (1757), and *Present State of Great Britain and North America* (1767); published essays on *Different Colors of People, Potash,* and *Electrical Cohesion* in *Phil. Trans.*, vols. xliii., xlv., li. Returned to England about 1767, where he d. Mar., 1768. His tracts on botany were published in 1769. Among his unpublished MSS. a paper on the yellow fever as it appeared in Virginia in 1737, 1741, and 1742 was valuable to Dr. Rush in his experience with that epidemic in 1793, and was published in the *Am. and Med. Reg.*, vol. iv.

Mitchell (John), b. at Chester, Conn., Dec. 29, 1794; graduated at Yale College 1821; studied at Andover Theological Seminary, and became a Congregational clergyman; edited the New Haven *Christian Spectator* 1824–29; licensed to preach 1829; pastor of the First church at Fairhaven, Conn., 1830–36, and of the Edwards church, Northampton, Mass., 1836–42, when the state of his health forced him to abandon preaching, and he made a European tour, after which he settled at Stratford, Conn., and devoted himself, as far as feeble health would permit, to literary avocations. He published *The Practical Church Member* (1835), *A Guide to the Principles and Practices of the Congregational Churches of New England* (Northampton, 1838), *Letters to a Disbeliever in Revivals*, *Notes from Over the Sea* (2 vols., 1844), *Reminiscences of Scenes and Characters in College, by a Graduate of Yale of the Class of 1821* (New Haven, 1847), *My Mother, or Recollections of Maternal Influence* (1849), and a novel, *Rachel Kell, or the Disowned, a Tale of Country Life*, besides occasional sermons and magazine articles. In his later years he took some part in politics, and was once or twice a member of the Connecticut legislature. He was a gentleman of culture and rare excellence of character. D. at Stratford Apr. 28, 1870.

Mitchell (John Kearsley), M. D., b. at Shepherdstown, Va., May 12, 1798; graduated at the University of Pennsylvania 1819; made three voyages to China as ship's surgeon; settled in 1822 in Philadelphia; began in 1824 to lecture on physiology and institutes of medicine in the Philadelphia Institute; became in 1826 professor of chemistry there; in 1833 began to lecture in the Franklin Institute on chemistry applied to the arts; became professor of the theory and practice of medicine in the Jefferson Medical College 1841; author of many valuable lectures, essays, and scientific papers, a volume of poems, and a treatise *On the Cryptogamous Origin of Malarious and Epidemical Fevers*. D. at Philadelphia Apr. 4, 1858.

Mitchell (Maria), LL.D., b. at Nantucket, Mass., Aug. 1, 1818, of Quaker parentage; assisted her father in his favorite astronomical studies; gave special attention to study of nebulæ and of comets; received in 1847 a gold medal from the king of Denmark for the discovery of a comet; was afterwards employed upon the Coast Survey and the *Nautical Almanac*; became in 1865 professor of astronomy in Vassar College, and is a member of various learned societies.

Mitchell (Nahum), b. at East Bridgewater, Mass., Feb. 12, 1769; graduated at Harvard 1789; was admitted to the bar 1792; was member of the Massachusetts legislature 1798–1812, except one term in Congress 1803–05; State senator 1813–14; circuit judge 1811–19; chief-justice of common pleas 1819–21; treasurer 1822–27; commissioner for settling boundaries between Massachusetts and Rhode Island and between Massachusetts and Connecticut; librarian and treasurer of the Massachusetts Historical Society for several years, and filled numerous other posts of trust and responsibility. With Bartholomew Brown he edited the *Bridgewater Collection of Sacred Music*, which was for many years the standard in New England, more than 100,000 copies having been sold. Judge Mitchell will be chiefly remembered, however, for his *History of Bridgewater* (1840), the first extended and accurate town-history published in America, with genealogical tables. Judge Mitchell was descended from Experience Mitchell, prominent among the early Pilgrims. D. at East Bridgewater Aug. 1, 1853.

Mitchell (Hon. Peter), b. at Newcastle, New Brunswick, Jan. 4, 1824; entered public life in 1856, and has since been distinguished as a legislator and leader of the confederation party in his native province, in which he has held important public positions. In 1867 he became minister of marine and fisheries for the Dominion of Canada.

Mitchell (Robert B.), b. in Richland co., O., 1828; educated at Washington College, Pa.; became a lawyer; served as an officer of Ohio volunteers in the Mexican war; took an active part in the Kansas struggle, having gone thither in 1856; was treasurer of Kansas 1858–61; adjutant-general 1860–61; in the U. S. volunteer service during the war of 1861–65, at first a col., and then as brig.-gen.; was badly wounded at the Wilson's Creek fight, and was gov. of New Mexico 1865–67. D. Jan. 26, 1882.

Mitchell (Samuel Augustus), b. in Connecticut in 1792; removed in early life to Philadelphia; published a series of twenty-four geographical works which attained a wide popularity; d. in Philadelphia Dec. 20, 1868.

Mitchell (S. Weir), M. D., b. Feb. 15, 1829, in Philadelphia, a son of Dr. J. K. Mitchell; graduated in 1850 at the Jefferson Medical College; well known for his researches on serpent-poisons, nerve-physiology, the respiration of tortoises, etc., published in the *Smithsonian Contributions*, etc.; author of a work on the *Cryptogamous Origin of Malarious and Epidemic Fevers*, etc.

Mitchell (Stephen Mix), LL.D., b. at Wethersfield, Conn., Dec. 20, 1743; graduated at Yale 1763; was tutor there 1766–69; became a lawyer of his native town 1772; associate judge of the Hartford county court 1779, its presiding judge 1790; judge of the superior court of the State 1795, its chief-justice 1807–14; was in Congress 1783 and 1785; U. S. Senator 1793–95. D. at Wethersfield Sept. 30, 1835.

Mitchell (Thomas), b. in London May 30, 1783, was educated in Pembroke College, Cambridge, devoted his whole life to the study of Greek language and literature, and d. at Steeple-Aston, near Woodstock, May 6, 1845. In 1813 he began a series of essays in the *Quarterly Review* on Aristophanes; in 1820–22 he published translations of the *Acharnians*, *Knights*, *Clouds*, and *Birds*; in 1834–38 followed with an annotated edition of Aristophanes, and 1839–42 an annotated edition of Sophocles.

Mitchell (Sir Thomas Livingstone), D. C. L., F. R. S., b. in Stirlingshire, Scotland, in 1792; entered the army in Portugal at the age of sixteen; was aide-de-camp to the duke of Wellington, and afterwards on the staff of the quartermaster-general till the end of the Peninsular war; was afterwards sent back to Spain as a member of Sir Henry Torrens' survey of the fields of battle; in 1827 was appointed deputy surveyor-general of New South Wales, and ultimately became surveyor-general, filling that post until his death. In that capacity he conducted four daring expeditions into the great deserts of Australia; discovered Mount Byna, the vast region called Australia Felix, the Red, Peel, Nammoy, and Victoria rivers, explored the courses of the Darling and Glenelg rivers, and mapped out a practicable route between the colonies of Victoria and South Australia. He published in 1838 an account of his first three expeditions, and in 1848 his *Journal* of the heroic but unsuccessful effort to reach the Gulf of Carpentaria from Sydney. He also published several elementary geographical and military treatises, and an account of a "boomerang propeller" invented by him for steam vessels. He was knighted in 1839, made a colonel in 1854. D. at Park Hall, near Sydney, Oct. 5, 1855.

Mitchell (William L.), LL.D., b. Aug. 25, 1805, in Henry co., Va.; moved to Ga. when a boy; graduated at the State University in 1825; studied law, and was admitted to the bar; rose to distinction in his profession, and in 1867, after the death of Judge Lumpkin, was put at the head of the Lumpkin Law School, one of the departments of the State University. He was also one of the trustees of the university for a number of years. D. Oct. 31, 1882. A. H. Stephens.

Mitchell's High Peak. See Black Mountain.

Mitch'ill (Samuel Latham), M. D., LL.D., b. at Plandome, North Hempstead, N. Y., Aug. 20, 1764; took his medical degree at Edinburgh 1786; studied law, and was a commissioner to treat with the Six Nations 1788; became in 1792 professor of chemistry, etc. in Columbia College; was 1797–1813 editor of the *Medical Repository*; was in Congress 1801–04 and 1810–13; U. S. Senator 1804–09; held professorships in the College of Physicians and Surgeons, N. Y., 1808–26; vice-president of the Rutgers Medical School 1826–30; was active in establishing learned societies and in scientific observation; author of several works, mostly upon natural and physical science, besides numerous papers of value. He was one of the fathers of natural science in America. D. in New York Sept. 7, 1831.

Mite. See Acarus.

Mit'ford (Mary Russell), b. at Alnsford, Hants, Dec. 16, 1786; published in early life some volumes of poems, and then became a successful and highly popular prose-writer. Her principal works are *Our Village*, a series of pleasant sketches (5 vols., 1824–32), *Belford Regis*, *Country Stories*, *Recollections* (1852), *Atherton and other Tales* (1854), and a number of dramas, of which *Rienzi* (1828) was the most successful. (See her *Life and Correspondence*, edited by Rev. A. G. K. L'Estrange, 3 vols., 1869.) D. Jan. 10, 1855.

Mitford (William), b. in London Feb. 10, 1744; was educated at Queen's College, Oxford, where he studied little but Greek; retired to his Hampshire estate, and often sat in Parliament; became professor of history in the Royal Academy; wrote *An Inquiry into the Principles of Harmony in Languages* (2d ed. 1804), and *History of Greece* (5 vols., 1784–1815), long regarded as a standard work. It is written from the aristocratic standpoint. The best edition (8 vols., 8vo, 1838) has the notes of his brother, Lord Redesdale. Mitford d. Feb. 8, 1827.

Mith'ra, or **Mithras** [Sansk. *Mitra*], one of the earliest divinities of the Aryan race, whose worship, well known to the Indians in Vedic times, was considerably modified by the Mazdeism of Zarathrestra, subsequently greatly extended in the later Persian empire, and even became a favorite at Rome and the Western cities during the second and third centuries A. D. Mithra in the Zendic religion was originally the highest of the twenty-eight divinities of the second class in the Persian pantheon, and of the seven *amshaspands* subordinate to the Ized or ruler of the universe; but at a later day he became the equal, and ultimately the superior, of Ormuzd, and was identified with the Sun himself. Monuments of the Mithra-worship have been found in Rome, and even at Marseilles and Frankfort-on-the-Main, in which the god is represented as a beautiful youth clad in Phrygian garb, kneeling upon an ox, into whose neck he plunges a knife, and surrounded by allegorical emblems of the sun and the twelve signs of the zodiac. The "mysteries" of Mithra were a peculiar feature of this religion; they were celebrated chiefly at the winter solstice, Dec. 25. The Mithra-worship was suppressed by law in the Roman empire 378 A. D., but lingered for centuries in the East, until extinguished by Islam. (See Lajard's great work, *Le Culte de Mithra*, and K. O. Müller's *Monuments of Ancient Art*.)

Mithrida'tes VI., king of Pontus, surnamed EUPATOR, or more generally THE GREAT, b. at Sinope, the capital of the kingdom, in 136 B. C.; succeeded his father in 124 B. C.; conquered during the first period of his reign the territories along the northern coast of the Euxine as far as Chersonesus Taurica; incorporated the kingdom of Bosporus farther to the W.; turned then to the countries S. of the Euxine, attacked Cappadocia and Bithynia, and met here with the Romans. Three wars ensued, known in the history of Rome as the Mithridatic wars—namely (1) 88–85 B. C.; (2) 83–82 B. C.; and (3) 74–66 B. C. They are fully described under SULLA, LUCULLUS, and POMPEY, and ended with the complete defeat of Mithridates, who retreated behind the Euxine, and killed himself at Panticapæum, where he was besieged by his own son, Pharnaces, in 63 B. C. Nevertheless, the Romans considered him as the most formidable enemy the republic had ever had to contend with, and he was evidently a highly gifted man, both as a general and a statesman. He had received a Greek education and spoke twenty-two languages, and, although he was an Asiatic despot in all his measures and in his whole character, he had a fine taste for art and science. His collection of gems and his library of medical books were very celebrated.

Mit'la [Aztec, *Mictlan*, "place of the dead"], a vast ruined city in Mexico, 15 miles S. E. of Oaxaca, supposed to have been built by predecessors of the Zapoteco race, who now occupy that region. The monuments, consisting of immense palaces and temples, are adorned with a high degree of art, and are still in tolerable preservation. (See Charnay's *Ruines américaines* (1860) and the accompanying magnificent collection of photographs.)

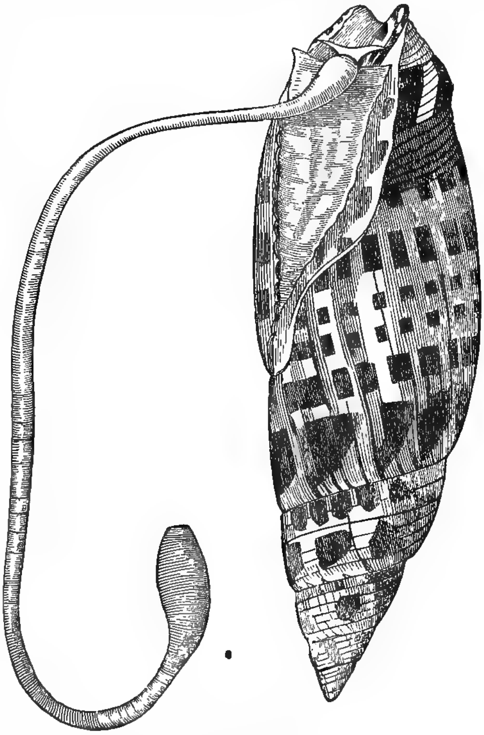
Mitrailleuse', a gun in which several barrels are combined in order to produce a greater effect by the rapid succession of a number of shots. Mitrailleuses existed as early as the fourteenth century. They were called *killing-organs* at that time; and artistically elaborated specimens, among which are also some breech-loaders, are found in the arsenals and museums of Vienna, Berlin, Rome, Constantinople, Moscow, and Sigmaringen. The Scaligers at the end of the fourteenth century, the Protestant princes of Germany in the Smalkaldian war, and Austria in the wars against Turkey, used this kind of guns. But the ancient mitrailleuse differs from the modern both in dimensions and in the position of the barrels. A peculiar kind of mitrailleuse was the *éspingol*, each barrel being loaded with several shots, which, by a slowly-burning charge, were discharged one after the other. The *éspingol* was used not only in the Middle Ages, but also recently—by the Danes in 1848–50 and 1863–64. At the storming of Düppel the Prussians took about thirty such guns. As it became evident, however, that a case-shot from a single-barrelled gun produced the same effect as the mitrailleuse, but in a higher degree, the mitrailleuse went generally out of use until recently an American inventor brought the old gun into fashion again under a new form. (See GATLING GUN.)

Mi'tre [Lat. *mitra;* Gr. *μίτρα*], in the Roman Catholic Church (Latin rite), the official head-dress of bishops and of certain abbots and other dignitaries. It has two points, and symbolizes the cloven tongues of fire which sat upon the apostles' heads at the great Pentecostal season. It is made of the richest and most costly materials.

Mitre (Gen. BARTOLOMÉ), b. at Buenos Ayres June 26, 1821; received a careful education, and early distinguished himself in literature; resided at Montevideo during the earlier period of the nine years' siege of that city, and aided in the defence both with sword and pen while engaged in historical researches; in 1846 proceeded to Bolivia, where he became a journalist and instructor in tactics at a military college, published a romance entitled *La Soledad*, and was engaged as an officer of the Bolivian army in a war with Peru; afterwards resided in Valparaiso, Chili, founded a newspaper, became favorably known as a poet, took an active part in politics, and was once exiled to Peru for his supposed connection with a conspiracy set on foot by the liberal party; returned to Montevideo in time to take an active part as colonel of artillery in the overthrow of Rosas at Monte Caseros, Feb. 3, 1852; was a leader in the movement at Buenos Ayres against Gen. Urquiza in the following September, resulting in the quasi independence of that province from the Argentine Confederation. Mitre engaged in journalism, literature, and politics; wrote his principal work, *Historia de Belgrano;* was minister of war under the administration of Obligado and Alsina, in which capacity he led the provincial forces in the campaign against Pres. Urquiza, which terminated in a defeat at Cepeda, Oct. 23, 1859, and resulted in the reunion of the seceded province to the Argentine Confederation, in accordance with the treaty of San José de Flores, Nov. 10, 1859. Mitre was chosen governor of Buenos Ayres in May, 1860; was made brigadier-general in July, and new difficulties having arisen with the federal government in 1861, he gained a signal victory over the national forces under command of Gen. Urquiza at Pavon, Sept. 11 of that year. As a consequence, Pres. Derqui was forced to resign, the "Confederation" was dissolved, Mitre became president *ad interim* in October, and called a congress, which met at Buenos Ayres May 25, 1862, and formed a constitution for the nation, which was thenceforth styled the "Argentine Republic." Mitre was elected president for six years in October, and administered the government with such skill and success that the country enjoyed a period of unprecedented prosperity. During the war between Paraguay and the triple alliance of Brazil, the Argentine Republic, and Uruguay he was for more than two years commander-in-chief of the allied forces. During the administration of his successor, Domingo F. Sarmiento, Mitre was sent as special minister to the Brazilian court to conclude a treaty. In the electoral campaign of 1874, Mitre presented himself as a candidate for the presidency, but being defeated by Dr. Avellaneda, he headed a rebellion which broke out Oct. 1. The attempt proved a failure, and the once-honored statesman accepted the amnesty tendered him, and has since remained in obscurity.

CHARLES A. WASHBURN.

Mi'tridæ (*Mitra*), a large family of gasteropod mollusks of the group Rhachioglossa. There are 400 living



Bishop's Mitre-Shell.

and 100 extinct species. The Philippine Islands are their geographical centre and principal habitat. The extra-tropical species are minute. The proboscis is long, and the animal emits an offensive, strong-smelling purple liquid. The bishop's mitre (*Mitra episcopalis*) is a fine shell from the Pacific Ocean.

Mit'rowicz [anc. *Sirmium*], town of Austria, on the Military Frontier, on the left bank of the Saave, has many interesting Roman antiquities, and is celebrated for the wines produced in its vicinity. Pop. 5200.

Mitsch'erlich (EILHARD), b. at Neuende, in the grand duchy of Oldenburg, Jan. 7, 1794; studied philology and Oriental history at Heidelberg, Göttingen, and Paris, but devoted himself from 1818 exclusively to chemistry. His discovery of the law of isomorphism—the same crystalline form covering two different substances, or one element being replaced by another without any palpable change taking place in the crystalline form—attracted the attention of Berzelius, on whose invitation he went to Stockholm in 1819. In 1821 he was appointed professor of chemistry at the University of Berlin, which position he held till his death, Aug. 28, 1863. His principal work is his *Lehrbuch der Chemie* (1829–41), besides which he communicated a number of valuable papers on dimorphism, the formation of artificial metals, benzine, the formation of ether, etc. to the *Transactions* of the Berlin Academy and to Poggendorf's *Annalen.*

Mitsukuri Rinsho. See APPENDIX.

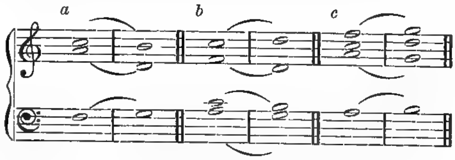
Mit'termaier (KARL JOSEPH ANTON), b. at Münich Aug. 5, 1787; studied law at Landshut and Heidelberg, and became professor of jurisprudence in 1811 at Landshut, in 1819 at Bonn, and in 1821 at Heidelberg, where he d. Aug. 28, 1867. He was member of the legislature of Baden for many years, and president of the German Parliament in Frankfort in 1849, but his influence was mostly due to his books, embracing almost every department of jurisprudence, and advocating throughout liberal and progressive measures, publicity of all legal proceedings, trial by jury, etc. His *Theorie des Beweises im peinlichen Prozesse* (1821), *Die Lehre vom Beweise im Deutschen Strafprozesse* (1834), and *Anleitung zur Vertheidigungskunst*, have been translated into several other European languages.

Mitt'weida, town of Germany, in the kingdom of Saxony, has large manufactures of linen, woollen, and cotton fabrics. Pop. 9218.

Mitylene. See MYTILENE.

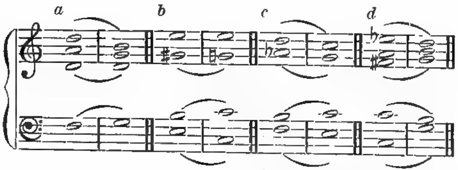
Mixed Cadence, in music, a term sometimes applied to such cadences as differ from those commonly known as the "perfect," the "imperfect," and the "plagal." The most common mixed cadence is that consisting of the subdominant harmony followed by that of the dominant, as in Ex. 1 at *a*, *b*, and *c*:

Ex. 1.



Several other mixed cadences may be seen at *a*, *b*, *c*, and *d* in Ex. 2:

Ex. 2.



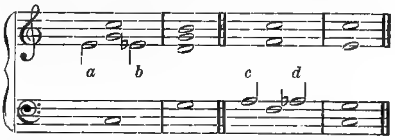
WILLIAM STAUNTON.

Mixed Mathematics, the application of mathematical principles to scientific investigations or to practical constructions in the arts. The term is used in contradistinction to the term pure "mathematics," which is applied to the investigations of the purely scientific principles of mathematics.

W. G. PECK.

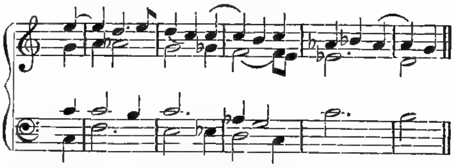
Mixed Modes. In modern music much of the variety and beauty of the harmony often arises from the mingling of chords belonging to one of the modes with the regular progressions of a composition written in the other. This occurs most frequently when in the course of a piece in the *major* mode certain harmonies are borrowed from the corresponding *minor*, and are substituted for those which would naturally occur. By a skilful use of this device many of the most striking and expressive traits of the minor mode may be transferred and incorporated into the major mode, thereby enriching that mode with new and singularly beautiful effects, and also surprising the ear by a train of unexpected and graceful turns of the harmony, such as could not be produced by the ordinary progressions of either of the modes exclusively. The chief characteristic intervals of the modes are the third and sixth, with the diminished seventh of the minor. Those belonging to the *minor*, when judiciously transferred into music of the major mode, as passing harmonies, not implying or leading into other keys, give a new interest and coloring even to very commonplace ideas, and are also the source of the grandest as well as the most elegant and pathetic developments of modern musical art. In its simplest form this mixing of modes occurs when, for instance, we change the *major* triad of the tonic or subdominant into the corresponding *minor*. Thus, in Ex. 1 the tonic triad of C major at *a* is exchanged at *b* for the tonic triad of C minor; and at *c* and *d* a similar change takes place with the subdominant triad:

Ex. 1.



It is quite evident here that the harmony at *a* and *c* belongs to the scale or key of C *major*, while that at *b* and *d* is derived from C *minor*. On the same principle are to be interpreted such progressions as those in Ex. 2, where several intervals of one mode are exchanged for those of the other (major yielding to minor), as indicated by the accidental flats. N. B. By *omitting* all the flats, the example will be reduced to simple major harmony, and may be so played:

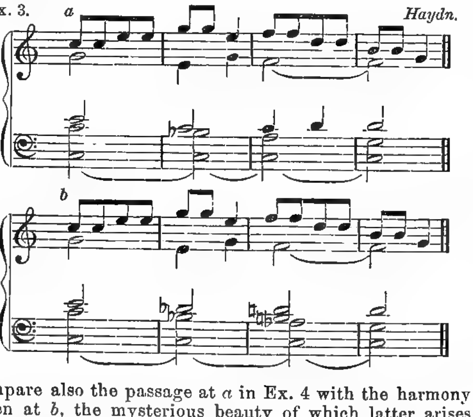
Ex. 2.



The superior richness of effect thus obtained by the mixture of modes will be still better apprehended by comparing the plain harmony of Ex. 3 at *a* with that at *b*, where two diminished sevenths are borrowed from the minor scales of F and C:

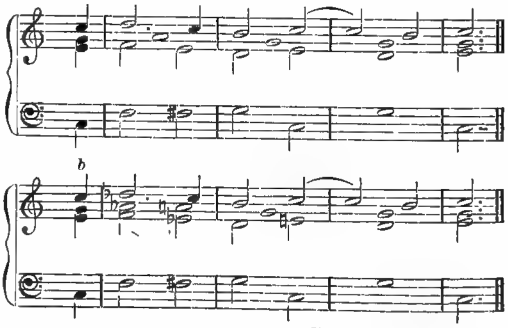
Ex. 3.

Haydn.



Compare also the passage at *a* in Ex. 4 with the harmony given at *b*, the mysterious beauty of which latter arises altogether from the adoption of two chords (in the first full bar) belonging to foreign scales:

Ex. 4.—*a*



WILLIAM STAUNTON.

Mixed Number, a number which is made up of an integral and a fractional part. Thus, $2\frac{1}{4}$ is a mixed number; numbers made up of an entire and a decimal part, as 2.25, are called *mixed decimals*. W. G. PECK.

Mixed Quantity, a quantity made up of an entire and a fractional part. Thus, $a + \frac{b}{c}$ is a mixed quantity. The numerical value of a mixed quantity may or may not be a mixed number; thus, in the example just given if $a = 2$, $b = 3$, and $c = 4$, the mixed quantity is also a mixed number equal to $2\frac{3}{4}$, but if $a = 2$, $b = 6$, and $c = 3$, the quantity is an entire number equal to 4. W. G. PECK.

Mixed Races. The union of parents belonging to two distinct varieties of mankind gives rise to a mixed race, which usually blends in some measure the bodily characters of the two parent races. The intermediate complexion, hair, and features thus produced may be best traced in the descendants of whites and negroes, from the yellow-brown, crisp-haired, mulattoes of the first generation, down to the children of whites and octoroons in the fourth generation, in whom negro blood may no longer be evident in the skin and hair, though a faint violet tinge of the finger-nails may remain. In crossing between races less different in complexion the absorption takes place sooner; thus, in Texas a single admixture of Mexican blood would be hardly observable beyond the second generation in a family otherwise of European descent. Thus, there is considerable justification for the popular terms describing mixed races as "half-breed," "quarter-blood," "octoroon," etc., as if their constitutions were made up by arithmetical fractions of the constitutions of their parents. This mode of estimation, however, though useful for general guidance, makes no approach to scientific accuracy. As in cross-breeds of other animals, so in man, some elements of parentage preponderate over others. One of the parent races may impress its type on the offspring more strongly than the other. In Russian Asia the hybrid race sprang from Russian fathers and Tatar mothers, and are described as showing the maternal Mongolian type, with high cheek-bones, oblique eyes, and coarse black hair, rather than the paternal Slavonic type. Such preponderance may also depend in some measure on sex. Thus, Nott and others maintain that the children of negro fathers and European mothers partake more of the negroid character than those of European fathers and negro mothers. Also, as is usual in crossed breeds of animals, reversion is apt to take place toward one or other of the parent types. This reversion is often noticed in a striking way in the same family where the parents are of different races, some of the children taking after one parent and some after the other. The four children of a negro father and an Arab mother, according to Pruner, were two of the father's and two of the mother's complexion. There are numerous accounts of mulatto and quadroon families where some of the children have strongly tended toward the negro and others toward the white type. Many observations on these subjects have been collected by Waitz and others, but the results hardly yet admit of generalization.

It may be laid down as a general rule that any two races of mankind are capable of producing offspring. This is in great measure actually proved by the existence of crossed races in endless variety of combination. Of these mixed races, experience shows that some become permanent populations, such as would continue and increase indefinitely if left to themselves without further foreign admixture. The Griquas of South Africa, mostly of European-Hottentot descent, and the Kuruglis of North Africa, of Turkish-Moorish descent, are mixed races well able to thrive. The *mestizo* populations of Mexico, Paraguay, Caraccas, mainly of Spanish mingled with indigenous American blood, have already some uniformity of type, and if undisturbed might no doubt in the course of ages, by intermarriage among themselves, become fused into a distinct sub-race of mankind, differing from the Southern European by a yellower complexion, stiffer and coarser hair, and a slightly oblique set of the eyelids. It is evident that such crossing of races, and the fusing of the result into a homogeneous whole, has been one of the most widely-acting processes which have shaped the national types both of the Old and New Worlds. It has, on the other hand, been argued that there are races between whom no permanent mongrel race can be formed, either because few children are born, or because such children or their descendants are short-lived or sterile. This may to a certain extent be true, but in such arguments the effects of social causes have sometimes been mistaken for physical failure. To take a striking instance, the scarcity of half-breeds in Australia between the indigenes and the white colonists has often been appealed to as proving these two races incapable of forming an intermediate race; but the real cause is now well known to have been that the blacks themselves habitually killed the half-caste children. In more ordinary cases, where half-castes, with the aspirations of a higher race and the status of a lower, are thrust by social pressure into a despised and disorderly life, the unfavorable effect of these conditions on the permanence and increase of their race is evident. Thus, it is not to be wondered at that in Western South America the Zambos, mongrels of mixed European, negro, and indigenous American races, should be prominent among the criminal class, or that in the East Indies the Portuguese-Malay half-castes should be sunk in a deplorable condition of misery, sloth, and moral degradation. In the second of these two instances it is probable that there is physical as well as moral failure. Apart from social causes, physical failure of a mixed race seems oftenest due to unsuitability of one of the parent races to the climate. Thus, while the English-Maori half-breeds in New Zealand are a strong and healthy race, the Dutch-Malay half-breeds in Java (known as Liplaps) are weakly in body and mind, and are said to die out in three generations. Yet the vitality of this mixed race, low as it is, is higher than that of the unmixed or creole whites in the district.

The terms invented to denote the various race-combinations in America are very numerous, but have been used so indefinitely that only a few of the principal ones have any ethnological accuracy. The first cross between white and negro are *mulattoes* (Spanish, *mulato—i. e.* "muled"); the second cross, white with mulatto, are *quadroons* (Spanish, *quarteron—i. e.* "quarter-bred"); the third class, white with quadroon, are *octoroons*, a word formed on the model of the last, to denote "eighth-bred" (Spanish, *octavon*). Here the negro blood is reckoned fractionally, but other terms, now out of use, were applied to the number of generations; *tercerons* were mixed-bred of the third generation, and therefore the same as the above quadroons, and *quinteroons* were mixed-bred of the fifth generation, children of white and octoroon. The race sprung from Europeans and indigenous Americans are usually known by the Spanish term *mestizos* (*i. e.* "mixed-bred," from Latin, *mixtus*); the next cross, of mestizoes with whites, being called *castizos* (*i. e.* "of good caste"). Even such simple terms as these cannot always be depended on, the crosses of Europeans with African and with native American blood being often confounded under the same designation. Among other well-known terms are *zambo* or *sambo* (Sp., meaning "bandy-legged"), which is applied either to the negro-American cross (such as negro with Aztec or Peruvian) or to the quarter-bred offspring of negro with mulatto. To this last combination, or to the mulatto, the name of *griffin* (from the composite nature of this fabulous animal) especially belongs. The term *saltatras* (Sp., "leap-back") is used for the quadroon-mulatto cross, as tending back toward the negro; but the similar word *tornatras* ("turn-back") describes a mestizo cross returning toward the white. The epithets *lobos* (Sp., "wolves"), *coyotes* (Mexican, "jackals"), and *cholos* (in Peru, "dogs") are bestowed more or less indefinitely on mixed populations of Spanish America. As if to increase the confusion, names of foreign peoples are brought in to describe native mixed castes. Thus, quadroons have been called *Moriscos* (Moors), while European-American mestizoes are known in Brazil as *Mamelucos* (Mamelukes), and elsewhere in South America as *Chinos* (Chinese). E. B. TYLOR.

Mixte'cas, a nation of Indians in Mexico occupying the mountains in the W. of Oaxaca, the E. of Guerrero, and the S. of Puebla. According to their traditions, they came from the N. some centuries before the Spanish conquest, and subdued the Popoloca or Chuchon tribes, the original occupants of the soil, who still occupy several mountainous recesses of the country. They at one time extended their empire to the Isthmus of Tehuantepec, but were driven from the valley of Oaxaca northward by the Zapotecas, and by the Aztecs southward from the valley of Puebla. They were a brave and warlike people, and are now intelligent Mexican citizens. Their language, which is of the Zapoteco family, is rich and melodious, and is still spoken in a considerable number of dialects. A grammar by Fray Antonio de los Reyes was published at Mexico in 1593, a copious dictionary was compiled by Fray Diego Rio, and several catechisms and religious treatises in the Mixteco language have been printed. The extensive region inhabited by these Indians, though forming part of three states, is currently known in Mexico as the *Mixteca*, which is divided according to altitude into *Alta* and *Baja*. The principal towns are Huajuapam, Yanhuixtlan, Tlaxiaco, and Topozcolula.

Mix'ture [Lat. *mixtura*], the name of one of the compound stops in a large organ. It consists of from two to five ranks of small metallic pipes, tuned in double and triple octaves, thirds, and fifths above the diapasons. In this respect it resembles the sesquialtera and furniture stops, but differs from them in being higher and shriller. The two smaller ranks of the mixture (sounding the 26th and 29th) usually change or "break" on the upper part of the organ scale (or range of keys) into the 19th and 22d—*i. e.* an octave lower. The necessity of such "breaking" in these compound stops arises from the obvious fact that the pipes in their upper ranks would otherwise be too small and feeble in sound to be of any practical use.

William Staunton.

Mnemon'ics, or **Mnemotech'ny** [Gr. *μνήμη*, "memory," and *τέχνη*, "art"], the art of assisting recollection by methods of association. The first to devise anything of this sort is said to have been Simonides, the Greek poet (500 B. C.), of whose method both Cicero (*De Orat.*, ii. 86–88) and Quintilian (*Instit.*, xi. 2) have spoken. In modern times we have various attempts to the same end, the most important of which are the *Memoria Technica* of Richard Grey (1730; new ed. Lond., 1851) and *The New Art of Memory* by Gregor von Fainaigle (Lond., 1812), whose system was further carried out by Aimée Paris in his *Principes et Applications diverses de la Mnémotechnie* (Paris, 1833). The common aim in all these methods is to associate the thing to be remembered with something else which it is thought can be more easily recalled. Thus, the method of Simonides was to form in mind the picture of some large place or building whose different parts in their order were to be made perfectly familiar to the thoughts, and then whatever was to be committed to memory was to be associated with these parts in the same order. In this way, by recalling at will the various parts of the building, it was supposed that the recollection of the various objects therewith associated might be brought equally within our control. This was deemed specially advantageous to an orator or a listener in committing to memory the parts of a discourse in their order, which parts are hence still spoken of as in the first *place*, the second *place*, and so on. The method of Fainaigle was similar to this, to which he added, in order to recall dates or sums, the substitution, for the numbers, of letters which were to be formed into words. The following table will illustrate how this may be done:

a	*e*	*i*	*o*	*u*	*au*	*oi*	*e*	*ou*	*y*
1	2	3	4	5	6	7	8	9	0
b	*d*	*t*	*f*	*l*	*s*	*p*	*k*	*n*	*z*

This table is at the outset, and once for all, to be committed thoroughly to memory, so that the numbers corresponding to the letters may at any moment be recalled. Then, if one wishes to recollect, *e. g.*, that Constantinople was captured by the Turks A. D. 1453, let him think of Constantinople as Constantino*boli*, because the letters *b o l i* represent in the table 1453.

While the dependence of the recollection upon the law of association is undoubted, very little practical utility will be found in any of these artificial and arbitrary methods devised for any mind by another. Each mind should notice what sort of associations are most facile to itself, and should use these in its own way for the assistance of its memory. "If any one ask me," said Quintilian (*Instit.*, xi. 40), "what is the only and great art of memory, I shall say that it is *exercise* and *labor*. To learn much by heart, to meditate much, and, if possible, daily, are the most effective of all methods. Nothing is so much strengthened by practice or weakened by neglect as memory."

J. H. Seelye.

Mnemotechnics. See Mnemonics.

Mnioltiltidæ. See Warblers, in Appendix.

Mo'a, the name given by the natives of New Zealand to a large bird, of the former existence of which they preserve a tradition, and which by that tradition is referred to the eagle tribe. The name, however, has been without much question assigned, and is now accepted as belonging, to species of the family Dinorthidæ, gigantic extinct birds related to the family of the Struthionidæ or ostriches, and at the present day represented in the islands by the smaller Apterygidæ. The *Dinornis giganteus* was from ten to twelve feet in height, and an ordinary hat would have made a suitable egg-cup for one of its eggs. The discovery, however, which has been recently made in the same region of a bird of prey of correspondingly gigantic dimensions may yet possibly raise a doubt to which bird the traditional name really refers. (See Dinornis and Notornis.)

Edward C. H. Day.

Mo'abites, descendants of Moab, the son of Lot by his eldest daughter (Gen. xix. 37). An idolatrous people, they were hostile to the Israelites, in spite of the relationship between them. The southern boundary of the Moabites was the brook Zered (the modern Wady el-Ahsy), which empties into the S. E. corner of the Dead Sea. Their territory was about 20 miles from E. to W., and at one time extended as far N. (50 miles) as the mountains of Gilead. At the time of the Exodus they had lost about 30 miles of territory, having been driven S. of the Arnon by the Amorites. Subdued by David, they regained their independence after the dismemberment of the Hebrew kingdom, and disappear from history after the conquests of Nebuchadnezzar (604–561 B. C.).

The Moabite Stone, which celebrates the achievements of one of their kings, Mesha (about 900 B. C.), is one of the most interesting discoveries of modern times. It was a block of black basalt, 3 feet 8½ inches high, 2 feet 3½ inches wide, and 1 foot 1$\frac{78}{100}$ inch thick, rounded at both ends, and inscribed with thirty-four lines of Hebrew-Phœnician writing. It was found Aug. 19, 1868, by the Rev. Mr. Klein at Dhiban (the ancient *Dibon*), just N. of the Arnon. Though broken to pieces afterwards by the Arabs, six-sevenths of the inscription have been preserved, and two-thirds of the stone itself are now in London. This inscription proves that the Greeks added nothing to the alphabet which was brought to them from the East. (See Ginsburg's *The Moabite Stone* (1870; 2d ed. 1871); and Tristram's *The Land of Moab* (1873).)

R. D. Hitchcock.

Mobeetie, cap. of Wheeler co., Tex. (see map of Texas, ref. 8–E, for location of county). Pop. not in census of 1880.

Moberly, city and R. R. centre, Randolph co., Mo. (see map of Missouri, ref. 3–G, for location of county), 146 miles W. of St. Louis, has flouring-mill, planing-mill, woollen-factory, brewery, and shops of the Missouri Kansas and Texas R. R. Pop. in 1870, 1514; in 1880, 6070.

Moberly (George), D. D., D. C. L., b. about 1803; graduated at Baliol, Oxford, 1825, of which he subsequently became fellow, tutor, public examiner, and select preacher. In 1835 he was appointed head-master of Winchester School, and in 1869 succeeded Dr. Hamilton as bishop of Salisbury. Among his publications are *A Few Remarks on the Proposed Admission of Dissenters into the University of Oxford* (1834), *Introduction to Logic* (1838), *A Manual of Prayers for the Use of the Scholars of Winchester College* (1840), *Essay on the Law of the Love of God* (1854), *Sermons on the Beatitudes, Unity of the Saints, Bampton Lectures for 1868*, etc.

Mobile, important R. R. and commercial centre, and port of entry, cap. of Mobile co., Ala. (see map of Alabama, ref. 8–A, for location of county), on the river of the same name, near its entrance into Mobile Bay, 30 miles above the Gulf of Mexico, 140 miles E. of New Orleans, at the point of junction of the Mobile and Ohio, the Mobile and Montgomery division, and the New Orleans and Mobile division of the Louisville and Nashville R. R., situated on a sandy plain gently rising from the river's bank, is regularly built, streets partly paved, lighted, and shaded, has a fine supply of water from Spring Hill, 5 miles distant, has 6 lines of street railroad, and enjoys a climate usually healthy, though subject to ravages of yellow fever at intervals ever increasing in length, owing to the skill and vigilance of the local board of health. The suburbs embrace several beautiful hills, upon which are the summer residences of the wealthier citizens, and which afford a healthful resort in the hot season. The harbor has been extremely shallow, admitting to city wharves only vesesls under 13 feet draught, while larger vessels had to remain 25 miles distant in the bay. The harbor improvements voted by Congress in 1873, however, dredged a secure passage for vessels drawing 17 feet. Mobile has 5 banks, 9 insurance companies, 34 churches, 1 daily and several weekly newspapers, an extensive public-school system, besides numerous private schools, a Jesuit college at Spring Hill, an academy conducted by the Sisters of the Visitation at Summerville, and 7 other Catholic schools, Barton Academy, the Alabama Medical College, 4 orphan asylums, a port hospital, a U. S. Marine Hospital, the Providence Infirmary, a spacious custom-house, affording accommodations for the post-office and the U. S. courts for the southern district of Alabama, a fine market-house, with municipal offices above, an extensive export trade, chiefly in cotton and naval stores, of lumber, rosin, turpentine, and coal, the latter growing rapidly, and a moderate import trade, of which coffee forms the most important article. The annual entrances from foreign ports average 228, and from domestic ports 200, of which 92 sailing vessels and 25 steamers are owned here, the latter plying upon the Alabama, Tombigbee, and Black Warrior rivers. Market-gardening has became a leading industry, having increased from $54,000 worth in 1877 to nearly three-fourths of a million in 1883. Kindred industries, such as box- and barrel-making, are also growing rapidly. The manufacture of cypress shingles is also becoming important. The census of 1880 showed 91 manufactories; capital, $525,708; average number of hands employed, 704; wages paid during the year, $261,643; value of products, $1,335,579.

Mobile was founded in 1702 by Lemoine, Sieur de Bienville, as the capital of Louisiana, which it continued to be until 1723. By the treaty of 1763, England acquired N. E. Louisiana with Mobile as its capital, but the city was captured in 1780 by the Spanish general Galvez, was confirmed to Spain by the treaty of 1783, and was thenceforth regarded as belonging to Florida. It was occupied, however, by Gen. Wilkinson Apr. 13, 1813, as belonging to Louisiana, the population being then only 500. In Dec., 1819, it was incorporated as a city, having then a population of about 2500; had in 1860, 29,258 inhabitants; in 1870, 32,034; in 1880, 29,132. In 1870 the area of Mobile was reduced and the name changed to Port of Mobile. (For an account of the remarkable naval engagements near Mobile during the civil war see Farragut, Admiral D. G., and the names of the several fortifications.)

Erwin Craighead, "Mobile Register."

Mobile Bay is 35 miles in length from its northern extremity to its outlet into the Gulf of Mexico, and 8 or 10 miles in width. The long, narrow sand-isthmus of Mobile Point, at the extremity of which is Fort Morgan (which see), is the barrier which divides it from the Gulf of Mexico. The entrance is between the point and Dauphin Island, 3 miles distant, on which is Fort Gaines. The bar, over which 18 or 20 feet of water can be carried, is 4 miles seaward. The depth of the bay generally is 12 to 14 feet, but a small area exists near the outlet having 20 to 21 feet, which forms the anchorage of the "cotton fleet" which (loaded by lighters from Mobile) bears away the rich cotton-crop of Alabama. The Alabama River (which see) enters by numerous arms, separated by mud-flats, the head of the bay. On one of these arms, called Mobile River, the city of Mobile is situated. The channel over the bar of this river, at Choctaw Pass, is maintained by dredging, as also that over the Dog River bar, a few miles lower down. The margins of Mobile Bay, generally low, but sometimes rising in bluffs, are thickly wooded with pine forests, with mixture of live-oak and magnolia (especially near the water), and are not destitute of beauty. The south-eastern portion of the bay, very shallow, is known as Bon Secours Bay. Between the western main shore and Dauphin Island, Grant's Pass leads into Mississippi Sound (which see), the steamer route to New Orleans.

Mobile Point. See Mobile Bay and Fort Morgan.

Mobile River is formed by the confluence of the Alabama and Tombigbee rivers. A few miles below the junction it divides into two branches, of which the eastern is called Tensas, and both branches subdivide into several others, which meet in a common embouchure at the head of Mobile Bay. The total length of the Mobile River proper is 50 miles. The city of the same name is on its W. bank.

Mobilier, Crédit. See Crédit Mobilier.

Mö'bius (August Ferdinand), b. at Schulpforta, Saxony, Nov. 17, 1790; became professor of astronomy at the University of Leipsic in 1815, and d. there Sept. 26, 1868. His principal works are *Der Barycentrische Calcul* (1827), *Lehrbuch der Statik* (1837), and *Die Hauptsätze der Astronomie*, often republished.—His son, Theodor Möbius, b. at Leipsic June 22, 1821, studied philology, especially the old Scandinavian language and literature, and became professor of the Scandinavian languages and literatures at Leipsic in 1859, and at Kiel in 1865. He wrote *Ueber die ältere Isländische Saga* (1852), *Catalogus Librorum Islandicorum* (1856), *Analecta Norroena* (1859), a Danish grammar (1871), and published an edition of the Elder Edda (1860) and *Fornsögur* (1860).

Moc'casin [Indian], **Water-Moccasin,** or **Cotton-mouth,** the *Ancistrodon* (*Toxicophis*) *piscivorus*, a very venomous serpent of the Southern States, found in swamps and wet places, and even in water. It is two feet long, dark-brown above and gray beneath. It attacks all within its reach, and its bite is justly dreaded. The name moccasin is also given to the *Ancistrodon atrofuscus* of the Southern States and to the copperhead (*Ancistrodon contortrix*), both dangerous reptiles.

Mo'cha, town of Arabia, province of Yemen, on the Red Sea, in lat. 13° 19′ N. It has a good, strongly fortified harbor, and is the most celebrated coffee-market in the world. More than 10,000 tons of the finest coffee are annually exported. Pop. about 7000.

Mocha-Stone, or **Moss-Agate,** a beautiful variety of chalcedonic quartz, remarkable for the dendritic ("tree-like") markings seen within it, which mimic mosses, foliage, and even landscapes. These appearances are not, as popularly supposed, traces of vegetation, but are due to an infiltration of oxide of manganese or of iron. The name Mocha-stone is attributed to a locality in Arabia whence it is mostly obtained.

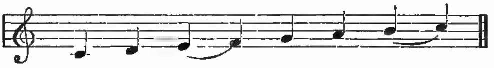
Edward C. H. Day.

Mock'ing-Bird, the *Mimus polyglottus*, a singing-bird of the family Turdidæ, found in the warmer parts of North America. It is a rare summer visitant in the more Northern States. The mocking-bird is the best American song-bird, and is one of the best singers in the world. Besides its own delightful song, it imitates the notes of most other birds. It readily learns to whistle tunes, but not to talk. The mocking-bird bears confinement well, especially if taken when young from the nest. Its song in the cage is often superior to that of the wild bird. The mocking-bird is a handsome, but by no means a brilliantly colored, bird.

Mocks'ville, cap. of Davie co., N. C. (see map of North Carolina, ref. 2–E, for location of county), 25 miles N. of Salisbury. Pop. in 1870, 300; in 1880, 562.

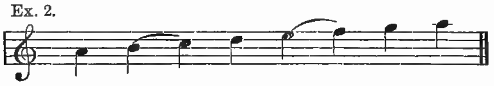
Mode [Lat. *modus*], in modern music, a certain scheme or arrangement of sounds in direct order from grave to acute, or *vice versâ*, under which they are recognized by the ear as forming a complete and conclusive series extending over eight degrees, and having a distinctly marked beginning, progress, and ending. If the eight principal sounds comprised in the octave were *equidistant*, there could be only one such mode or system, inasmuch as a series of notes commencing on D or E, etc. would differ only in point of acuteness (not in quality) from another series commencing on B or C. But as it is, the degrees or intervals of the octave are *not* equal, for we find in the octave five whole tones and two *semi*tones; and it is also essential that these tones and semitones shall fall into a certain order to render the scale available in modern music. That order may be twofold—viz. major and minor—and these two forms of scales constitute the two *modes* now in use, the third above the tonic being in the one case major, and in the other minor. The pattern scale of the *major* mode, with the places of its two smaller intervals or semitones marked by slurs, is given in Ex. 1:

Ex. 1.



From no other starting-point but C can such a scale be formed by the use of the natural notes or intervals, inasmuch as the relative positions of the two semitones between the third and fourth and the seventh and eighth could not be preserved if we should commence on D, E, F, or any other degree of the scale. A scale in this mode may, however, be founded on any other degree of the scale by the use of such sharps or flats as may be found necessary to raise or lower the incorrect intervals, and thus bring them into conformity with the normal scale of C. (See Transposition.) The pattern scale of the *minor* mode (that of A), with the peculiar position of its two semitones, is shown in Ex. 2:

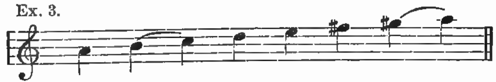
Ex. 2.



A scale such as this also can be formed from the natural notes only by beginning on A. But (as in the major mode) it may take its rise from any other degree of the scale by using the necessary sharps or flats to bring its intervals into correspondence with the model.

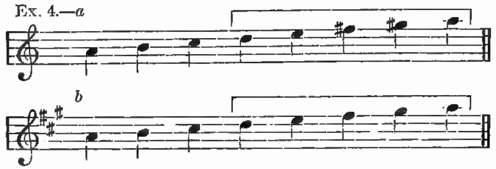
The distinction between the two modes springs chiefly from the dissimilarity of the respective thirds, sixths, and sevenths, which are all (in their natural or original form) one semitone greater in the major than in the minor mode. These intervals are therefore the characteristic and essential elements of the modes when those modes are viewed in their simple and normal condition. But in the minor mode there is a certain peculiarity which does not appertain to the major—viz. a difference between the ascending and the descending scale—and also an indeterminate or equivocal quality in the sixth and seventh of the scale which is too subtle to be regulated by any fixed rule. In the ascending scale (see Ex. 2) it will be observed that the seventh is *minor*, and for that reason cannot be a true and satisfactory "leading note" to the octave above. The interval of a whole tone thus existing between the seventh and the eighth is disappointing and repulsive to the cultivated ear, and especially so in final cadences. To obviate this, it becomes necessary to bring the seventh one semitone nearer to the octave by means of a sharp, thereby constituting it a leading note similar to that of the major mode. But by this process we create a new difficulty by widening the distance between the *sixth* and the seventh into the interval of an extreme second. But this also admits of adjustment by raising the sixth also a semitone, which places it now midway between the fifth and the seventh. With these modifications the ascending minor scale of A will stand as in Ex. 3:

Ex. 3.



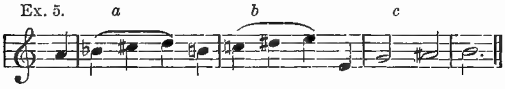
It is a valid objection, however, to this sharping of the *sixth* that it renders the upper part of the minor scale identical with that of the major; for it is evident that by such a process every trace of a distinctively minor mode is obliterated. On comparing the altered minor scale at *a*, in Ex. 4, with the major scale at *b*, it will be seen that *from the fourth upward* there is no difference whatever:

Ex. 4.—*a*



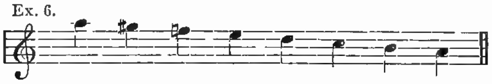
For this reason composers of instrumental music often prefer the use of the natural to the sharped sixth; and this not only when the progression of the melody turns *downward* from the sixth, but also when it *ascends* to the sharped seventh and the octave. Some illustrations of this are given at *a*, *b*, and *c* in Ex. 5:

Ex. 5.



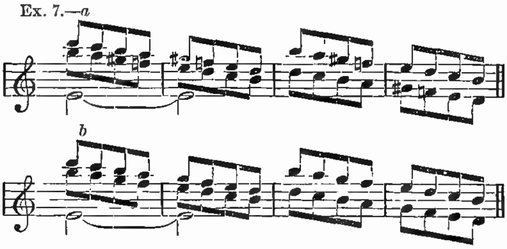
A similar difference of opinion and practice prevails also in regard to the *descending* scale in the minor mode. Ordinarily, the seventh and sixth are taken in their natural form—*i. e.* unchanged by sharps, etc. But frequently the progression by the sharped seventh and the *natural* sixth is preferred, and in numerous cases is even imperative. In this form, as shown in Ex. 6, one of the strongest characteristic intervals of the mode is preserved—viz. the sombre and plaintive effect of the sixth:

Ex. 6.



In this form of the descending minor scale a singularly beautiful effect is produced by a chain of thirds or sixths, as at *a* in Ex. 7, while no such effect is observable when the same movement is taken on the natural notes of the scale, as at *b*:

Ex. 7.—*a*



WILLIAM STAUNTON.

Mo'dena [anc. *Mutina*], a large town of Northern Italy, capital of the late duchy of Modena, which embraced the territory between Venetian Lombardy, the Pontifical States, Tuscany, and the Mediterranean, and the duchy of Parma and the kingdom of Sardinia. The town itself, situated in lat. 44° 38′ N., lon. 10° 56′ E., lies in a low, moist, but healthy and fertile plain between the Secchia and the Panaro, with which rivers it is connected by canals. From the ramparts, now converted into a public promenade, the views are fine; the city itself is well built and the streets and squares are spacious. The Duomo was begun in 1099; adjoining it is the famous tower La Ghirlandina, 315 feet in height, one of the seven highest in Italy. In this tower is said to be preserved the Secchia which forms the subject of Tassoni's *Secchia Rapita*. The ducal palace, a vast and grand mediæval edifice, contains a picture-gallery with many fine works by the best Italian masters; a library of 100,000 volumes and 3000 MSS.; a museum with 26,000 ancient medals; also archives of the greatest interest. Some of the churches deserve special notice. Modena boasts many learned societies, and is conspicuous for her educational and charitable institutions, but has little trade or manufacturing interest. The history of this town may be traced to 200 B. C. Mark Antony besieged it without success. Cicero names it as one of the most splendid of the Roman cities. In the reign of Constantine it began to decline, and so rapidly that St. Ambrose in 387 speaks of it as "but the corpse of a city." Its mediæval history is stormy and changeful. In 1288 the Marquis Obizzo d'Este became ruler of Modena, and in 1291 also lord of Reggio. From this time, with a few brief intervals, the house of Este, in one or another of its branches, governed Modena and its dependencies until 1859. Among the most distinguished of its dukes should be mentioned Borso (1452), afterwards also duke of Ferrara, a true friend of peace and of the people; Alphonso I. (1476), a man of great genius and valor and the patron of Ariosto; Alphonso II., a brilliant and magnificent prince, whose court was made illustrious by the poet Tasso. Modena formed a part of the Cisalpine republic, but in 1814 was restored to Francis IV., who in 1831 dishonored himself by his faithlessness in the terrible affair of Ciro Menotti. Francis V. was driven out by his subjects in 1848, restored soon after by Austria, and obliged to fly a second time in 1859, soon after which Modena by a popular vote was annexed to the kingdom of Italy. A canal connects it with the Ponaro, the Po, and the Adriatic. Pop. in 1881, 58,058.

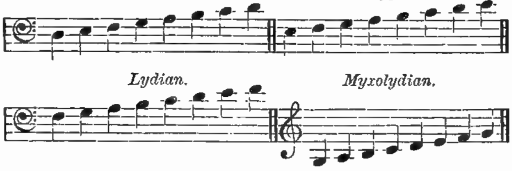
Modes, Ecclesiastical, in music, the designation of the ancient scales on which, for many ages, the music of the Church was founded. Each of these scales or "modes" consisted of five tones and two semitones in the octave, as in the modern diatonic scale. The notes, however, were taken in their natural order (*i. e.* without flats or sharps) from whatever degree of the scale the series might commence. The relative position of the two semitones to the five tones would therefore differ very much in the various scales, and music written in one scale could not be transposed to another without the loss of most of its distinguishing features. A scale commencing on C, for instance, was quite different in structure from another commencing on D or E, etc. (See MODE.) There were, in reality, as many modes as there were scales; and with one exception they were unlike either the major or minor modes of our modern system. Each scale had its own peculiarity of form, and from that form resulted a certain quality or effect—solemn, tranquil, joyous, or plaintive—which constituted its special characteristic.

The ancient Greeks, amid their confused, bewildering, and almost unintelligible speculations concerning musical intervals and their mathematical proportions, finally classified or arranged them in these several species of octaves now called "modes." At first, there appear to have been only four, and these were for the most part named after the nations to which their origin was referred. These four modes were the Dorian, Phrygian, Lydian, and Myxolydian (or mixed Lydian). The first of these commenced on D of the scale, the second on E, the third on F, and the fourth on G; and their scales, with the places of the semitones marked by slurs, were as in Ex. 1:

Ex. 1. *Dorian.*—D, E, F, G, A, B, C, D.
Phrygian.—E, F, G, A, B, C, D, E.
Lydian.—F, G, A, B, C, D, E, F.
Myxolydian.—G, A, B, C, D, E, F, G.

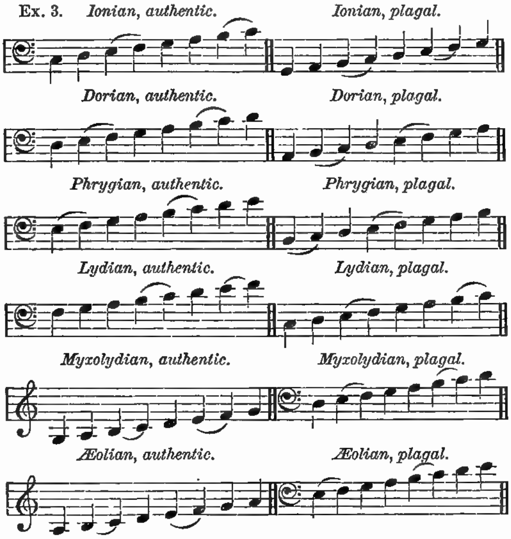
See the same expressed in notes in Ex. 2:

Ex. 2.



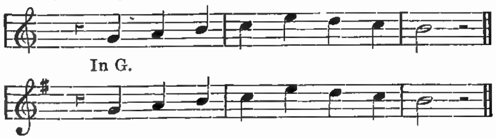
To these four modes were added by the Greeks two others called the Ionian and the Æolian; and subsequently, the Hypo-Dorian (from ὑπό, "below"), the Hypo-Phrygian, Hypo-Lydian, Hypo-Myxolydian, Hypo-Ionian, and Hypo-Æolian, making in all twelve modes by *name*, though (as will be seen presently) several of them appear to be only duplicates. Of these modes, St. Ambrose in the fourth century selected the original four for use in the Church—viz. the Dorian, Phrygian, Lydian, and Myxolydian. And, as the plain-chant or *canto-fermo* in the early ages seldom exceeded a fourth or fifth in its compass or range of inflection, the limits of these scales were held to be sufficient for all the psalmody and liturgical demands of public worship. Eventually, however, the Church melodies were extended so as to embrace the remaining degrees of the octave, and in the course of time they assumed a character so nearly resembling what was afterwards called the "florid style" as to require much more space than that afforded by the narrow bounds of the recognized modes. This led to the introduction by St. Gregory (200 years after St. Ambrose) of the other modes above mentioned, though with some modifications and under a different nomenclature. The old modes, including also the Ionian and Æolian, were called "authentic," or principal, while the added modes were styled "plagal," or subordinate; and on these twelve modes (or those most approved) the chants and other music of the Church were written. Hence, the rise of the well-known "Gregorian Tones" or chants, eight in number. These were short strains consisting of intonations (or introductory notes), reciting notes, mediations, cadences, and usually several terminations or "endings." The plagal modes always commenced on the fourth below the corresponding authentic, as if three notes below were added to the authentic, and the three upper ones omitted. In Ex. 3 all these modes, both authentic and plagal, are exhibited, and the different places of the semitones are marked, as before, by slurs:

Ex. 3.



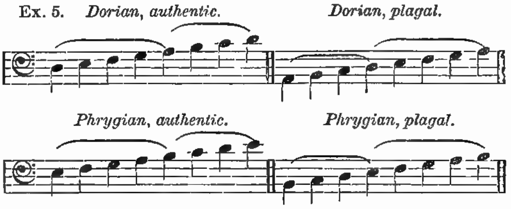
On noticing this example critically, it will be seen that several of the plagal scales are apparently mere duplicates of some of the authentic. Thus, the Lydian plagal and the Ionian authentic are the same in *notes*, as are also the Myxolydian plagal and the Dorian authentic. It is not to be presumed, however, that these scales are in all respects identical. There is a probability, at least, that the Greeks made use of some kind of *temperament*, by which certain intervals of these similar scales were so far modified as to give them a special coloring or effect, and thus enable any one to recognize in them a real distinction. It is known also that the melodies, cadences, and general mode of treatment proper to the plagal were not also considered appropriate to the authentic; and thus a difference might exist, though the notes were in other respects the same. This may perhaps be better understood by observing that something similar often occurs even in modern music, an illustration of which is given in Ex. 4, where the *same train of notes* will be found to suggest different ideas, according as the notes are regarded as belonging to the key of C or that of G:

Ex. 4.



There is also a further point of difference between authentic and plagal modes, which are alike in notes. Each mode was treated by the ancients as consisting of two parts or divisions, the lower and the upper. In the authentic, the lower division comprehended five degrees of the scale, and the remainder (commencing on the fifth) formed the upper division. But in the plagal the case was reversed—the lower division comprising only four degrees, while the upper (commencing on the fourth) contained five. The difference is shown in Ex. 5, where the divisions in two of the modes are marked by strokes:

Ex. 5.



From this it will be evident that the whole course of a melody in a plagal mode would give an impression essentially different from one in an authentic mode, even though the two should coincide in notes, and seem to form one and the same scale.

In some of the modes it was found expedient to correct the imperfection of the fourth and fifth by the use of an accidental flat or sharp. In Gregorian music the *flat* is often expressly written in cases where the note requires it; but it is probable that the *sharp* was in many cases used, though not actually written. Some diversity of opinion exists relative to the names of two or three of the modes—*i. e.* whether those names are rightly applied. Dr. Burney, for instance, remarks that "the Æolian is improperly called the Lydian." The same writer also gives similar variations of name to several of the other modes. In the present article the names employed are those which are adopted by Kollmann and other modern writers of repute. WILLIAM STAUNTON.

Modes'to, Stanislaus co., Cal. (see map of California, ref. 4–B, for location of county), on the Visalia division of the Central Pacific R. R., 29 miles S. E. of Stockton, has some manufactures and a considerable trade in agricultural products. Pop. in 1880, 1693.

Mod'ica [*Sar Mohac, Motycat, Motuca*], a large town of Sicily, in the province of Syracuse, is a flourishing and industrious city, situated in a fruitful valley surrounded by lofty hills, about 20 miles W. S. W. of Noto and about 10 miles from the sea. The streets are narrow, but the buildings are good, and among them are some fine churches, a municipal palace, and a strong castle from which a charming view may be obtained. The trade here is considerable, and the exports are wheat, barley, olive oil, hemp, etc. The chief interest of Modica for the traveller, however, consists in the remains of a troglodyte city not far distant in the direction of Spaccaforno. On both sides of a valley rich in fruit trees and walnuts may be seen numerous chambers cut in the solid rock, story above story, which in their ruined condition present a most picturesque aspect. Some of the chambers communicate internally with each other, but are very difficult of access from without. Pop. in 1881, 41,231.

Modiglia'na, town of Italy, in the province of Florence, situated on the little stream Tramazzo. It is somewhat famous for the pretended exchange—by the Orleans family, then living here in the palace of the Borghi—of the daughter of the duke of Orleans for the son of a certain Chiusini, a man in very humble life. According to this story, it was this boy who in 1830 ascended the throne of France under the name of Louis Philippe. Pop. 6742.

Mo'docs, a tribe of American Indians, originally of the Klamath nation; since 1846 they have been known as a treacherous and murderous band, 151 persons being reported killed by them while occupying their old ground along the Klamath Basin, through which ran the old emigrant-road to Oregon. In 1864 a treaty was made with these Indians (and other tribes), requiring them to settle upon Klamath reservation. The particular band known as Capt. Jack's party complied reluctantly, but soon after, for the alleged reason of bad treatment of the agents, left the reservation. In the latter part of Nov., 1872, an ineffectual attempt was made by the Indian superintendent to induce this band to return, when military aid was invoked to compel them. A demand for surrender was refused, and they opened fire upon the troops, inaugurating the Modoc war. The Indians then retreated to the lava-beds, and maintained a successful defence until June 5, by which date nearly all were captured, but not without a loss to their pursuers in killed and wounded of 132, including Gen. Canby and Peace Commissioner Thomas, who were treacherously murdered in April while attending an appointed conference with Capt. Jack and others about 1 mile from the camp. Capt. Jack, with three others, was executed Oct. 3, 1873. In 1884 there were 94 Modocs in Indian Territory and 151 in Oregon, all wearing citizens' dress.

Modugn'o, town of Southern Italy, in the province of Bari delle Puglie, about 5½ miles S. W. of the town of Bari. The inhabitants are industrious, and possess some small manufactories. Pop. 9082.

Modula'tion [Lat. *modulor*, to "compose" or "sing in measure"]. In music, this term signifies the process by which, in any part of a composition, a transition is made from one key to another. Every piece of music, if regular, is written in some particular key, and to that key several others are so nearly related that short excursions may be made into them from the original key. From a *major* key we may thus proceed to the keys of its dominant, subdominant, relative minor, and the relative minors of the dominant and subdominant—*i. e.* from the key of C major, for instance, we may proceed to the keys of G, F, A, E, and D. And from a *minor* key we may pass to the keys of its dominant and subdominant, its relative major, and the relative major of its dominant and subdominant; *i. e.* in the key of A minor we may modulate to the keys of E, D, C, G, and F. It is to be observed, also, that a transition may be made into any of these nearly-related keys by the intervention of a single chord —viz. that containing the leading note and dominant of the new key. Transitions of this kind, being simple and easily effected, constitute what is called *natural* modulation. *Abrupt* modulation occurs when a transition is made into some more remote key, as from C major to A♭; or by a sudden change of the mode, as from C major to C minor, A minor to A major, etc. *Enharmonic* modulation takes place when one and the same note (with the harmony dependent upon it) is treated as equivocal or having two distinct relations, and therefore capable of progression in two entirely different directions. This occurs, for instance, when F♮ is assumed to be E♯, or when B♭ is regarded as A♯, and a transition is unexpectedly made in accordance with the *latter* instead of the former quality of the note or chord. (See MUSIC.) WILLIAM STAUNTON.

Mod'ulus [Lat.], in mathematics, a constant factor of a variable function, which serves to distinguish the function from others of the system. W. G. PECK.

Modulus of a System of Logarithms, a constant number which, multiplied by the Napierian logarithm of any number, will give the logarithm of that number in the given system. (See LOGARITHMS.) W. G. PECK.

Modulus of Elasticity. If a force is applied to elongate a bar of any material whose cross-section is 1, and whose length is L, the amount of elongation will depend upon the nature of the material and upon the intensity of the force. If the applied force is not too great, the bar will recover its original length when the force ceases to act; and the greatest strain to which a bar may be thus subjected and recover its original length is called the limit of the body's elasticity. If we denote the total elongation of the bar in question when acted upon by a force W, within the limit of the body's elasticity, by l, we shall have the relation

$$W=\frac{l}{L}\times E, \text{ or } E=\frac{WL}{l},$$

in which E is constant for each particular material; this constant is called the *modulus of elasticity*. (See Mahan's *Civil Engineering*, Appendix, note D.) W. G. PECK.

Modulus of a Number. M. Mourey has shown that every directed line can be represented by a number of the form $a+b\sqrt{-1}$, in which the length of the line is equal to $\sqrt{a^2+b^2}$, and in which $\frac{b}{\sqrt{a^2+b^2}}$ is the sine and $\frac{a}{\sqrt{a^2+b^2}}$ the cosine of the angle that this line makes with some given initial line. The number $\sqrt{a^2+b^2}$, which is constant for all lines of a given length, is called the modulus of the number $a+b\sqrt{-1}$. W. G. PECK.

Mö'en, an island of Denmark, in the Baltic Sea, is separated from Seeland by Ulfsund, and from Falster by Grönsund. Area, 84 square miles. Pop. 15,000. It is one of the most fertile and (on account of its elevated and diversified surface) one of the most beautiful of the Danish islands, presenting a row of bold bluffs toward the Baltic. Principal town, Stege.

Mœ'ris, a lake, or rather an artificially formed reservoir, in Central Egypt, in the province of Fayoom, connected with the lake Birket-el-Kehroon, and through that with the Nile, which during its time of inundation fills the reservoir with water. Herodotus gives a magnificent, though, as it seems, not correct, description of it.

Mœ'sia, province of the Roman empire, corresponding to the present Bulgaria and Serbia, and bounded N. by the Danube, E. by the Black Sea, S. by the Hæmus (Balkan Mountains), and W. by the Save. It was originally inhabited by tribes of Thracian race, with whom the Romans came in contact after the conquest of Macedonia, but it was not made a Roman province until the time of Augustus. It was then divided into Mœsia Inferior (Bulgaria) and Superior (Serbia), fortifications were constructed along the Danube, and several Roman settlements were formed. Among its towns the most remarkable were Tomi on the Black Sea, whither Ovid was banished; Durostorum (Silistria) on the Danube; and Singidunum near the present Belgrade. In 250 A. D. began the invasions of the Goths, and in 395 several Gothic tribes settled in the country and received the names of Mœso-Goths. The country still remained a province of the East Roman or Byzantine empire until, in the seventh century, the Slavonians and Bulgarians entered it and formed the kingdoms of Serbia and Bulgaria.

Mœso-Goths. See ULFILA, by CLEMENS PETERSEN.

Mof'fat (ROBERT), b. at Inverkeithing, Scotland, in 1795; went to South Africa as a missionary in 1817, and passed nearly sixty years in successful labors among the Bechuanas and other barbarous tribes, into whose languages he translated portions of the Bible, hymn-books, and other religious books. He published in 1842 a *History of Missionary Labors in South Africa*, widely read in England and America. A testimonial, amounting to £5800, was presented to the venerable missionary in 1873, in recognition of his lifelong labors. D. Aug. 10, 1884. The wife of the celebrated explorer, Dr. Livingstone, was a daughter of Mr. Moffat. She d. Apr. 27, 1862.

Mofras', de (EUGÈNE **Duflot**), b. at Toulouse, France, July 5, 1810; studied at Paris; entered the diplomatic service as attaché at Madrid, where he became a friend of the learned Navarrete, from whom he acquired an interest in the geography of N. W. America, and in 1839 set out on a scientific voyage to Mexico, California, and Oregon, of which the result was the valuable work *Exploration d'Oregon et des Californies* (Paris, 1844, with an atlas).

Mogadore', or **Sui'rah,** town of Morocco, on the Atlantic, in lat. 31° 30′ N. It is regularly laid out and well built, and has an excellent harbor. It is strongly fortified, and has extensive exports of wool, gum, wax, hides, gold-dust, feathers, and almonds. Pop. about 15,000.

Moglia'no Ve'neto, town of Northern Italy, in the province of Treviso, situated in a fertile district, about 6 miles S. of the town of Treviso. Pop. 5611.

Moguer', town of Spain, in the province of Huelva, is an old and decaying place, but it is of interest in the history of Columbus, who lived here for some time, as it was from Palos, the port of Moguer, that he started on his great voyage. Pop. 7332.

Mogul', or **Great Mogul,** is a corruption of "Mongol," and is the name generally applied by Europeans to members of that Mohammedan dynasty of Mongolian descent which in the sixteenth century established itself in Hindostan under Baber, a descendant in a direct line from Timour or Tamerlane, and which here founded a great and powerful empire. The most remarkable of the rulers of this dynasty were Akbar (1556–1605), Jehan-Geer (1605–27), and Aurung-Zeb (1658–1707), during which period the empire comprised almost the whole of Hindostan. In Europe these monarchs were generally known under the name of the *Great Mogul*, and the most extravagant stories of their riches and power were current. Their magnificence became proverbial, and hints at their wealth and splendor are frequent in all comic writers of that period of European literature. The title used by themselves was the Persian *shah*, and Persian was the official language. After the death of Aurung-Zeb the power of the dynasty rapidly declined, and at the beginning of the present century the Mogul empire was but a shadow of itself. When the English conquered India they gave the dynasty a pension, but after the rebellion of 1857, in which it was implicated, they sentenced the last Great Mogul to transportation to Rangoon, though he was a man of ninety years of age, and put the twenty-four other members of the family to death.

Mohacs', town of Southern Hungary, on the Danube, the centre of a considerable trade in cattle, grain, wine, and other agricultural products, which are shipped hence to Vienna. Pop. 12,047. In history it is famous as the place where two of the most momentous battles in Hungarian history were fought (Aug. 29, 1526, and Aug. 12, 1687). In the former the young and chivalric king, Louis II., with an army of hardly 25,000 men, attacked, without waiting for the reinforcements which approached under John Zapolya, a Turkish army of 200,000 men, under Solyman the Magnificent. After a protracted and desperate fight the Hungarian army was cut entirely to pieces, the king in his flight drowned in the Csellye, and a large portion of the country fell into the hands of the Turks. In the latter battle the Austro-Hungarian army under Charles of Lorraine completely defeated the Turks and put an end to their dominion in Hungary.

Mo'hair [of Oriental origin], the wool of the Angora goat and the fabrics which are woven from it. This kind of goods, formerly made only in the East in a small way and imported sparingly into Europe by way of Venice, is of late years extensively produced in Great Britain and other parts of Europe, and much less extensively in the U. S. Mohair is combed like coarse wool or worsted and alpaca. It is mixed in many cases with cotton or silk. The raw material brings a high price, and might doubtless be produced abundantly in the U. S.

Moham'med, or **Mahom'et,** the founder of *Islam* (which is the Arabic name for the Mohammedan creed), the prophet of *Moslem* (which is the name the professors of this creed give themselves), b. at Mecca April 20, 571. The tribe to which he belonged, the Koreish, was one of the most distinguished Arabian tribes; the guardianship of the Caaba was hereditarily entrusted to it. But his family, Hashem, was poor. His father, Abdallah, died before he was born, and he lost his mother, Amena, a nervous and sickly woman, when he was six years old; two years after, also, his grandfather, Abd-el-Moottalib, died. Adopted by his uncle, Abu Taleb, he made a journey with him to Syria, where he formed the acquaintance of a Christian monk. With another uncle, Zubeir, he afterwards travelled much in Northern Arabia for mercantile purposes. In his twentieth year he served in the war against the Beni Kinanah. In his twenty-fifth year he was a shepherd on the pasture-fields in the vicinity of Mecca. At this time he received some employment from a linen-trader named Saib, and having been recommended as a smart and trustworthy man to a rich widow, Kadijah, he undertook the management of her business. She liked him so well that she married him, though she was fifteen years older than he; and, considering himself rich enough, Mohammed now (595) gave up business and devoted himself to religious meditations. The time was very favorable for the formation of a new and more spiritual religion. Star-worship, demon-worship, and idolatry had overclouded the old monotheism of the Arabs, and brought the religious instincts of the people into manifold confusion. Judaism and Christianity were widely spread over the peninsula, and whole tribes were known to have adopted them—not in their genuine form, but mixed up with rabbinical subtleties and heretical fancies. Mohammed took part from early youth in this general fermentation of the religious state of his nation. From the thirty-fifth year of his age he often retired to a cave in Mount Hara, near Mecca, and here he spent hours and days in solitary contemplations. In his fortieth year he received the first revelation concerning the new truth, but afterwards such revelations, accompanied by epileptic fits and spasmodic convulsions, continued to occur throughout his life; from them originated the Koran (which see). He began to preach in 609, and entered upon his *public* ministry in 612. His first believers were his wife, Kadijah, some relatives and friends, among whom were Abubekr and Ali, but their number was small; and when he proclaimed himself publicly in Mecca as a prophet, he met with ridicule and violent opposition, especially from his own tribe. It soon became necessary for his adherents to emigrate and seek refuge in Abyssinia, and he himself was banished from the city, and lived concealed in a cavern in the vicinity. But when, after three years' banishment, he was allowed to return, he met with better fortune. Of great importance was the conversion of a number of pilgrims from Medina, who carried the new faith back to their native town, where they preached it with decided success. Nevertheless, his position in Mecca was still very dangerous. Kadijah died Oct. 23, 619, but, although he felt much grief at her death, he soon after married several other wives. Abu Taleb also died. The famous Hedjrah, or flight from Mecca to Medina (250 miles N.), occurred Sept. 20, 622, from which date the Mohammedan era begins. He now built a mosque, instituted religious rites, and consolidated the congregation: but having failed in his attempt at gaining over the numerous Jews residing in and around Medina, he determined to propagate the new faith, not by preaching, but by fighting, and began to attack the surrounding Arabian tribes, the Jews, and the Christians. He was very successful. In a contest with the Meccans at Bedr in 623 he was victorious, and although he met with a heavy reverse at Ohod in 624, and was even besieged in Medina in 627, yet he made a favorable peace with the Meccans in the following year. Meanwhile, he had opened connections with different foreign courts—Abyssinia, Byzantium, and Persia. The results of these missions and some campaigns which ensued were small, but when the Meccans broke the peace during a war between the prophet and Abyssinia, he conquered the city; and this event furthered more than any other the conversion of all the Arabian tribes and their consolidation into one people. In 632 he undertook his last great pilgrimage to Mecca at the head of 40,000 disciples, shortly after which he d, at Medina, June 8, 632. He left ten wives (of fourteen, which he had in all), but only one child, Fatima, the daughter of Kadijah and the wife of Ali. He was buried in the mosque of Medina, and at his tomb thousands of pilgrims gather every year. Of the numerous biographies of Mohammed, the best are Sprenger's, in German (3 vols., 1861, 1862, 1865), and Muir's, in English (4 vols., 1861). Clemens Petersen.

Mohammed, the name of four Ottoman sultans: Mohammed I. (1413–21), b. in 1387, the youngest son of Bajazet I. When his father died, one year after the battle of Angora (1402), and Tamerlane retired behind the Oxus, the Ottoman empire was divided between the four sons of Bajazet, but Mohammed defeated and put to death his three brothers, and became sole ruler in 1413. Although his whole reign was filled with wars against the Venetians, Bedreddin the Reformer, Mustapha the Pretender, Persia, etc., he was a peace-loving man, and showed great nobleness towards his allies and towards rebels, whom he forgave. He built the mosque of Adrianople.—Mohammed II. (1451–81), b. at Adrianople in 1430, the son and successor of Amurath II., was one of the most brilliant princes of the Ottoman dynasty—valiant, sagacious, equally able in the camp and the council. He spoke Arabic, Persian, Greek, and Latin, was well versed in geography and mathematics, understood drawing, even painted; nevertheless, those features of his character which impress the student most strongly are his cruelty and treachery. On May 29, 1453, he took Constantinople by storm, and gave it up to plunder and massacre for three days. Although fearfully devastated, the city recovered, nevertheless, very soon; he rebuilt it, made it his capital, and induced the Greeks, in whose hands were the commerce and industry of the place, to return by proclaiming religious freedom. After the death of John Hunyady, who successfully checked his progress in the N. W. for some time, he conquered Serbia and Bosnia in 1458; in 1460, Morea; in 1461, Trebizond. From Scanderbeg he sustained some very heavy losses, but after the death of this prince he also conquered Albania in 1467. In 1474 he took Caffa and Tana from the Genoese; in 1480, Negroponte and Lemnos from Venice, and the Ionian Islands from Naples. His attack on Rhodes in the same year was repelled, but he was just preparing for a second attack and an invasion of Italy, where he had already occupied Otranto, when he d. in a campaign against Persia. He conquered in all twelve independent empires and 200 cities.—Mohammed III. (1595–1603), b. in 1556, the son and successor of Amurath III.; conquered Erlan Sept. 21, 1596, and defeated the Germans and Hungarians in the battle on the plains of Keresztes, Oct. 23 same year. Under him the signs of decadence of the Turkish power began to show themselves in insubordination in the army, corruption in the administration, and intrigues in the ruling family.—Mohammed IV. (1648–87), b. in 1642, the son and successor of Ibrahim I., who was strangled by the Janizaries. He was a man without talent or energy, and took no interest in the affairs of the country. In the beginning of his reign the wars with the Venetians, Hungarians, and other nations were conducted with various success, but afterwards the Turkish army met with fearful reverses. Defeated at Chotyn in 1673, routed completely by Sobieski before the walls of Vienna (Sept. 12, 1683), beaten at Mohacs (Aug. 12, 1687), it marched to Constantinople, deposed Mohammed, and raised his brother, Solyman III., to the throne. Mohammed was kept in prison till his death, in 1692.

Moham'medanism, the religion founded by Mohammed, and professed, according to recent estimates, by about 180,000,000 human beings, teaches, in opposition to the various idolatrous religions which it has succeeded in superseding, a strong theism, essentially the same as that taught by Judaism and Christianity, from which it was borrowed. "There is no God but God" is the principal tenet in Mohammedan dogmatics, and he has created the world and the immortal soul of man, whose life on earth he shall judge and reward or punish in a future state. But the further development of this idea, especially of the relation between God and mankind, is narrow, fantastic, and arbitrary. Before the almighty power of Allah the free-will of man vanishes; Mohammedanism is fatalism. Nevertheless, the idea of fate has often inspired the Moslems with a fanatical enthusiasm, while it seems never to have affected in a restrictive manner the progress of their civilization, and appears seldom to have weighed down individual life with its crushing burden. The reason is, that although the primitive conception of the idea is very decided and even rigid, its further development is fortunately vague, wanting in consistency, and apt to evaporate in mysticism. In a similar manner, the idea of the justice of Allah is narrowed—not to say desecrated—by the childish and sensuous pictures of heaven and hell with which Mohammed inflamed the imagination of his followers; and the only thing which saves these pictures from becoming ludicrous and detestable is a certain delicate poetical atmosphere which surrounds them and softens their coarser lines. Least attractive is the delineation which the Koran gives of Divine Providence in history. Immediately after the above passage follows, "and Mohammed is his apostle." Adam, Noah, Abraham, Moses, and Christ are acknowledged as prophets sent by God, but Mohammed is the fulfilment of all prophecy and the Koran the final revelation. To a Christian the whole of this part of Mohammedanism is a pitiful delusion; in the eyes of modern science it is only miserable stuff.

As the dogmatics of Mohammedanism, so also its morals, contain many points which command respect and sympathy, though they too are often disfigured by narrowing peculiarities of time and place, and sometimes even distorted by wanton vagaries. The five principal commandments in the moral code of Islam, symbolized in Mohammedan art by the hand with its five fingers, are prayer, almsgiving, fasting, pilgrimage, and war against the infidel. The influence which these five commandments exercised in the time when they actually bore sway over the Moslem mind is very apparent in history. But at present only the first of them has maintained its authority intact; that of the last is entirely lost, and that of the three others is disputed, or at least subject to commentaries of a doubtful character. Travellers in Mohammedan countries speak with unqualified praise of the earnestness, sincerity, and devotion with which the Moslem performs his prayers several times a day after careful ablution, kneeling on his prayer-carpet in any place if he cannot go to the mosque, and with his face turned toward Mecca. But it must be remembered that prayer is the only form of divine service which Islam possesses, especially since pilgrimage has gone somewhat out of use; Mohammedanism has no priesthood and forms no Church. The two most striking features, however, of Moslem ethics are the practice of polygamy and the usury law. The Koran knows not that polygamy is so far from being natural—not to speak of its relation to any higher ideal—that Nature herself begins to eliminate it from the animal kingdom long before even the faintest foreboding of a moral consciousness has dawned upon the soul. The Koran acknowledges and encourages polygamy, and it exists in all Mohammedan countries, with all its deteriorating and weakening consequences, spiritual and bodily. The usury law is very curious. The Koran forbids the Moslem to lend money on interest. As, now, modern civilization is based on the fact that there exists an interest-bearing capital which allows certain members of society to devote themselves not to the mere maintenance, but to the progress of society, and as this state of affairs has never been doubted by any moral philosophy originating from the Christian theology, it is surprising to hear that there is a moral code which condemns it, and which at times has enforced its opposite commandments without hurting the progress of industry, commerce, and general civilization. (For further information see KORAN, MOHAMMED, SHIAHS, and SUNNAS.) CLEMENS PETERSEN.

Mohave Desert, a large basin of Southern California, mostly in San Bernardino co., having but few streams, none of which reach the sea. It is not a desert, for in large areas of this region abundant pasturage is found, and water is readily obtained in wells. Parts of this valley are intensely hot in summer.

Mohave Indians, a tribe of the Yuma division of the Pima-Apache stock, having a large reservation in Arizona, on the Colorado River, known to the Spaniards as Jamajabs and Cosninas. They numbered, in 1884, 813 in Ariz. on the Colorado River reservation, 300,800 acres. In addition to these, there are about 700 Mohaves in Ariz. not under an agent.

Mohave (or **Mojave**) **River** rises in the San Bernardino Mountains in San Bernardino co., Cal., flows N., and finally sinks in an alkaline marsh in the so-called Mohave Desert.

Mohawk River, the principal affluent of the Hudson, surpassing in volume that stream above its confluence. It rises in Lewis co., and after a generally eastward course reaches the Hudson at Cohoes. It affords valuable water-power, and flows through a valley famed for its beauty.

Mohawks, Mahaquas, or **Maquas,** the most eastern of the original "Five Nations" of New York, who constituted the "League of the Hodenosaunee," or confederacy of the Iroquois. They were called in their own language Agmeque or Gagmeque, and were the most warlike tribe of the league, inhabiting chiefly the valley of the river which bears their name. Allies of the English in their wars with the French and American colonists, they, after the war of the Revolution, migrated to Canada (1784) with their chief, the celebrated Joseph Brandt, and settled on the Grand River, where several hundred still remain. Portions of the Bible were translated into Mohawk by Brandt, and grammars have been published by Bruyas and Marcoux.

Mohee'lev, or **Moghilev,** government of Russia, situated on the Dnieper, between lat. 52° and 55° N. Area, 18,158 square miles. Pop. 1,117,398. The ground is a level or slightly undulating plain, of an elevation of from 600 to 900 feet, and forming the watershed between the Dnieper and the Dwina; the soil is very fertile and the climate mild, which circumstances, together with the industry and enterprise of the inhabitants, have made Moheelev one of the richest provinces of Russia. Of the whole area, nearly one-half (46 per cent.) is under crops; nevertheless, considerable quantities of grain are usually imported, on account of the immense consumption of the distilleries. Corn, timber (especially masts), and cattle are largely produced, and carried on the Dnieper to the ports of the Black Sea. The cultivation of hemp is very important; hemp and hempseed oil are exported to Riga.

Moheelev, or **Moghilev,** town of Russia, the capital of the government of Moheelev, on the Dnieper. It is a handsome and well-built town, the see of a Greek bishop and a Roman Catholic archbishop, and the residence of many of the Russian nobility. It has many good educational institutions, several manufactures, and a lively export trade in corn, hides, leather, wax, and honey through the ports of the Baltic and those of the Black Sea. The preparation of skins is an old and famous industry of the place. Its cathedral, built in 1780, is a very fine building. Pop. 40,500, of which two-thirds are Jews and the rest White Russians.

Moheelev, or **Moghilev,** town of Russia, in the government of Podolia, on the Dniester. It is a beautifully-situated and thriving town, with 18,200 inhabitants, of whom nearly one-half are Jews and the rest Little Russians. The Jews carry on a very brisk trade. Corn, wine, spirits, timber, etc. are bought in Galicia and sold in Odessa, and manufactured goods are imported from Austria and sent to the interior of Russia. The Little Russians are mostly occupied with agriculture, gardening, wine-making, and mulberry culture.

Mohe'gans, or **Mohic'ans,** a tribe of Indians formerly inhabiting a considerable part of New England and part of what is now New York as far W. as the Hudson River. They were of Algonkin stock, and were tributary to the Iroquois. They were, after the advent of the Europeans, broken up into small bands, and generally appear to have been friendly to the colonists and hostile to their Indian enemies. A remnant of this tribe long dwelt at Norwich, Conn., where a few of their descendants still remain. Relics of the Mohegans are found also with other tribes, especially at Green Bay, Wis., and among the Munsees in Kansas. Uncas, their most famous chief, was a Pequot by birth.

Mohl, von (JULIUS), b. at Stuttgart Oct. 28, 1800; studied Oriental languages, especially Persian and Chinese, at Tübingen, Paris, London, and Oxford; was made professor of Oriental languages at Tübingen in 1826, with permission to remain in Paris, which at that time, under the leadership of De Sacy, was the great school for Oriental learning in Europe; became professor of Persian at the Collége de France in 1845, and in 1852 director of the Oriental department of the national printing-office. His principal work is his edition of Firdousi's *Shah Nameh* (Paris, 1838–66) for the *Collection Orientale.* His *Vengt-Sept Ans des Études Orientales,* published after his death (Jan. 4, 1876), is also of great interest.—His brother, HUGO VON MOHL, b. at Stuttgart Apr. 8, 1805, studied medicine and natural science at Tübingen, and was appointed professor in botany and director of the botanical garden in that city in 1835. D. Mar. 31, 1872. He was the most eminent vegetable anatomist of his day. His principal works are *Ueber den Bau und das Winden der Ranken und Schlingpflanzen* (1827), *Beiträge zur Anatomie und Physiologie der Gewächse* (1834), *Grundzüge zur Anatomie und Physiologie der vegetabilischen Zelle* (1851), and a large number of memoirs, the principal ones collected in his *Vermischte Schriften.*

Möh'ler (JOHANN ADAM), b. at Ingersheim, Würtemberg, May 6, 1796; studied theology at several of the most prominent universities of Germany, both Protestant and Roman Catholic; was ordained a priest of the Roman Catholic Church in 1819; became professor of theology at Tübingen in 1825, and at Munich in 1835, and d. there

Apr. 12, 1838. His principal works are *Die Einheit in der Kirche, oder das Princip des Katholicismus* (1825), and his *Symbolik* (1832), which latter work ran through many editions, and was translated into English in 1832 by Robertson. It is a defence of the Roman Catholic creed, and an ingenious attempt to idealize it by means of modern Protestant philosophy and theology. It was ably answered by Nitzsch, Marheineke, and especially by his Protestant colleague, Dr. Baur, in consequence of which the author removed to Munich.

Mohs (FRIEDRICH), b. Jan. 29, 1773, at Gernrode, Anhalt; studied at the University of Halle and at the mining school of Freiberg; travelled much in the Austro-Hungarian countries; became professor of mineralogy at Grätz in 1811, at Freiberg in 1817, at Vienna in 1826, and d. at Agordo, Venetia, Sept. 29, 1839. His principal works are *Grundriss der Mineralogie* (1822–24) and *Anfangsgrunde der Naturgeschichte des Mineralreichs* (1832).

Moigno (FRANÇOIS NAPOLEON MARIE), b. at Guémené, in the department of Morbihan, France, Apr. 20, 1804, entered the order of the Jesuits in 1822, and was in 1836 appointed professor of mathematics in the college of the order in Paris. His intimate intercourse with Arago, Ampère, Alexandre Dumas, etc. caused some alarm in the order, and in 1840, while he was publishing his *Leçons de calcul differential et integral*, one of the most complete expositions of the subject, he was ordered by his superior to stop his scientific researches and go to Laval to teach Hebrew and history. After some hesitation he left the order, devoted himself to literature and science, and published several valuable works on mathematics, mechanics, etc. D. July 15, 1884.

Moir (DAVID MACBETH), M. D., b. at Musselburgh, Scotland, Jan. 5, 1798; received his medical education; became in 1817 a successful practitioner of medicine at Musselburgh, where he was settled till his death. He soon became widely known as "Delta," from the letter Δ appended to his numerous poems in the periodical literature of that time. His *Legend of Genevieve* (1824), *Life of Mansie Wauch*, a novel (1828), *History of Medicine* (1831), *Domestic Verses* (1846), and his lectures on *Poetical Literature* (1851) are all of value. D. at Dumfries July 6, 1851.

Moira, EARL OF. See RAWDON (LORD FRANCIS).

Moire′ Antique′ [Fr. *moire* is the English *mohair*], a name given to the best kinds of watered silk. Broad silks of good quality are first dampened, then carefully and smoothly folded, and lastly submitted to great pressure. On drying, the curious lines called watering appear in the fabric.

Moissac′, town of France, in the department of Tarn-et-Garonne, carries on an important trade in grain and flour, also in wool, wine, oil, saffron, and salt. Pop. 9202.

Mo′la di Ba′ri, town of Southern Italy, in the province of Bari delle Puglie. It is pleasantly and healthfully situated on the Adriatic, about 12 miles S. E. of Bari. The streets are narrow and irregular, but there are some respectable buildings. The harbor is small but good, and the traffic is animated both by sea and land. The highroad to Bari is, for some distance from this town, flanked by enchanting gardens, which rise on one hand to the rich olive-crowned hills, and on the other descend to the sea. Pop. 11,976.

Molas′ses [Lat. *mellaceus*, from *mel*, "honey"], or **Treacle** (the *Syrupus fuscus, theriaca*, or *Sacchari fæx*, of the pharmacopœias), a thick, dark-colored syrup, produced during the manufacture of sugar, and consisting essentially of uncrystallizable sugar, water, coloring-matter, and various impurities. It is in part the product of the sugar-plantations (known as West India and New Orleans molasses), and in part comes from the sugar-refineries of other countries (sugar-house molasses). The latter is separated by the centrifugal process, by claying, and the other operations of sugar-refining. (See SUGAR, MANUFACTURE OF.) Molasses is used as a cheap substitute for sugar, especially by the poorer classes, and is imported in considerable quantities for the manufacture of RUM (which see).

Mol′dau, a river of Bohemia, rises in the Böhmerwald Mountains at an elevation of 3750 feet, flows first in a south-eastern, then in a northern direction, becomes navigable at Budweis, and joins the Elbe opposite Melnik after a course of 276 miles.

Molda′via, province of Romania, bounded W. by Galicia and Transylvania, S. by Wallachia and Turkey, from which it is separated by the Danube, and E. and N. by the Black Sea and Russia. Area, 20,118 square miles. Pop. 1,462,105. The western part is hilly, covered with spurs of the Carpathians, which are said to be rich in precious metals and other kinds of useful minerals. Mines are very little worked, however, and rock-salt is the only mineral extensively produced. The middle and eastern part of the country is a low and level plain, watered by the Sereth and Pruth, two affluents of the Danube, and exceedingly fertile. Wheat and wine are produced in large quantities, though the greater part of the country is laid out as pasture-land or covered with immense forests. Herds of cattle, sheep, and horses are reared on the pastures; the latter especially are exported in great numbers to Austria and Prussia. Numerous swine are fed in the forests, and bee-culture forms an important branch of industry. Stags, wild-boars, bears, wolves, and foxes abound. The inhabitants are a mild, good-natured, industrious, and intelligent race, but, with the exception of the nobility, who enjoy all kinds of luxury and refinement, they live under almost abject conditions. Their houses, even in the towns, are mud huts, their beds a skin, their furniture a few kitchen utensils. The established religion is that of the Greek Church, but Armenians, Turks, Jews (numbering over 60,000), Roman Catholics, and Protestants are tolerated and enjoy equal political rights. The language generally spoken is a Latin dialect, mixed with Slavonic and Turkish elements, but nearer to the original Roman tongue than the Italian language; with this the Russian, Turkish, Greek, Hungarian, Italian, and German languages mingle in endless confusion; the gypsies speak a dialect of Sanskrit, and the Jews bad German or worse Spanish. Education is in a very backward state; in 1844 there were only 14 public elementary schools, with 1244 pupils, in the whole province; but in this respect, as in many others, the country is rapidly progressing under its new government, established in 1866. (For further information see ROMANIA.)

Mole [Dutch, *mol*], a name applied primarily to small insectivorous mammals of Europe (*Talpa Europea* and *T. cæca*), distinguished by their cylindrical or barrel-shaped body, little-defined neck, and broad, flattened fore feet, or, in other words, adaptation for digging and subterranean life; and (2) extended secondarily to analogous mammals more or less related in structure and affinities. It is therefore popularly bestowed on (1) all the various species of TALPINE TALPIDÆ, with or without some qualifying adjectives, found in different parts of the northern hemisphere; (2) to the species of CHRYSOCHLORIDÆ, or "golden moles," which inhabit Africa; and (3) to certain rodents adapted for subterranean life; *e. g.* the SPALACINÆ or "sand-moles" and "mole rats" of the family MURIDÆ. (See TALPINÆ and MOLE-RAT.) THEO. GILL.

Molé (LOUIS MATHIEU), b. at Paris Jan. 24, 1781; was educated in Switzerland and England; attended afterwards the École Polytechnique of Paris; published in 1806 his *Essais de Morale et Politique*, which attracted the attention of Napoleon by their defence of monarchical principles; held different offices in the civil service during the Empire; was made a count and peer of France, which dignities were confirmed by the Bourbons; became minister of marine in 1817, of foreign affairs in 1830, and prime minister from 1836 to 1839; retired from political life after the *coup d'état*, and d. at Champlâtreux Nov. 23, 1855.

Mole-Cricket, a name given to the burrowing crickets, and primarily to those of the genus *Gryllotalpa*. In the U. S. they are most common in the South. They are more commonly found in wet ground, and some species are very destructive to crops. THEO. GILL.

Molecular Volumes. See VOLUMES, MOLECULAR, by PROF. HENRY WURTZ, A. M.

Molecule. See CHEMISTRY.

Mole-Rat, a name given to certain remarkable rodents of the family Muridæ, but differing from all other rats in their mole-like habits and appearance, and in their rudimentary eyes. They feed on the roots of plants, and inhabit Asia and Africa. They have been differentiated into the genera *Spalax, Rhizomys, Heterocephalus, Bathyergus, Georhychus, Heliophobius, Siphneus*, and *Ellobius*, and combined in a family designated Spalacidæ. These, however, only agree in physiological adaptation, and widely differ structurally, the first six genera being nearly related to the Murinæ and the last two to the Arvicolinæ.

THEO. GILL.

Mo′leschott (JACOB), b. at Herzogenbusch, Holland, Aug. 9, 1822; studied medicine at Heidelberg; began to practise at Utrecht; lectured on physiology at Heidelberg from 1847 to 1854, but was considered to endanger religion and morals by his views of the absolute relation between the lowest material conditions and the highest spiritual manifestations of human life; received a professorship at Zurich in 1856, and removed in 1861 to Turin. His principal works are *Physiologie der Nahrungsmittel* and *Lehre der Nahrungsmittel* (1850), which latter was translated into English by Dr. E. Bonner in 1856, under the title of *The Chemistry of Food and Diet; Ursache und Wirkung in der*

Lehre vom Leben (1867), and *Von der Selbstbestimmung im Leben der Menschheit* (1871).

Moles'worth (GUILFORD LINDSAY), brother of Rev. William Nassau, b. at Millbrook, England, in 1828; was educated at the College of Civil Engineers, Putney; served an apprenticeship on the London and North-western Railway; perfected his studies in mechanical engineering under Sir William Fairbairn at Manchester; superintended the construction of the buildings and machinery of the royal arsenal at Woolwich in 1854–55; was for several years a consulting engineer in London; went to Ceylon in 1859; became chief engineer and director-general of the railways in that island, and in 1871 was appointed consulting engineer to the government of India. His *Pocket-book of Engineering Formulæ* passed through six editions in a single year, and is recognized as a standard work in the profession.

Molesworth (Sir WILLIAM), BART., b. at Camberwell, a suburb of London, England, May 23, 1810; succeeded to the baronetcy in 1823; studied at the University of Cambridge, but was obliged to leave on account of having challenged a tutor to fight a duel; finished his education at Edinburgh University and in Germany; travelled through Europe; became in 1831 an enthusiastic advocate of reform measures; was elected to Parliament for East Cornwall Dec., 1832; was an intimate friend of Bentham and James Mill, of whose opinions he was a leading exponent in Parliament; founded the *London Review* in 1835, which he merged in the *Westminster Review* in 1836, and published at great expense a magnificent edition of the *Works of Thomas Hobbes* (16 vols., 1839–45), of which he presented copies to the leading libraries of Great Britain and Ireland, and left unfinished a *Life of Hobbes*, which remains unpublished. Sir William Molesworth was the first to call public attention to the horrors of the convict system then in vogue, and to the maladministration of the colonial office, and was largely instrumental in effecting a radical change in both these important branches of the administration. In 1853 he became first commissioner of public works in the cabinet of the earl of Aberdeen, and in 1855 secretary of state for the colonies in Lord Palmerston's first cabinet. This appointment was hailed with great enthusiasm by the colonies, but before any considerable results could be derived from his policy Molesworth d. in London, Oct. 22, 1855. Had his life been prolonged to the ordinary limit, there can be little doubt that he would have figured as one of the great statesmen of the age.

Molesworth (WILLIAM NASSAU), b. at Millbrook, near Southampton, England, Nov. 8, 1816; was educated at King's School, Canterbury, St. John's and Pembroke colleges, Cambridge, where he graduated in 1839; took orders in the Church of England; became incumbent of St. Andrew's, Manchester, in 1841, and vicar of St. Clement Spotland, Rochdale, in 1844. He published, besides several minor works, a *History of the Reform Bill of 1832* (1864), a *New System of Moral Philosophy* (1867), and a *History of England from the Year 1830* (3 vols., 1871–73). A later edition brings this valuable work to the year 1874, making it the only reliable history of England during the period within the memory of the younger generation of readers. It is very highly commended by the celebrated John Bright, a neighbor of Mr. Molesworth at Rochdale. D. Apr., 1877.

Molfet'ta, town of Southern Italy, in the province of Bari delle Puglie, in lat. 41° 13′ N., lon. 16° 39′ E., stands on a little peninsula surrounded by the Adriatic except on the S. Its external aspect is attractive, but within all is narrow and gloomy, with the exception of some fine churches and other public buildings. A commodious and secure harbor, however, and its central position, make this place one of the chief markets of the province, both for imports and exports, the latter consisting of grain, wine, almonds, olive oil, etc. There is also considerable industry here in the way of small manufactures. The origin of Molfetta is not well known, but it was probably founded about the same time as was Amalfi (300 A. D.). Its mediæval life was that of Southern Italy generally. Pop. in 1881, 26,516.

Molière (JEAN BAPTISTE POQUELIN), b. in Paris Jan. 15, 1622. His father, M. Poquelin, was a tradesman and mechanic (*tapissier*) of good standing and connected with the court, from which he received the title of valet de chambre. This title was afterwards conferred on the son, and has given rise to many absurdities, as if Molière had been a simple valet, and his comedies mere amusements gotten up to humor his master. The son was educated in his father's shop till his fifteenth year, when he was sent to the college at Clermont, one of the best educational institutions at that time. He also enjoyed the instruction of the celebrated philosopher Gassendi, and after finishing his college course (1642) he studied law for a couple of years. He was just about entering into a professional position when he happened to fall desperately in love with Madeleine Béjart, an actress belonging to a troop of strolling actors playing in Paris. At once he gave up his profession, left Paris (1645), assumed the name of Molière, and strolled around in the provinces for twelve years—first as an actor, then also as an author, and at last even as a manager. Very little is known about his life in the provinces, except that he made a name for himself and his troop. In 1653 he brought his first original comedy *L'Étourdi* (translated into English by Dryden under the title of *Sir Martin Marall*) on the stage in Lyons, and with decided success. In 1657 he represented another original play, *Le Dépit amoureux*, with equal success in Nantes, and in 1658 he reached the goal of his exertions, to play in Paris for the court and the king. Paris had at that time two stationary theatres—one in the Hôtel de Bourgogne, where Corneille's tragedies were performed, and the other in the Hôtel de Petit-Bourbon, where was represented by Italian comedians the so-called *commedia dell' arte*, a sort of farce, whose characters comprised only a few fixed types, whose plot consisted of extravagant situations, and whose dialogue was mostly improvised. Molière pleased. His troop received the title of "troupe de Monsieur," and was allowed to perform alternately with the Italian comedians. Next year he brought on the stage *Les Précieuses ridicules*. It was hailed by the audience with the exclamation, "Voilà, la vraie comédie!" It had a run of four months, although the prices were trebled. It was not only a success, but a victory; the Italian comedy was defeated. In 1661, Molière's troop removed, under the name of "troupe du roi" and with a yearly pension of 7000 livres, to the Palais Royal, and thus the foundation was laid of the renowned institution the Théâtre Français. *Les Précieuses ridicules* was, indeed, the beginning of the true comedy; all modern comedy before Molière was farce. The plots and the characters were formed only with a view to comical effect. No regard was paid to probability, psychological truth, or moral impression. With respect to his plot, Molière made no decisive progress. Although some of his plays—as, for instance, *L'École des Femmes* (1663)—were models of brilliant composition, yet he never thought of using the situations as a means of depicting life; he only used them as a means of depicting characters. But his characters are no longer fixed types of general follies; they are studies of life. They have a satirical (consequently a moral) bearing on what was actually going on. They are historical documents, and acted as agents for ideas. In *Les Précieuses ridicules* he attacked the finery and pedantry of the Hôtel Rambouillet, the most solidly established and most generally acknowledged literary power of the time; and he repeated the attack with *Les Femmes savantes* (1671), as if he had not hit hard enough the first time. In *Le Médecin malgré lui* and *Le Malade imaginaire* (1674) he attacked the physicians of his time; and in order to understand that his satire is not a mere ridicule, it must be remembered that the science of anatomy was not yet discovered, while the most celebrated physician in Paris believed that he had invented an elixir of life. In every one of his comedies he aimed at some folly, and he was not only a man of penetrating sense, but also a man of courage. In *Tartufe* (1667) he touched the sorest but also the most dangerous point in contemporary life in France—namely, religious hypocrisy. But he was equal to his task. *Tartufe* is one of his greatest creations, and the hypocrites smarted under the blows it dealt. Of course, such a man must have many enemies, especially when he is admired and applauded by the people, as Molière was, and more than once the king himself, Louis XIV., had to step in and support him against the intrigues and chicaneries of his foes. And to the troubles of his public life were added domestic calamities. In 1661 he had married Armande Béjart, a younger sister of his former mistress. People said that he had married his own daughter, and this slander was not completely refuted till 1821. Madame Armande proved a coquette, and Molière was jealous. He suffered horribly. There is in *Le Misanthrope* (1667) a passion and almost a cry of despair which excites the deepest sympathy. Very early, too, his health failed. He was only fifty-one years old when one night, during the representation of *Le Malade imaginaire*, in which he acted the chief part, he broke down and had to be carried home. He died a few days after (Feb. 17, 1673). The archbishop of Paris, a person noted for his dissipation and debauchery, denied Molière ecclesiastical sepulture because he was an actor and because he had written *Tartufe*, and, but for a special order from the king, infamy would have been thrown on the grave of the greatest poet of his age. His works were translated into English by Von Laun (12 vols., Edinburgh, 1875). CLEMENS PETERSEN.

Moli'na (Felipe), son of Pedro, b. at Guatemala in 1812; became a distinguished member of the liberal party; was exiled after the downfall of the federal government, and became a citizen of Costa Rica; was appointed in 1848 envoy of that republic to Nicaragua; was subsequently minister of Costa Rica in England, France, Spain, Rome, and the U. S.; negotiated a commercial treaty with the U. S.; published in several languages sketches of the history and geography of Costa Rica and reports upon its boundary and navigation questions with Nicaragua. D. at Washington, D. C., Feb. 1, 1855.

Molina (Juan Ignacio), known in Italian as Giovanni Ignazio, b. at Talca, Chili, June 24, 1740; received a brilliant education at Santiago; was acquainted at the age of twenty with the whole circle of sciences and languages then taught in the colony; entered the order of Jesuits; became librarian of its college, and devoted himself to mathematics and the natural sciences. Being expelled, with all the members of his order, from the Spanish colonies in 1767, he settled at Bologna, Italy; was ordained priest; became a teacher, and published several esteemed works upon Chili: *Compendio di Storia geografica natrale e civile del Chili* (Bologna, 1776), *Saggio sulla Storia Naturale del Chili* (1782), and *Saggio della Storia Civile del Chili* (1787), of which the latter was published in English at Middletown, Conn., by Richard Alsop in 1808. Abbé Molina inherited a fortune in 1815, when he endowed a library at his native city. D. at Bologna Sept. 12, 1829.

Molina (Luis), b. at Cuenca, in New Castile, in 1535; entered the order of the Jesuits in 1553; was professor of theology at the University of Evora, Portugal, for twenty years, and d. at Madrid Oct. 12, 1601. In 1588 he published his *Liberi Arbitrii cum Gratiæ Donis, Divina Præscientia, Providentia, Prædestinatione et Reprobatione Concordia*, which, under the form of a commentary on some parts of Thomas Aquinas's *Summa Theologiæ*, attempted to harmonize the views of Augustine concerning grace with the semi-Pelagian ideas of free-will. The Dominicans, of whom Thomas Aquinas was the pride and spiritual fortune, attacked the book with fury, and the Jesuits defended it. A contest between the *Thomists* and *Molinists* ensued, and grew very hot. The pope was asked to interfere, but, finding it not only difficult but even dangerous to be infallible on such a point, he transferred the whole question to an assembly of cardinals, the celebrated *Congregatio de Auxiliis*, and forbade all controversy till the Congregatio had made its decision. This decision, however, never came, and was never intended to come; but the question arose again in the strife between the Jansenists and the Jesuits, and still remains unsettled in the Roman Catholic Church.

Molina (Pedro), b. in Guatemala in 1777; received an excellent education; became a physician, and was distinguished as a poet and a politician; was noted for the liberality of the political views which he inculcated in his writings; was one of the members of the first national executive in 1823; went as ambassador to Colombia 1825, and signed a treaty of alliance; represented Central America in the Congress of Panama 1826; was governor of Guatemala 1829, secretary of state for foreign affairs 1832–33; was exiled by Carrera, and resided some years in Costa Rica; was deputy to the constitutional assembly 1848, and for many years president of the medical faculty and chief director of the University of Guatemala. D. about 1850.

Molina, de (Fray Alonso), b. in Spain in 1496; went to Mexico as a Franciscan monk soon after the Conquest; was zealous in the conversion of the natives; made himself a thorough master of the Mexican or Aztec language, in which he published a catechism (1564), a manual of confession (1565), and a grammar (1571), besides his great work, the dictionary of that tongue, of which the first part, *Vocabulario en Lengua Castellana y Mexicana*, was published at Mexico in 1555, and both parts in 1571. The latter has been sold in Europe for fifty guineas; the earlier edition is so rare that its existence was unknown until recently to European bibliographers. The whole work consists of 286 folio leaves, and contains first a Spanish-Mexican and then a Mexican-Spanish dictionary. D. in Mexico in 1584.

Moline', city and R. R. centre, Rock Island co., Ill. (see map of Illinois, ref. 3–C, for location of county), on the E. bank of the Mississippi River, 350 miles, by river, below St. Paul, has fine water-power, and owes its prosperity largely to its numerous and extensive factories for the manufacture of ploughs, malleable iron, steam-engines, files, wagons, paper, lumber, tubs and pails, pumps, pipe-organs, milling-machines, crackers, windmills, lead roofing, scales, and furniture. It contains a free public library, gas-works, and water-works. Pop. in 1870, 4166; in 1880, 7800.

Molinel'la, town of Northern Italy, province of Bologna, situated between the Reno and the Po, lies in the old valley of the Po, and had its beginning in a few hamlets built on the islands left by the river as it gradually changed its bed. As these islands became united by the further divergence of the river, new houses were put up, and Molinella is now a populous town with respectable buildings, the inhabitants of which are chiefly occupied in the manufacture of hemp and cheese. Pop. in 1874, 10,751.

Mol'inism, the scheme or theory proposed by Luis Molina in his treatise on *The Reconciliation of Grace and Free-will* (1588), and designed to harmonize the doctrine of predestination with that of human responsibility. (See Molina.)

Moli'no del Rey, a massive series of buildings half a mile N. of the castle of Chapultepec, near the city of Mexico, originally a flour-mill, afterwards a foundry of arms, and occupied as a fortress by a portion of the Mexican army, was attacked and carried by storm Sept. 8, 1847, by a division of the army under Gen. Winfield Scott, after a well-contested battle, in which the Americans lost several hundred men.

Moli'nos (Miguel), b. near Saragossa Dec. 21, 1627; studied at Pamplona and Coimbra; settled, after being ordained priest, at Rome, where a great number of people chose him for their confessor; when afterwards his papers were seized, they contained about 20,000 letters from persons asking for his spiritual advice. In 1675 he published his *Guida Spirituale*, which attracted great attention and was translated into different languages. It teaches that true godliness consists in uninterrupted communion with God, established by contemplation, and was the foundation of the so-called Quietism which afterwards found its most striking development in Madame Guyon. The Jesuits, however, found that this view endangered the doctrine of good actions. Pope Innocent XI. condemned the book in 1687; Molinos recanted, and was imprisoned for the rest of his life in a Dominican monastery of Rome, where he d. Dec. 29, 1696.

Moliter'no, town of Southern Italy, province of Potenza, stands on a hill, enjoys a salubrious climate, and its inhabitants are industrious and fond of traffic. Half the trade of the Basilicata and much of that of Cosentino is carried on here. An effort is now making to supply the want of roads, which is severely felt. Pop. in 1874, 6621.

Moll, in music, the German for *minor*, whether in relation to modes, keys, or intervals. Thus, C moll is C minor.

Mol'lah, among the Turks, Persians, and Toorkomanians, the title of the superior judge of civil and ecclesiastical law. The position and dignity of the mollahs are not uniform in different Mohammedan countries.

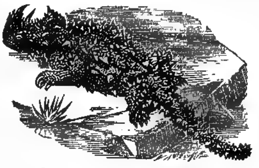
Mollusca. See Conchology, by G. W. Tryon, Jr.

Molluscoi'dea, a name given to a provisional group of animal organisms formerly included among mollusks (see Conchology, by G. W. Tryon, Jr.), but now excluded from their number by most of the best systematists of the age. The Molluscoidea include the Brachiopoda, the Bryozoa, and the Tunicata. The prevailing tendency seems to be to consider them all, or mostly, as articulate animals, but some authorities make them intermediate between mollusks and articulates, not really belonging to either. (See Bráchiopoda, Bryozoa, and Tunicata.)

Moll'witz, a v. of Prussian Silesia, near which the Prussians won a decisive victory over the Austrians Apr. 10, 1741.

Mo'loch, or **Mo'lech** [Heb. הַמֹּלֶךְ, "the king"], called also **Milcom** (1 Kings xi. 5) and **Malcham** (Zeph. i. 5), the fire-god of the Phœnicians (a modification or hypostasis of Baal, the sun-god), but spoken of in Scripture as more especially "the abomination of the Ammonites." That children were sacrificed to this deity is not to be questioned, although "passing through the fire to Molech" may not always mean so much. Diodorus Siculus (xx. 14) describes a brazen image used among the Carthaginians in sacrificing children to Cronos or Saturn. R. D. Hitchcock.

Mo'loch Hor'ridus, one of the most hideous of existing animals, a lizard of Australia, belonging to the family Agamidæ, which is completely covered with sharp spines and has large horn-like spines over the eyes. It is of a pale yellow, spotted with black, brown, and red. It is not very large. Theodore Gill.



Molo'ga, town of Russia, in the government of Jaroslav, at the confluence of the Mologa and the Volga. It carries on considerable boatbuilding and trade in timber. Pop. 4440.

Moloss'idæ [from *Molossus*, the name of the typical genus], a family of the order of bats (Cheiroptera) and sub-order Animalivora, without nasal appendages. The head is large; the ears are simple and rounded, and have each a distinct tragus; the intermaxillaries are deficient at the symphysis; molars $\frac{4}{5}$ or $\frac{5}{5}$ (M. $\frac{3}{3}$, PM. $\frac{1-2}{2}$) × 2; the true molars have W-shaped ridges; incisors variable in number (*e. g.* $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{1}$, or $\frac{1}{0}$) and small; the stomach is sacciform, and its extremities approximated. The hinder extremities are robust, and the animal more capable of progression on all fours than most of the order. They are generally larger than the familiar bats of northern countries. They inhabit chiefly tropical regions of the Old as well as New World. At least two genera are recognized—viz. (1) *Molossus* (with the sub-genera *Nyctinomus*, *Mormopterus*, *Promops*, *Molossus*, *Molossops*, *Dinops*, *Myopterus*, and *Mops*), tropicopolitan; and (2) *Chiromeles*, Indian. The family has not yet been well defined. Theo. Gill.

Molt'ke, von (Helmuth Carl Bernhard), Count, b. Oct. 26, 1800, at Parchim, in Mecklenburg, and educated at the military academy of Copenhagen; entered the Prussian service in 1822, and was appointed a member of the staff in 1832. He devoted himself with great energy to the scientific part of his office, and published in 1835 a work on the Turko-Russian war of 1828–29. This war, as all questions relating to the Orient were of great interest to Prussia, led Moltke, who was thoroughly conversant with them, to make a journey to Turkey in 1835. The sultan, Mahmood, to whom he was introduced, and whose confidence he enjoyed, procured for him a furlough of several years, during which time he aided the sultan by his advice, both in the reorganization of the Turkish army and in the improvement of the fortifications of Silistria, Shoomla, Varna, Roostchuk, and the Dardanelles. Together with several other Prussian officers on furlough, he accompanied the Turkish army in the campaigns against the Koords and against Mehemet Ali, viceroy of Egypt. After the death of Sultan Mahmood he returned home and published in 1841 *Briefe über Zustände und Begebenheiten in der Türkei aus den Jahren 1835–39*, and a map of Constantinople and the Bosphorus on the scale of 1:25,000. In 1846 he was appointed adjutant to Prince Henry of Prussia, who lived in Rome, and the fruit of his residence in this city was a map of its surroundings. After the death of the prince in 1847, he was attached to the governor-general on the Rhine, and became chief of a division of the staff in 1848, chief of the staff of the fourth army corps from 1849 to 1855, adjutant to Prince Friedrich Wilhelm in 1856, and chief of the staff of the whole army in 1858. In this prominent position he has made his name immortal as a general. Under his inspiriting leadership the staff became a most convenient and effective means of commanding the army, and in the subsequent wars his plans and dispositions resulted in an unbroken series of brilliant victories. For the achievement of such results the presence of the king was of vital importance. In 1866 and 1870–71 the latter led as commander-in-chief, and gave absolute authority to Moltke's dispositions. On a minor field, in 1864 against Denmark, Prince Friedrich Karl having received the command in April, Moltke led the army for the first time in war, having drawn up beforehand the plan of the whole campaign. In 1866, in the war against Austria and her allies, he entered a larger theatre, and showed his strategical talent in a most brilliant manner. In June, 1866, he was made a general of infantry, and after the short and astonishing campaign was finished the king gave him the highest Prussian order, that of the Black Eagle, and the Diet voted him a dotation. He was elected a deputy to the North German Diet in the next year. Anticipating the French attack, he planned a campaign against France immediately after the Austrian war; which plan was laid before the king in 1868, and followed out in 1870 as far as such a plan could be followed—that is, with respect to the organization of the army and the choice of the first point of attack. The French campaign of 1870–71 is probably one of the most brilliant which has ever been fought, and although its entire success cannot be ascribed to Moltke, as many different agencies were at work, the larger share is nevertheless his due. Although possessed of the highest theoretical education, he is never caught by a theory, but surveys with admirable freedom the changing incidents of the war, and acts in accordance with them. With him the greatest audacity of plan is connected with a perfectly cool and sober calculation in the execution: and this is his greatness. On the day of the capitulation of Metz the king created him a count; on the conclusion of the armistice he gave him one of the five grand crosses of the Iron Cross, and on the day of the return of the troops to Berlin he made him a field-marshal. He also received a dotation of 300,000 thalers, and the freedom of many cities was presented to him. He is not very talkative, and as he is thoroughly conversant with several languages, people say of him, epigrammatically, that he is silent in seven languages. Among the works which he has partly written, partly edited, are *Der italienische Feldzug von 1859*, *Ueber den Krieg vom Sommer 1866*, and *Der deutsch-französische Krieg, 1870–71*.

August Niemann.

Moluc'cas, or **Spice Islands,** are a group (or rather a multitude) of islands of the Malay Archipelago, lying between Celebes and Papua, between lat. 3° S. and 6° N., and between lon. 126° and 135° E. They are all of volcanic origin, high, mountainous, and exceedingly fertile. The forests which cover the mountains to their very tops contain teak, ebony, sandal, iron, and satin wood, besides palms, bread-fruit trees, and many varieties of the finest fruit trees. Rice, sage, cotton, indigo, coffee, and sugar are grown; the nutmeg and the clove are indigenous to all the islands, but the Dutch have confined the cultivation of the clove to Amboyna and the Uliassers, and that of the nutmeg to the Banda Islands; on the other islands the trees of native growth have been rooted out. The original inhabitants were Malays; Arabs, Hindoos, and many Chinese have since immigrated and settled down, and one of the most prominent features of the population are the mestizoes, descendants of Europeans—Portuguese, Spaniards, or Dutch—and natives. On the islands directly governed by the Dutch the inhabitants are Christians, and live in orderly communities; the inhabitants of the islands which are only indirectly governed by the Dutch are mostly Mohammedans, and are generally pirates. The northern division of the archipelago, comprising the islands of Ternate, Tidore, Batjan, Makian, Motir, and the Obi group, and forming the residency of Ternate, which contains 95,142 inhabitants, is thus only indirectly under Dutch government, while the southern division, comprising Amboyna, the Banda Islands, and the Uliassers, and forming the two residencies of Amboyna and Banda, which together contain 236,737 inhabitants, are governed directly as a province of the motherland. The Dutch have been in possession of these islands since the beginning of the seventeenth century. The name Molucca is derived from an Arab word meaning "king." (For further information see Amboyna and Banda.)

Mo'ly [Gr. *μῶλυ*], a fabulous herb, a sovereign remedy for all diseases, which Mercury gave Ulysses as a countercharm against Circe. The ancients identified it with a species of garlic. A wild Oriental garlic is now called *Allium moly*, and the name *moly* was given to a proposed genus (not now recognized) of alliaceous plants by Mönch. The *Allium moly* is a showy plant, cultivated under the name of golden garlic for ornament.

Molyb'denite, the natural sulphide, a mineral crystallizing in the hexagonal system, with eminent cleavage, and occurring commonly foliated or in highly flexible, inelastic scales. In its crystallization, hardness (1–1.5), lead-gray color, and metallic lustre it much resembles graphite, but is distinguished from that mineral by its streak, which is lead-gray, its specific gravity, 4.6, and by emitting sulphurous fumes before the blowpipe. It is met with in gneissoid, granitic, and other crystalline rocks. The natural dioxide, molybdic acid, occurs as *molybdite*, a yellow earthy mineral, and also combined in several minerals, as with lead in Wulfenite (which see).

Edward C. H. Day.

Molybde'num [Gr. *μόλιβδος* and *μόλυβδος*, "lead;" *μολίβδαινα* and *μολύβδαινα*, a "ball of lead" used in games; Fr. *molybdène*; Ger. *Molybdän* and *Wasserblei*: the last term is apparently attributed by Gmelin to both the metal and the native sulphide], an elementary metal, occurring in a well-known mineral which is so extremely similar to graphite or "black lead" that it was first discovered in 1778 by the great Scheele to yield the peculiar oxide known as *molybdic acid*. A few years later, in 1782, Hjelm isolated its metal. The reason why the Greek name for *lead* was applied to it seems most probably traceable through the German term "Wasserblei." A passage is, however, quoted from Pliny in which he speaks of "molybdæna" and "galena" as the same mineral, and as "common in silver and lead veins." Molybdic acid occurs native, as *molybdite* or molybdic ochre, of which there are several American localities. Of the native sulphide, *molybdenite*, there are quite a number of localities on this continent. It is only distinguishable from graphite by a very practised eye, but on white glazed earthenware it gives a *greenish* trace, easily distinguishable from that of black lead. Its laminæ are much more flexible and infrangible than those of graphite. On heating in an open glass tube beautiful crystals of molybdic acid sublime. The metal is not too well known. It is easily reduced from its oxide, even by hydrogen gas, but is fusible with difficulty. Debray fused it, and describes it as white, with silver-like lustre, very hard (almost equal in this respect to topaz), and of density = 8.6. Bucholz gives the density as 8.49–8.636. New density determinations, under different well-marked definite conditions, are yet needed, as is indeed the case with most of the less-known elements. It is unacted on by the air at normal temperatures, but when heated sufficiently burns to molybdic acid. Concentrated acids act upon it—diluted ones not readily or not at all. Its most important compound, practically, up to this time, is the compound of molybdic acid with ammonia, used in chemical analysis for the detection and determination of phosphoric acid. Few laboratory reagents are more important than this when its mode of use is understood so as to be reliable. It must, in the first place, be itself free from phosphoric acid. It should give no precipitate on standing, and only a faint yellow color when its dilute solution with excess of ammonia is heated to boiling and a small excess of nitric acid added. To detect phosphoric acid the manipulation is the same; another needed precaution being a large *excess* of molybdic acid over the phosphoric acid present. If the first trials fail, they must be repeated on *largely diminished quantities* of the liquid tested, to obtain certainty as to such an excess being in action. The phosphoric acid is carried down, when present, as a beautiful lemon-yellow granular precipitate, whose composition is not yet wholly settled, although it is known to contain but a very trifling percentage of phosphoric acid—a fact which explains the great delicacy of the test. In quantitative operations the yellow compound is washed, by decantation, with a mixture of molybdate of ammonia and dilute nitric acid, then dissolved in strong ammonia, and precipitated with a magnesian solution. HENRY WURTZ.

Mol'yneux (WILLIAM), LL.D., F. R. S., b. at Dublin, Ireland, Apr. 17, 1656; graduated at Trinity College; studied law at the Middle Temple; returned to Dublin 1678, and founded there a philosophical society 1683; became surveyor of public works 1684; inspected the fortresses of Flanders 1685; resided several years at Chester, where he wrote his important *Treatise on Dioptrics* (published 1692); was engaged in the siege of Limerick (1690); returned to Dublin soon after the Revolution; became a member of the Irish Parliament 1692, and wrote many papers on natural philosophy, astronomy, mathematics, politics, and law, chiefly published in the *Philosophical Transactions*. He was considered an eminent astronomer, and was a correspondent of Locke and Halley. D. at Dublin Oct. 11, 1698.

Mombas', or **Mombaz,** an island with a town of the same name, belonging to the sultan of Zanzibar, is situated in lat. 4° 4' S., just off the eastern coast of Africa, in a small bay formed by the estuaries of two rivers. The island is a coral formation, low and flat, but containing an excellent harbor. The town, which in the sixteenth century, when the Portuguese took possession of it and fortified it, was a flourishing place, is now nothing but a heap of wretched ruins, and the inhabitants are notorious for their rapacity and treachery. It has thus undergone the same fate as most of the Portuguese possessions in Africa: after a short time of comparative prosperity it became paralyzed and doomed to perpetual stagnation. The island, which is 3 miles long and 2½ miles broad, is, according to the latest estimation, inhabited by about 20,000 persons, partly Arabs and partly Wamwitas and Wakilindinis, the two divisions of the Wassawahilis. They are mostly Mohammedans; only the few mestizoes are Christians.

Mom'berger (WILLIAM), b. at Frankfort-on-the-Main, Germany, in 1829; studied art at the Düsseldorf school; came to the U. S. in consequence of having participated in the revolutionary movements of 1848; established a chromo-lithographic business in New York City; engaged with great success in preparing illustrations for books; built a fine studio at Morrisania, and has painted some effective landscapes, among which is that representing Sugar-loaf Mountain (near Winona, Wis.).

Moment and **Momentum,** in mechanics. See FORCE, by PROF. E. C. PICKERING, B. S., and MECHANICS and DYNAMICS, by PROF. W. P. TROWBRIDGE, A. M., PH. D., LL.D.

Mômiers' [Fr., "mummers"], the cant name given in 1818 to a body of evangelical Protestants of Switzerland and the adjoining parts of France and Germany, whose distinguishing characteristic was the fervency of their religious exercises. The Mômiers accused the national Church of Switzerland of apostasy from Calvinism, especially in denying the divinity of Christ. They were consequently subjected to repressive measures, and ultimately returned to the orthodox communion. The most distinguished of the Mômiers was Rev. Cæsar Malan.

Momm'sen (THEODOR), b. at Garding, Sleswick, Nov. 30, 1817; studied law and philology at Kiel; travelled 1844–47 in France and Italy; was appointed professor of Roman law at Leipsic in 1848, at Zurich in 1852, at Breslau in 1854, and at Berlin in 1858. His *Oskische Studien* (1845), *Die unteritalienischen Dialekte* (1850), *Corpus Inscriptionum Neapolitanarum* (1851), *Geschichte des römischen Münzwesen* (1860), *Corpus Inscriptionum Latinarum* (1864), etc., opened up new roads for the study of the ancient Italian language and history; and his *Römische Geschichte* (1854–70), translated into English by Rev. W. P. Dickson, is one of the most original and most interesting productions of modern historical art. His description of the oldest nations which inhabited Italy, based on a most ingenious combination of the results of comparative philology, and his representation of the origin and earliest development of the city of Rome and its institutions, military and political, based on most acute inferences from that which is known to that which is not known, have excited general admiration even with those who have attacked his views; but his style is heavy, and has that juridical clearness and legal precision which outside of the court-room is awkward and obscure. In 1875 he was appointed professor of jurisprudence in the University of Leipzig, and in 1882 he was tried in Berlin for having slandered Prince Bismarck in an election speech. He was, however, acquitted by both the inferior and the superior court.

Momot'idæ [from *Momotus*, the typical genus, which is the Latin form of the vernacular MOTMOT (which see), derived from the note of the bird], a family of "coccygomorph" birds which have some resemblance to kingfishers and woodpeckers. The head is quite large; the bill rather long, somewhat decurved, depressed at the base, compressed forward, and with denticulated edges; the nostrils are roundish, near the base and upper margin of the bill; the tarsi short and scutellated; the toes normal—*i. e.* second, third, and fourth directed forward, and first backward; the tail is graduated and produced towards the middle. The maxillo-palatines and vomerine bones are of the "desmognath" type. The birds are most closely related to the todies (Todidæ) and more distantly to the Coraciidæ, Meropidæ, and Alcedinidæ or kingfishers. They are denizens of the forests of tropical America, and according to Murie (*Ibis*, 1872, pp. 383–412) there are four well-defined genera—viz. *Momotus*, *Barypththengus*, *Hylomanes*, and *Eumomotus*. THEODORE GILL.

Mompox', town of the Columbian confederation, South America, on the Magdalena River, has some shipbuilding and considerable trade. Pop. 10,000.

Mo'mus, in Greek mythology, was a son of Night, according to Hesiod, and the personification of mockery and censure. Aphrodite was the only being whom he found blameless.

Mon'achism [Gr. μόνος, "alone"], a life of religious seclusion, asceticism, and devotion. Traces of such a life appear in remote antiquity—among the Hindoos, in their earliest sacred books, the Vedas (cir. 1400), in the laws of Menu (cir. 1000); in Booddhism, which rose cir. 600 B. C.; and in the time of Darius and Alexander, in the Gymnosophists or naked and solitary devotees, who addicted themselves to contemplation and self-mortification as a means to the purification of the soul and its reabsorption in the original Brahm. Among the Hebrews similar ideas and tendencies are traced in the Nazarites in the time of Moses, in Elijah and the prophets in the era of the Kings, and in the Essenes and Therapeutæ of later periods. Among the Greeks, the Pythagoreans (cir. 500 B. C.) may be regarded as a species of monastic institute, and in the elder and later Platonists are found those speculations regarding matter and soul that are the primal elements of monachism.

Christian monachism differs from its Brahmanic prototypes in that, while the latter were developed from the dogma of an eternal dualism and conflict of good and evil, the former roots in the idea of an eternal divine monarchy, and the apostasy but final subjugation and recovery to it of lapsed souls. It regards a solitary, ascetic, and contemplative life as a means to this result, by liberating the soul from the dominion of sense and exalting it to the realms of pure truth and communion with Deity. The idea of expiation has also been engrafted upon it.

Christian monasticism in its development embraced four stages—the ascetic, the anchoretic, the cenobitic or conventual, and the confederation of monasteries in orders or congregations. Tendencies to a monastic asceticism appear in the apostolic age, claiming their warranty from such passages in the inspired writings as Matt. xix. 12; 1 Cor. vii. 5–7, etc. They are alluded to in the Epistles and the apostolic Fathers. An ascetic life, at first purely voluntary, came to be regarded by the middle of the second century as a superior morality and merit, for the attainment of which men gave up their property and addicted themselves to self-denial and mortifications of the flesh, but without vows and within the churches. Subsequently, asceticism developed into anchoretism or the eremite life. Men sought the desert first as a refuge from the persecutions of the Empire, afterwards in flight from the blandishments of the world and the corruptions of a secularized Church. When martyrdom no longer challenged Christian heroism the desert became the recourse of a religious enthusiasm and saintly chivalry. About the middle of the third century Egypt especially became the theatre of the anchorite life. (See Antony, Simeon Stylites, etc.) There was the confluence of the ideas and systems from which it sprang—of the Oriental with the Occidental, Christianity with Brahmism, and of Neo-Platonism and Gnosticism with Chaldean and Persian theosophies. In Egypt we are told that the number of the anchorites increased till they nearly equalled the population of the cities. Gradually, for the sake of sustenance, defence, concert, and discipline, these solitaires were gathered into communities, organized, regulated, and living in common (cenobites), and dwelling within common enclosures (cloisters).

In 325, Pachomius established on Tabennæ, an island in the upper Nile, a society of monks, organized into priories and convents, under the superintendency of abbots (fathers), with common regulations for spiritual exercises and labors, but with no compulsory or perpetual vows. Similar communities of women (nunneries) were organized about the same time by the sister of Pachomius. Other similar institutions soon grew up around the establishments at Tabennæ, numbering, as early as 348, as many as 50,000 monks and religious recluses. About the same time similar monastic communities were established by Ammonius in the desert of Scaetis in Lower Egypt, and by Macarius in the Nitrian Mountains, the latter embracing some fifty monasteries. Soon the institution spread through the East. Monasteries were founded in Syria by Hilarion, in Mesopotamia by Ephraem, by Eustathius in Armenia, and by Basil the Great in Cappadocia and Pontus; and not in wildernesses only, but for readier access and greater influence over men they were established near the cities also, while some bands of monks led a wandering and sometimes marauding life. Monastic institutes spread along the coasts, cliffs, and isles of the eastern Mediterranean, and thence to Italy and Western Europe.

Monachism was first brought to Rome by Athanius in his flight from the persecutions of the Eastern empire, and was stimulated there especially by the panegyrics and example of Jerome and Ambrose, and by Augustine in Africa, and Martin of Tours in Gaul. Directly, the monasteries became the asylums of the persecuted, oppressed, and afflicted, the sick, the forlorn, the unhappy, and also often the refuge of those who wished to escape from labor or from civil or military service or the burdens of taxation. Idleness and corruption soon entered. Efforts were made from time to time to introduce stricter discipline for the removal of abuses and the furtherance of spiritual improvement, useful industries, and of literary and theologic culture. For this purpose Basil the Great introduced his "Rule" (cir. 350)—a rule which at his death embraced some 80,000 monks, and prevailed extensively for a long period through the East. Under this rule there were no perpetually binding vows; only a tacit and voluntary devotion to a life of seclusion, spiritual meditation, purity, and obedience to the superiors.

In time, monastic establishments, at first isolated and independent, combined into larger communities, having a common rule and a common head. These confederacies were termed orders, and appear most fully organized and powerful in the West in the mediæval period under the government of congregations and chapters. Some of them became ultimately among the most potent factors in European society, stronger often than its monarchs, and possessing a large portion of its territory. Their voice was powerful in determining not only questions of doctrine and morals, but also of international peace or war, and in electing or dethroning princes.

As regards the relations of monachism to the hierarchy, at first as a lay institution under abbots who might or might not be ordained priests, and with a life differing from the social order and relations of the rest of the world, it presented an anomaly for which no provision had been made in the hierarchical system, and was regarded with solicitude because of its great influence with the multitude. Soon, however, the hierarchy converted it into an instrument for strengthening its own power. Monasteries were first brought under episcopal control, and the monks became a standing army or force of minute-men for the bishops. A mass of men of enthusiastic or gloomy religious temperament; detached from all the relations and interests of common life, from property, families, and social ties and cares; hardened by their discipline against pain, hunger, fatigue, and all inclemencies of the sky; with affections and passions distorted and inordinate, because out of accord with nature; easily wrought to superstitious or fanatical excitement,—they became a numerous and formidable band of retainers for the hierarchy. Gradually detached from episcopal control, and brought into immediate dependency on the papacy, this class became in the Middle Ages potent instruments for subverting the independence of the national churches.

From early times (cir. 400) the monasteries became training-schools for the clergy and nurseries for missions. Selections were made from them for papal commissioners and legates and for ecclesiastical preferments. The main body of the clergy became monks. Superior sanctity was attached to the regular compared with the secular orders, and to a great extent monks became the preachers and confessors of Christian nations.

With the fall of the Roman empire in the West the monasteries almost perished in the migration and confusion of nations. They were reorganized and restored to a superior system and unity of government and discipline by Benedict of Nursia, whose order, the Benedictine, ruled the West for centuries, and who is regarded as the organizer of mediæval monachism. He founded (529) the cloister of Monte Casino, so celebrated and powerful in after ages, placed it under a mild rule adapted to the times, with irrevocable vows of poverty, celibacy, obedience, and stability (or permanent adhesion to the order). With spiritual exercises he combined various industrial pursuits, mechanical and agricultural, and also the education of the young, adapted from Cassiodorus, and missionary enterprise, incited by Gregory the Great. Affiliated convents, reformed or established on his model, were diffused through Southern and Central Europe, especially in France, Italy, and Germany, from the sixth to the ninth century. They extended also their establishments to Britain and Ireland and amid the Sclavonian and Scandinavian tribes. Their work in clearing forests, reclaiming marshes, diffusing some knowledge of letters and the arts, as well as in spreading Christianity and exterminating heathenism, was beneficent to civilization for ages. But in the troublous times toward the close of the Merovingian rule decay of discipline, with luxury, idleness, and corruption, entered the monasteries, enriched by the gifts of kings and nobles, and removed more and more from episcopal control, and under the rule of abbots subject only to the distant supervision of the papacy.

The court meantime bestowed the offices and revenues of monasteries on its favorites, not only among the clergy, but among the nobles and military chiefs, and often on the wives and mistresses of monarchs. The convents were often occupied as residences by the families of lay abbots or their retainers, and often used as rendezvous for banquets, hunts, and military games. Charlemagne attempted to correct these abuses and restore discipline, and to connect schools and literary enterprises with conventual life, as at Paris, Lyons, Cologne, Treves, Padua, and Osnaburg, with a respectable measure of success, extending through the ninth and tenth centuries.

Under the commission of William, duke of Aquitaine, Berno, a Burgundian count, founded (910) the monastery of Cluny, under the immediate supervision of the pope, with renewed enforcement of the rule of Benedict and additions of increased rigor. In imitation of Cluny a large number (1000) monasteries were reformed or newly organized, and formed themselves into a confederation, with Cluny as its head. This became the liberated congregation of Cluny, which by strict asceticism, the splendor of its ritual, and zeal for literature and education, and by a succession of distinguished abbots, secured an influence unexampled in those ages, numbering among its adherents no less than 2000 convents, attracting to itself the admiration and revenues of princes, and possessing, especially after the Crusades led men, in order to raise money, to sell or mortgage their estates, a large portion—nearly one-third—of the domain of France. They arbitrated between princes, and it was their boast that the heart of France was in the hands of the monks of Cluny. The congregation of the Cistercians, founded at or near Dijon, in 1098, rivalled that of Cluny, differing from it in simplicity of ritual and in submission to episcopal jurisdiction. Bernard, abbot of Clairvaux, gave it especial celebrity. It embraced in the thirteenth century more than 2000 monasteries and 6000 nunneries. Celebrated and powerful in Italy was the Camaldolite order, founded in 1018, and the Vallambrosan, established in 1038. Various other orders originated in the eleventh and twelfth centuries, as the Carthusians and the Carmelites, but most important of all were those of the preaching mendicant friars, the Franciscans and Dominicans.

The Franciscans originated from Francis of Assisi (b. 1182), who went forth, after the example of the apostles, without scrip or purse, preaching the gospel to the multitudes, subsisting upon alms, and drawing with him a band of enthusiastic youth as followers. His order was sanctioned by Honorius III. (1223) with the right of preaching and the care of souls in any district or country. Their humility, simplicity, love, and contempt of the world won the multitude, and procured for them the epithet "seraphic." They became a power in the Church, and before the rise of the Jesuits divided with the Dominicans the claim of pre-eminence. The Franciscan order was strengthened much, as were subsequent orders, with a class of *Festionis*—men who wished to live according to its rule, and yet were compelled to remain in secular avocations.

The order of the Dominicans was founded by Dominico Guzman (b. 1170), a Castilian of high family, whose zeal was especially aroused for the conversion of heretics, and led him to the S. of France (1208) to preach to the Albigensians. Thoughtful, scholarly, profoundly emotive, and devoted to the Catholic faith, he drew around him disciples similar in zeal, temperament, and culture. His order, like that of the Franciscans, was empowered to preach and hear confessions everywhere; and in 1220 it adopted the rule of St. Francis, and became a mendicant preaching fraternity, differing from the Franciscans in superior literary and theologic culture, which was pursued by them with an especial view to the confutation of heretics. These orders obtained great influence as preachers and confessors of the people; the Dominicans also as confessors of the noble and the cultivated, and especially as ministers of the Inquisition, which was committed peculiarly to them. United to the papacy by reciprocal interests, these orders became its spiritual militia. They encroached on the province of the diocesan clergy. The Dominicans also, as guardians against heresy, aimed to get possession of the chairs of the universities. Their arrogance and ambition ultimately provoked the jealousy of the other clergy and of the learned classes, and produced a reaction against them. Moreover, their rivalry of position, diversity of genius, and divergency in philosophy and theology threw these orders into antagonism to each other, and in a measure broke the power of each. Subsequently, corruption of discipline, from the evasion of their vow of poverty, and internal dissensions, diminished their energy and influence. Finally, from being largely contributors to the theologic literature of the fourteenth century, they became in the fifteenth eminently antagonistic to intellectual progress and Church reform.

The Augustine order, founded 1256, also subsequently rose to importance, and was distinguished for eminent names, especially for that of the great Reformer. The Carthusian latest retained the strictness of its primitive discipline.

Especially to be noted also are the military orders, which appeared in the times of the Crusades in the eleventh and twelfth centuries—spiritual knights who added to monastic vows that of perpetual war with the infidel. (See articles on KNIGHT and TEMPLAR.)

Various other orders, representing various types of religious sentiment, temperament, and enterprise, sprang up in the latter part of the Middle and the earlier of Modern Ages. Especially to be noted among these is that one which has been the most potent arm of the papacy in its conflict with Protestantism during the last three centuries—the order of the JESUITS (which see).

In relation to the Reformation of the sixteenth century, from the monasteries came some of its earliest heralds and some of its most effective leaders, as Luther and Bucer. But the monastic orders, true to the genius of their system, soon presented the most hostile and effective resistance to it. But the rise of great Protestant powers in Europe greatly diminished their numbers, wealth, and influence. Through popular and political disfavor, retrenchment of privileges and revenues, or through suppression and by confiscation of their estates to civil, educational, eleemosynary, or religious uses, the monasteries in Protestant countries suffered loss of power or entire extinction. In Catholic countries also, though they maintained their formal existence, somewhat reformed in discipline, they were often there much depressed in estimation and influence by the spirit of the age.

The tendency to liberalism in European thought in the age preceding the French Revolution was disastrous to monachism in Catholic countries. It was regarded as hostile to the progress of ideas, and as adverse to economical interests, because discouraging marriage, withdrawing multitudes from productive avocations, and holding vast properties in a dead hand. In 1781, Joseph II. abolished some orders and reclaimed others from allegiance to a foreign (papal) power. In France the shock of the Revolution was still more damaging. Monasteries were abolished early in the Revolution, subsequently were allowed to revive, but with diminished prestige and influence. The example of France was followed by much of Catholic Europe under Napoleon. Excepting in Austria, Spain, Portugal, and Naples their wealth was extensively secularized.

Monachism at present subsists with little of its former importance, even in Catholic countries. Amid a world no longer presenting the conditions that gave it its birth, its uses, and its power, it is no longer the *potent factor* of former times in history and civilization, while its work in hospitals, schools, and asylums—which offices its establishments now extensively subserve—is brought into comparison and competition with institutions which general society, now more enlightened, more scientific, more humane, and more free, is erecting for itself.

In historic survey, the influence of the monastic institution is marked in strong contrasts of light and darkness, widely different with different individuals and different ages. As Augustine says, the best and the worst of men were found among the monks, and its function in civilization has varied with varying eras. Monasticism undoubtedly accelerated the fall of heathenism, and was especially active in Christian missions amid barbarous tribes. It presented at times a moral contrast and check to a corrupt Church and society; furnished sanctuaries against barbaric violence in ages of force; conserved something of ancient letters, though often the classic manuscript was effaced for the monkish legend; promoted agriculture and the mechanical arts, and, to some extent, the education of the young. It opened a spiritual and intellectual gymnasium to saintly and scholarly men, and has bequeathed a literature, scholastic, theologic, devotional, and hymnic, for some of which the modern ages are its debtors. Many of our sweetest Christian lyrics and books of devotion dear to the whole Christian world come down from the old convents in eras of social decay or of anarchy and darkness. Names such as Basil the Great, the saintly Gregories, Chrysostom, Augustine, a Bernard, a Thomas à Kempis, and a Xavier constellate along its history. On the other hand, it has at times withdrawn from Church and society much of their most needed and beneficent forces, has sequestered in wildernesses their noblest, saintliest, and most gifted spirits, has diverted from economic interests much of industrial energy and enterprise, and turned the channels of religion from common life into the desert. Often through its violence to nature it has been the focus of superstition, fanaticism, and moral corruption, whence they have gone forth to infect the world, and has been the readiest instrument and most potent champion of hierarchical bigotry and despotism in their antagonism to intellectual, spiritual, and political freedom and progress. T. M. POST.

Mon'aco, a small city, with 1887 inhabitants, situated on a lofty promontory in the Gulf of Genoa, forms, together with a surrounding territory comprising an area of 6 square miles, with 2879 inhabitants, an independent principality of Europe. It is a legalized gambling-place, and has lately acquired great reputation as a watering-place and a resort for consumptives.

Mon'ad [Gr. μονάς, ἑνάς] does not seem to have been used with any technical philosophical meaning by the ancients. It obtained such first in the writings of Giordano Bruno (1548–1600), who used it to designate the primal elements of all existence, spiritual as well as material. The monads, which are minute spheres, contain the potency of all the forms of life. The soul is a monad, and God is the monad of monads. It was probably the doctrine of Giordano Bruno that gave Leibnitz the fundamental thought of his *Monadology*. In that work Leibnitz lays down his doctrine of monads, which he elsewhere defines as "metaphysical atoms, destitute of parts and incapable of being produced or destroyed naturally" (*i. e.* without a creative or annihilating act of the primal monad, or God). They all differ from each other, and are subject to continual automatic change, involving, of course, the existence of something that changes and something that remains—in other words, multitude in unity, which again involves appetite and perception. They are indeed "entelechies" (not in the Aristotelian sense) or potential souls, existing in a state of unconscious stupor. They are created by God, the primitive Unity, who is the absolutely infinite and perfect Being, toward which they all tend, and which they all symbolize and more or less confusedly represent through their more or less numerous relations. Thus, every created monad represents the entire universe. (See *Journal of Speculative Philosophy*, vol. i. pp. 132 *seq.*; cf. Coleridge, *Religious Musings*, "Believe thou, O my soul," etc.) The profundity of the *Monadology* has seldom been recognized. Kant propounded a doctrine of monads, which, however, he regarded as extended though simple. They exert attraction and repulsion through space, and are perfectly elastic. (Cf. Kant, *Monadologia Physica.*) He suggested, in his *Critique of Pure Reason*, a doctrine somewhat similar, but approaching more nearly to that of Leibnitz. He holds that what to our external sense is objective may be, to its own internal sense, subjective—that the material is but the outside aspect of thought. At the present day Hermann Lotze (*Medicinische Psychologie*) propounds a doctrine of spiritual monads or simple unextended beings, each of which is a modification of the Absolute. (Cf. the *Song of the Norns* in Jordan's *Nibelunge*.)

Thomas Davidson.

Monad'nock, or **Grand Monadnock,** a solitary mountain, Cheshire co., N. H. (See Grand Monadnock.)

Mona'gas (Gen. José Tadeo), brother of Jacinto, b. in Venezuela about 1786; was actively engaged in the war of independence under Bolivar (1810–20); headed unsuccessful revolutions against Presidents Paez and Vargas; was elected president 1846; overthrew the constitution 1848; exiled Paez, and governed the country dictatorially until 1859, when he was overthrown. In 1868 he "pronounced" against the government of Gen. J. C. Falcon, which he overthrew, assumed the provisional presidency, and was elected for a regular term Oct. 4, but before his inauguration d. at Caraccas Nov. 18, 1868. He was a brave and skilful officer, but unprincipled in the exercise of power, and accumulated great wealth.—His son, Gen. José Ruperto Monagas, was afterward president for a short time.

Mon'aghan, county of Ireland, province of Ulster. Area, 498 square miles. The surface is hilly, in the eastern part even mountainous. The principal range is that of Slievebeagh, which extends into Fermanagh and, in its highest point, rises 1254 feet above the level of the sea. The county was formerly densely wooded, but is now nearly bare of trees. The numerous small lakes and streams form a peculiar feature of the landscape. In the more level portions the soil is fertile, but on the hills it consists of a stiff clay difficult to handle. The main crops are oats, barley, flax, and potatoes. Of the total area (318,806 acres), only 131,124 acres were under crops in 1882—namely, 53,997 oats, 21,321 potatoes, 12,348 flax, etc. In the same year the county had 10,666 horses, 72,266 cattle, 9858 sheep, 29,972 pigs, and 434,260 poultry. The only important manufacture is that of linens, and it has for several years been on the increase. Pop. in 1881, 102,748. From 1851 to 1881 no less than 56,408 persons emigrated from the county. Principal town, Monaghan, named from a monastery very early founded there. The town was incorporated by James I.

Mon'archy [Fr. *monarchie;* It. *monarchia;* Sp. *monarquia*—from Greek μόναρχος, from μόνος, "alone," and ἄρχω, "to rule"], government of a state by one chief only. The word in its original sense can hardly be applied to the constitutional sovereignties of the present day, in which the administrative power is shared by officers and representatives chosen by the people. The governments of England and others more or less resembling it are therefore called "limited" or "mixed" monarchies, and thus distinguished from those to which the term *absolute* is given, and where the chief has almost or altogether irresponsible power over the lives and property of his subjects. Absolute monarchies, which as the world advances toward freedom are becoming rarer, are now found in perfection only in the East, where were the five great monarchies of the ancient world—namely, Chaldæa, Assyria, Media, Babylonia, and Persia. (See G. Rawlinson, *The Five Great Monarchies*, etc., and the article on Government, by Hon. A. H. Stephens, LL.D.)

Janet Tuckey.

Monastery. See Monachism, by T. M. Post, S. T. D.

Monasticism. See Monachism.

Monastir', or **Mistir,** town of Tunis, in Northern Africa, on the Mediterranean. It has extensive manufactures of coarse woollen fabrics. Pop. 35,000.

Monastir, town of European Turkey, in the province of Room-Elee, carries on a very important transit-trade, and has some manufactures of gold and silver ware. Pop. 40,000.

Monbod'do (James **Burnet**), b. at Monboddo, Kincardineshire, Scotland, in 1714; educated at Aberdeen and Groningen; practised as advocate in Scotland in 1767; became a judge, with the title of Lord Monboddo. His *Dissertation on Language* (6 vols., 1774–92) expresses his high opinion of the Greek literature and philosophy, and the theory of the origin of the human race from the monkey, which he further elaborated in *Ancient Metaphysics* (6 vols., 1778). D. at Edinburgh May 26, 1799.

Monca'da, de (Francisco), count of Osuna, b. at Valencia, Spain, Dec. 29, 1586; served as ambassador to the emperor of Germany, and as general-in-chief of the Spanish forces in the Netherlands (1633), under the administration of the infanta Isabella, and obtained some successes over the prince of Orange. D. in the province of Cleves in 1635. Moncada wrote several historical, biographical, and miscellaneous works, but his fame as a Spanish classic rests upon his picturesque account of the famous campaign of Roger de Flor in the Byzantine empire, *Expedicion de los Catalanes contra los Griegos y Turcos* (Barcelona, 1623). A good modern edition is that of Ochoa in the *Tesoro de los Historiadores Españoles* (Paris, 1841).

Moncalie'ri, town of Northern Italy, province of Turin, about 5 miles S. of the city of Turin. It is beautifully situated on a hill commanding a superb view of the Alps and the plains of Piedmont, and has some fine buildings, among them the Castello Reale, a large and imposing structure. This town was little more than a villa of the Knights Templar in the thirteenth century, but afterwards acquired importance under the dukes of Savoy. Pop. 9994.

Monck (Charles Stanley), fourth viscount, G. C. M. G., b. at Templemore, Ireland, Oct. 10, 1819; educated at Dublin University, and called to the bar in 1841; succeeded his father in 1849; entered the House of Commons 1852; was a lord of the treasury 1855–57; was governor-general of Canada 1861–68; received a seat as a baron in the House of Lords 1866; became in 1867 a commissioner of the Irish Church temporalities. During his service in Canada the Dominion was established.

Monck'ton (Robert), a son of the Viscount Galway; entered the British army in 1742; served with distinction in Flanders; also at Dettingen, Louisbourg, C. B. (1758), Quebec (1759), where he was second in command and badly wounded; was lieutenant-governor of Nova Scotia 1756; governor of New York 1762; captured Martinique 1762; became lieutenant-general 1770; served afterwards in Great Britain, sat in Parliament, and d. May 3, 1782.

Moncreiff (Sir Henry). See Wellwood.

Moncton, a beautiful village and port of Westmoreland co., N. B., at the head of navigation of the Petitcodiac River, on the Intercolonial Railway, 89 miles N. E. of St. John. It contains the railway-shops, and has 4 churches, 1 weekly newspaper, and manufactures of leather, tobacco, castings, etc. Pop. in 1881, 5032.

Mon'day [Ger. *Montag;* Fr. *Lundi*—signifying "moonday"), the second day of the week. Dion Cassius (xxxvii. 18), who wrote about 220 A. D., says that "the practice of referring the days of the week to the seven planets began among the Egyptians," and had been but recently adopted by the Roman world.

R. D. Hitchcock.

Mondoñe'do, town of Spain, in the province of Lugo, in a valley of the Sierra Lorenzana, Galicia, has 10,112 inhabitants, who are mostly engaged in cattle-rearing and agriculture.

Mondovi' [*Monsvici, Monsregalis, Vicodunum*], town of Northern Italy, in the province of Cuneo, about 42 miles S. of Turin and about 1600 feet above the sea-level. It is surrounded by ancient walls, with a citadel on the S. side, and the torrent of Ellero flows by it on the W. The episcopal palace is a very fine building, and the cathedral and other churches are of considerable interest. About 2 miles from Mondovi is the great sanctuary of the Madonna di Vico, a building of much architectural merit and adorned with interesting works of art. Mondovi is not very old, and its mediæval history resembles that of other Piedmontese towns. In 1796 occurred in this neighborhood the engagement known as the battle of Mondovi, in which Bonaparte defeated the Piedmontese army, and thus prepared the conquest of all Upper Italy. In 1799 the inhabitants of Mondovi having revolted against the French, the town was retaken by them, sacked, and nearly destroyed. Pop. 17,902.

Monette' (John Wesley), M. D., author of a valuable work, *History of the Discovery and Settlement of the Valley of the Mississippi* (2 vols., 1846); d. in Madison parish, La., Mar. 1, 1851.

Mon'ey [commonly derived from *moneo, moneta,* because the Roman mint stood in the temple of Juno Moneta, or because *nota inscripta de valore admonet*], a standard by which wealth is measured, and an instrument by which one kind of wealth can be exchanged for another. It differs specifically from wealth, in that while wealth is any object of common desire which costs labor, money is that kind of wealth by which it has been agreed that the value of wealth shall be estimated, and for which all other kinds of wealth can be exchanged. Its two qualities are that it is a standard of value and an instrument of exchange. Money differs also from currency. While currency is anything with which commodities can be bought and debts cancelled, it does not always have an intrinsic value, but may be, as in the case of bank-bills or government notes, merely a voucher or representative of value, in which case it is not money. Money is that kind of currency which has an intrinsic value, and which thus, if not used as currency, would still be wealth. Money also differs from capital. Capital is that portion of wealth set aside and used for the reproduction of wealth. It may have been money, but the money ceases to be such when it becomes capital.

Different Commodities used as Money.—Any article of wealth—*i. e.* anything which has value—may be used as money. Tin was thus employed in ancient Syracuse and Britain, while to the same purpose we find iron in Sparta, cattle in Rome and Germany (*pecunia*, from *pecus*, "cattle"), a preparation of leather among the Carthaginians, platinum in Russia, lead in Burmah, nails in Scotland, pieces of silk among the Chinese, cubes of pressed tea in Tartary, salt in Abyssinia, cowrie-shells on the coast of Africa, slaves among the Anglo-Saxons, tobacco in Virginia, codfish in Newfoundland, bullets and wampum in the early history of Massachusetts, logwood in Campeachy, sugar in the West Indies, soap in Mexico, etc. But from the time of Abraham, when he paid (Gen. xxiii. 16) to the children of Heth 400 shekels of silver, "current money with the merchant"—the earliest historical record of a purchase with money—till now, gold and silver have been the money of the world with civilized and commercial people. It should be noted that money does not depend upon the nature of the commodity employed as such, but wholly upon its use. When anything that has been used as money becomes devoted to any other use, it thereby ceases to be money. Gold money turned into gold plate is no longer money.

Adaptedness of Gold and Silver for Money.—These metals possess some singular advantages which explain why they are used as money They are intrinsically valuable, everybody in the civilized world desiring gold and silver, not simply as money, but for ornaments, for plate, and other uses, and no one being able to obtain them without labor. They have both the elements, therefore, of true value. Besides this, they wear out very slowly; they are very easily divisible and malleable, and can be readily alloyed and refined; they are largely distributed over the globe, and are yet of sufficient scarcity; they are of the same quality wherever found, and are subject to fewer fluctuations in value than any other commodities known. This last quality is a prime requisite in money. In exactly the degree in which the value of money were unstable would it cease to be a trustworthy standard of value, while in the same degree exchanges would be made difficult and contracts uncertain.

Where gold and silver are the currency of a country there cannot be, for any length of time, either a redundancy or a stringency of the money-market. Supposing for a time a redundancy, more money than is needed, what takes place? One of two things, probably both. In the first place, gold becomes cheap, and it at once begins to be used for other things than money; *e. g.* ornaments and plate. Also, when gold is cheap—which means that other things are dear in comparison with it—this immediately leads to the sending of gold for the purchase of goods to where it is not so cheap—a procedure which will soon change a preponderance to a healthy equilibrium. In like manner, when there is a stringency, and gold becomes dear, it will be drawn from other lands, and diverted from the making of ornaments and other uses till the stringency is removed. By a law as beautiful as that of the tides, and as inevitable, the money-market regulates itself wherever gold and silver, the money of the world, are the currency employed.

Whence, then, come financial panics and revulsions, and so-called stringencies in the money-market? These undoubtedly occur with sad frequency and dire results. But they are not due to outside calamities. Their causes are always in some wrong procedure on the part of the commercial world which suffers them. They grow out of the attempt to make that to be real in business transactions which is not real—either the attempt to make credit or something besides capital do the work of capital, or the attempt to make a currency which is not money do the work of money. When the latter attempt is made, the former is sure to follow. An unsound currency irresistibly induces unsound credit, and these inevitably lead to an unstable business structure, which soon or late must fall with a crash and ruin.

When money alone, or a currency convertible at once into money, is used as a medium of exchange, it is not certain but that credits may be pushed inordinately, and business be carried on where there is no capital to support it; in which case a financial revulsion, however delayed, cannot be prevented, as any falsehood, however speciously concealed or plausibly declared to be the truth, can never be employed without betraying itself in ruinous results. But when a currency is used which cannot be converted into coin—a currency which professes to be what it is not—this first falsehood draws others in its train; promises become easily made which there is no power to perform; speculation grows rampant; the business of buying and selling seems to be the most profitable of all employments, and multitudes beyond its power to support them are drawn from productive works into this; trade becomes a bubble, blown till it bursts; and the highest activity and apparent prosperity are suddenly changed to stagnation and ruin. A currency like bank-bills or government notes, which cannot be converted into money at the pleasure of the holder, is only a shadow put in place of the substance, which not only furnishes no support for the community which trusts it, but is as destructive to all business prosperity as it is deceptive. This conclusion is equally supported by a clear knowledge of the nature and uses of money, or a comprehensive acquaintance with the history of trade.

In order that money may be a standard of value as well as an instrument of exchange, its own value must be invariable—a condition to which gold and silver better conform than any other commodity, but in which any currency not convertible into these necessarily fails. When bank-notes or government notes become currency without a corresponding basis of money, nothing has ever been able to prevent their fluctuation in value and the consequent effect upon all other values. The temptation to increase these issues according to the fancied interest of the bank or the government is always likely to prove irresistible, in consequence of which the community employing them finds itself flooded with a currency upon which all values float with an unsteady motion, and any standard of value is out of the question.

A poor currency inevitably causes a good one to disappear whenever put by its side. Inconvertible paper will always drive out gold and silver from circulation when brought into competition with these. The paper, being cheaper, will of course be used in preference to the dearer commodity, and gold and silver coin not only cease to circulate, but leave the country where the inconvertible paper abounds. In such a case nothing can bring the gold and silver back and put them into circulation again except the removal of the currency which has driven them out. When the poorer currency is withdrawn, that which is better flows back as naturally as the air rushes into a vacuum, while any other attempt to restore specie payments where they have been discontinued is as futile as the effort to put two mutually repellent bodies into the same place at the same time. (See COINAGE.) J. H. SEELYE.

Monfesti'no, town of Italy, province of Modena, about 20 miles from the city of Modena. Pop. 5426.

Monghir', town of British India, in the presidency of Bengal, on the S. bank of the Ganges. It is noted both for its beautiful situation on a rocky height at a bend of the river, and for its salubrious climate. It is fortified, and manufactures hardware, cutlery, and firearms of a lower grade. Indeed, the whole district in which it is situated, and of which it forms the administrative centre, is noted for its manufacture of cheap iron goods. Pop. about 60,000.

Mongo'lia [the land of the *Mongol* or *Moghols*, for the name is spelt variously even by the native population] is still a vast district in Central Asia, extending fully 1000 miles E. and W., and in some parts as much as 600 miles from N. to S. Its present boundaries E. and N. are Manchuria and Siberia, respectively, and on the S. and W. Thibet and Toorkistan; but these boundaries have varied greatly at different periods of history. The whole of what is now usually recognized as Mongolia is considered to belong to the Chinese empire; indeed, its eastern portion can hardly be separated from China proper; moreover, the Chinese province of Kansa, a late incorporation with that empire, is, in fact, as completely Mongolian as any part of the interior of that country. A large portion of Mongolia is occupied by the Great Gobi Desert, extending N. E. and S. W. between the 90th and 120th parallels of E. lon., a tract as hopelessly desolate and sterile as can be found on the face of the earth—a district alike waterless and treeless, in some places exhibiting a considerable depression, and in some parts more than 200 miles in breadth. Generally, this desert is a level land, and though, on the whole, at an average elevation of 2000 feet above the sea, there are but few hills of any altitude. On the other hand, the Alashan country to the S. is mountainous and well wooded. On the western side of these hills the great river Hoang-Ho runs for nearly 400 miles, and some peaks, beyond where the Hoang-Ho forces its way eastward, are covered with perpetual snow, and are probably not less than 10,000 to 12,000 feet high. These mountains bear the name of Inchin or Kinghan. Beyond this range, to the N. E., Mongolia and Manchuria, with populations almost identical, extend to the shores of the Yellow Sea; and though some attempts have been made at cultivation, the interior is still for the most part wild and desolate. It was to prevent the earlier Mongolian tribes descending into and plundering the more fertile provinces of China to the E. and S. that the first Chinese emperor built, more than 2000 years ago, the famous Wall, with an extent of 1800 miles from the Gulf of Peking to Western Tartary. To the N. and N. W. chains of high mountains separate Mongolia from Siberia, the range of Altai being the most famous. This, which is the richest portion of Mongolia, is chiefly in the hands of the Booddhist priesthood, the high priest himself residing at Ourga, on about the 116° E. lon. This place is the seat also of a special Chinese Manchu governor, with a supreme court of justice, and serves as a principal dépôt for the trade passing into Siberia at Kiakhta. Though better watered than other parts of Mongolia, and the source of some considerable rivers, such as the Amoor and the Orkhon (which flows into the Siberian lake Baikal), the intense winter cold renders the rearing of even the commonest and hardiest vegetables almost impossible. Owing to the peculiar character of their country, the Mongolians are now, as they have ever been, essentially nomadic, and, though in all parts acknowledging the emperor of China as their suzerain, are still mostly under the rule of native chiefs, who govern with feudal rights the numerous tribes into which they are divided. Their two largest branches are the eastern or Mongols proper, and the western, who are usually called Calmucs; and their three leading tribes (the whole number of which is said to be twenty-six) are known by the names of Tsakhars, Kalkhas, and Sunorits; of these, the Kalkhas are, or were till recently, under four hereditary chiefs, each claiming descent from Genghis Khan. Their military service extends from the age of sixteen to sixty; and the Chinese tribunal of foreign affairs, with one civil and two military governments, is now the ultimate seat of appeal. By far the largest number of the population dwell in tents, and their chief possessions are large herds of camels, horses, sheep, asses, and mules. A considerable trade passes through Mongolia to China on the one side, and Russia on the other, with frontier marts at Kiakhta in Siberia and Maimaitchin in Mongolia; this trade is carried on wholly by barter, money being either forbidden or (at least) seldom used. The caravans perform their journeys between October and the end of the winter, bringing furs, woollen stuffs, and leather from the West, and conveying thither teas, silks, cotton, rhubarb, and sugar-candy. No reliable estimate can be formed of the actual number of these nomads, but as desolating wars long prevailed before their submission, 200 years since, to the Chinese rule, and as the greater part of the country is practicably uninhabitable, it has been conjectured that the existing Mongolians could not bring into the field more than 500,000 fighting-men, and therefore that their whole population cannot amount to 3,000,000. As they are of the same origin as the present Manchu rulers of China, similar interests as well as relationship ensure their chiefs many favors from the Chinese government; thus, some are married to princesses of the imperial house, so as to attach them more closely to the reigning family, while as a rule, the rich gifts they receive far exceed the nominal tribute exacted from them. Unlike nomadic nations, the Mongolians have an alphabet (derived from the Syrian Nestorians) and a literature—of little value, however, being chiefly translations from Chinese works, or stories, more or less fabulous, of their great national hero, Genghis Khan. The Mongolians are middle-sized, strong and active; their skin of a dark yellow hue; their faces broad, with flat noses and projecting ears. They have little beard, and generally shave off what they have except one tuft. They belong to the great group now often called Turanian, and are thus allied to the Chinese, Thibetans, and the Japanese, and more remotely to the Esquimaux, Samoyedes, Lapps, Turks, and Magyars; in other words, to nearly two-thirds of the whole human race. In ancient history we find their ancestors under the generic title of Scythians or Cimmerians, and the founders of the Median empire, whose cuneiform writings we are even now only partially able to decipher; in later times they appear as the terrible and devastating Huns, and still later as the scarcely less ferocious warriors of Genghis Khan and Timour. Though doubtless connected with the Turkish tribes, the Mongols ought not to be confounded with them. The true Tartars (or more properly Tátars), of whom little is known, historically, before their conquest in the thirteenth century by the Mongols under Genghis Khan, the Toorki or Toorkoman tribes, the ancestors of the Ottomans, now known as the Nogai, Oozbek, or Kirgheez hordes, though nearly as nomadic as the Mongols, differ from them as exhibiting in many cases a more refined and even a Caucasian type of features. Except as wandering hordes, overwhelming each country in its turn like a set of hungry locusts, and devastating (as is clear from Herodotus, Ammianus, and Jornandes) rather by their vast numbers than by knowledge of war as an art, we hear little of the Mongols till the time of Genghis Khan. Not long after the Kalkhas, under their khan, Kublai, conquered all China, and held the chief power there for about a century; and though, as is usually the case with empires so formed, that of the Mongols was soon broken up into a number of separate dynasties, the great Timour widely extended the already vast frontiers of the Mongolian empire. Lastly, in the year 1519, Baber, a lineal descendant of Timour, founded by conquest a monarchy in Hindostan, popularly called the "Mogul" dynasty, and celebrated for the famous Akbar, a contemporary of the English Elizabeth. To the invasion of Western Asia by the Mongolian tribes we owe the establishment of many dynasties which became notable in history, partly owing to their conflict with the Franks during the Crusades, and partly to the great ability in matters of government which these wild tribes from Central Asia exhibited as soon as they found themselves settled in the fertile lands of the West. Among the dynasties which owe their origin to the Mongolian conquests may be mentioned that of the Moguls of Persia and Syria (A. D. 1157–1355); the Kara-koiunbu (Toorkomans of the Black Sheep), (A. D. 1357–1496); those of the White Sheep (A. D. 1406–1502); and, connected with these, the khans of Kapchak, of the Crimea, and of Kasan, with the Oozbeks of Bokhara, Samarcand, and Balkh. In Egypt we find Thoulonides and Ikhshidites, and, as more remote descendants, the powerful kingdom of the Mamelukes, under their double designation; in Southern Central Asia, the Samanians and Bouides, and in near connection with them the earlier Ghaznavides of Ghazna. Then comes the great dynasty of the Seljooks, first in Persia from A. D. 1029–1194, and then at Iconium, Aleppo, and Damascus from A. D. 1081 to 1154. With these last rulers commenced the long conflict with the Christians. Lastly, we may name the important dynasties of the Ortokides of Syria (A. D. 1082–1220), of the Atabeks of Syria and Persia (1084–1250), who numbered among their greatest leaders the famous Salah-ed-din (Saladin). All these rulers, and to some extent their subjects also, had embraced the doctrines of Islam, though in many cases their practice would have been scarcely sanctioned by the rigid followers of the Koran. Indeed, it may be doubted if anything but the warlike principles of the Prophet would have availed to keep together a people as wild and as shifting as their own sands. At the present time, it should be added that nearly all who claim to be Mongolians have gone back to the faith of their ancestors,–the religion of Booddha. Large collections of Mongolian manuscripts, as well as printed books, are found in the Asiatic Museum of the St. Petersburg Academy, in the libraries of Kasan and Irkutsk, and in the royal library of Dresden. (See I. J. Schmidt, *Bildungsgeschichte der Völker Mittelasien*, Leipzig, 1824; Huc, *Travels in Tartary, Thibet, and China*, 1852, 2 vols.; Wolff, *Geschichte der Mongolen*, Breslau, 1872.)

W. S. W. Vaux.

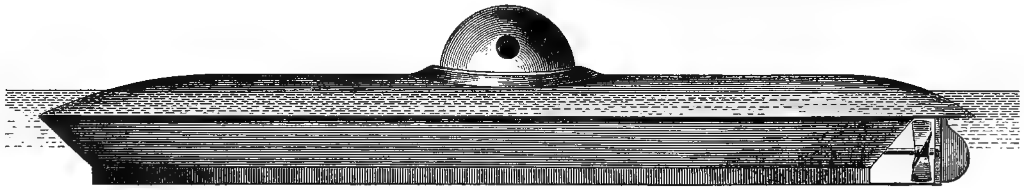
Mongom'erie (John), a native of Ayrshire, Scotland; became a soldier; was groom of the bed-chamber and aide to George II., and governor of New York 1718–31. D. July 1, 1731.

Monhe'gan (or **Manheigan**) **Island,** off the coast of Hancock co., Me., has been since 1608 a resort for cod-fishing. It was visited in 1614 by Capt. John Smith, of Virginia. It has a rock having marks which have been incorrectly regarded as of Runic origin. It has a granite lighthouse with a flashing white dioptric light; lat. 43° 45′ 52″ N., lon. 69° 18′ 37″ W.

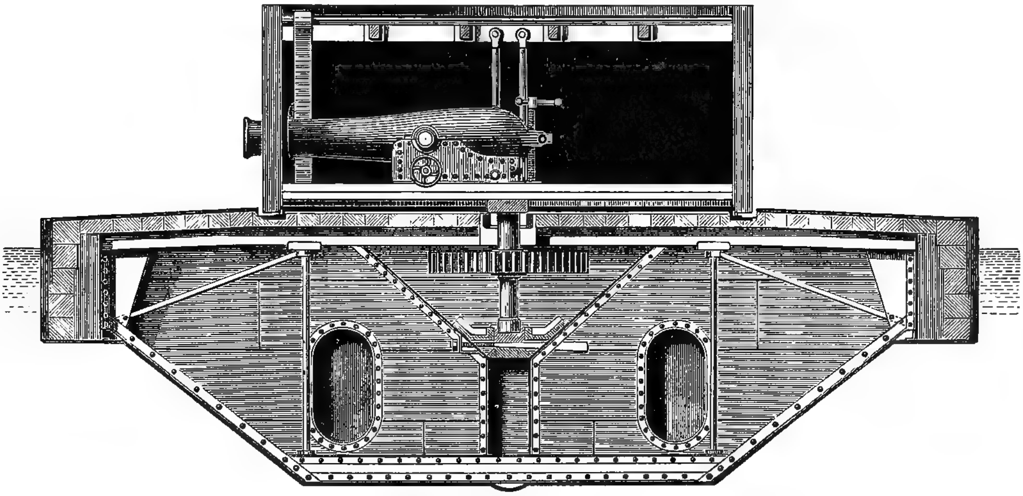
Monition, in the practice of the English ecclesiastical courts, is the mildest form of ecclesiastical censure—simply an order admonishing the person complained of to do something specified in the instrument "under pain of the law and penalty thereof." Nevertheless, when duly and regularly served, disobedience to it entails the penalties of contempt of court.

Mon'itor [so called because it was believed to give warning of the approach of the crocodile], a genus of large Old-World lizards, some of which approach the size of the alligators. *M. niloticus*, the monitor of the Nile, is the typical species. The natives believe that it is hatched from crocodile's eggs. It is certain that it devours a large part of the eggs of the crocodile. It is some six feet long. The *M. dracæna* of India and *M. Gouldii* of Australia are also well-known monitors. The great lizards of the South American family Teiidæ are also often called monitors, and indeed closely resemble the true monitors.

Monitor, the designation of a special class of armored vessels, invented by JOHN ERICSSON (which see). On Sept. 26, 1854, this distinguished engineer submitted to the emperor Napoleon III. the plan and specification of a nearly-submerged vessel, represented by the annexed engraving. The principal features of this vessel, the parent of the present monitor, consisted of a revolving cupola, composed of wrought iron six inches in thickness, for protecting a single gun of large calibre, inclined sides, and an overhang deck for protecting the propeller and rudder. In 1861 a majority of the slaveholding States made war upon the Union, and the President proclaimed a blockade of their coast. It was imperative that this should be effected quickly; and as the Southern harbors were in possession of the Confederates, light-draft iron-clads became a necessity. The competition of France and England in the construction of armored vessels had awakened in the U. S. neither interest nor anxiety, so that this subject, which required careful thought and study, was precipitated upon the counsellors of Mr. Lincoln at the beginning of a great war. On Oct. 4, 1861, the secretary of the navy contracted with Capt. Ericsson, as principal, for the construction of "an iron-clad, shot-proof steam battery of iron and wood combined;" and under this indenture a vessel, named by Capt. Ericsson "Monitor," was launched at Greenpoint, Long Island, on Jan. 30, 1862, and went to sea Mar. 6 in command of Lieut. John L. Worden, U. S. navy, with a crew of 43 men and 12 officers, exclusive of Chief Engineer A. C. Stimers, inspector at New York, who went as a volunteer. The Monitor was an iron hull with wooden deck-beams and side projection, and of the following dimensions:



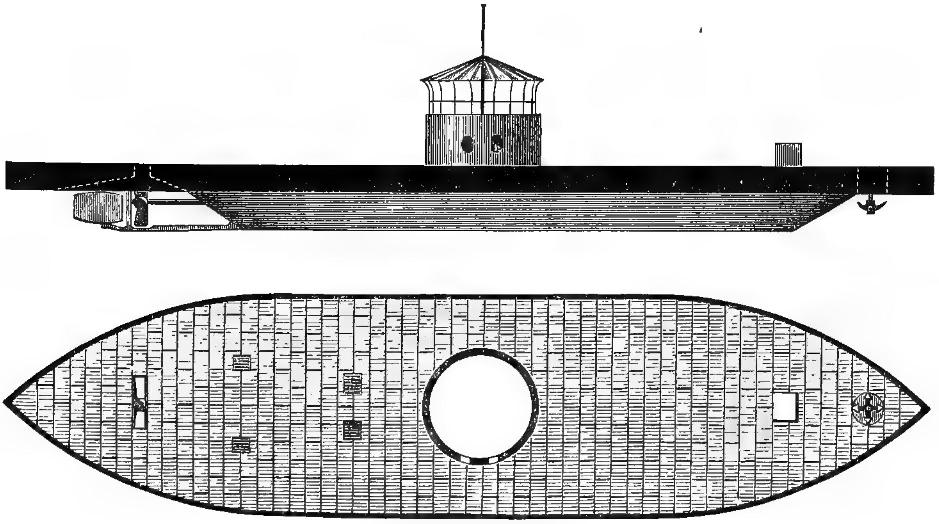
Ericsson's Cupola vessel of 1854.



Section of Ericsson's Monitor and Turret of 1861.

Extreme length	172	feet.		
" breadth	41	"	6	inches.
Depth of hold	11	"	4	"
Draught of water	10	"	6	"
Inside diameter of turret	20	"		
Height of turret	9	"		
Thickness "	...		8	"
" of side-armor	...		5	"
" " deck-plating	...		1	inch.
Diameter of propeller	9	"		
" " steam cylinders (two)	...		36	inches
Length of stroke	2	"	2	"
Displacement	1255	tons.		

Armament, two 11-inch shell guns, each 15,668 pounds.



Ericsson's Monitor of 1861.

The preceding engraving represents a transverse section of the Monitor and turret; also a side elevation, showing the position of the turret, pilot-house, propellers, equipoise rudder, and anchor-well. This peculiar structure put into practical operation the invention of 1854—a seagoing raft carrying a fort.

At Norfolk, Va., the steam frigate Merrimack, of 4700 tons displacement, had been converted by the Confederates into a casemated iron-clad with submerged ends, protected by four inches of iron, and armed with two banded 7-inch rifles, two banded of $6\frac{4}{10}$ inches, and six 9-inch, smoothbore, shell guns. Her crew consisted of 320 men and 30 officers, and she drew 22 feet of water. On Mar. 8, 1862, the sailing frigate Congress and the razee frigate Cumberland were lying at anchor off Newport News, Va. The sailing frigate St. Lawrence and the steam frigates Minnesota and Roanoke (the latter with a broken shaft) were under the guns of Fort Monroe. The construction of the Merrimack, her near completion, and her probable advent were known at Washington and to the military and naval authorities at Hampton Roads;* therefore it was not a surprise when she was reported to be coming down Elizabeth River a little after meridian with two gunboats in company. About one o'clock all three vessels opened a destructive fire of shells upon the Congress and Cumberland, to which they replied promptly, but ineffectually. It was "full sea" there at 1.56 P. M., and while the Cumberland was riding to the last of the flood the Merrimack ran into her, striking just abaft the starboard fore-chains; the blow was fatal, and the ship immediately began to sink. Her defence against the attack of these new and tremendous forces—the steam-ram and iron-clad—had now been maintained to the last extremity, and her commander would have been justified in hauling down his flag; but Lieut. Morris preferred to give another example of the high standard of the American navy. He fired his last broadside as the ship made her final plunge, and the living and the dying and the dead went down together, the American flag flying at the peak. The Confederates were joined by three more gunboats from James River, and the Congress, having been set on fire by shells, slipped her cable, ran on shore, surrendered, and was abandoned, being on fire in several places. By five o'clock the battle was over. No hostile gunboat was disabled; the Merrimack had none of her plates penetrated or knocked off; only two of her crew were killed and nineteen wounded. She lost her metal prow by ramming, and the muzzles of two guns were shot away, but the whole of her injuries were not considered of sufficient importance to suggest a return to the navy-yard, therefore she anchored off Sewall's Point, that she might more conveniently complete the work of destruction on the morrow. When the Union squadron at anchor off Fortress Monroe observed that the Confederate vessels were steering for the Congress and Cumberland, an effort was made to go to their succor. The Minnesota was the only one adequate for offensive operations, and by signal from the senior officer, Capt. Marston, she slipped her cable and steamed up for Newport News, 7 miles distant. Unfortunately, she grounded before reaching there, and remained immovable during the battle within the zone of fire of the combatants. The Roanoke and the St. Lawrence, while being towed to the scene of the conflict, met with the same misfortune, but were relieved, and returned to their anchorage. At 9 P. M. the Monitor arrived, and was ordered to proceed immediately to the protection of the Minnesota. The President had directed the writer to go to Hampton Roads, and, after consultation with the naval authorities there, withdraw such portion of the naval force as he thought proper to co-operate with the army in clearing the right bank of the Potomac of the hostile batteries which closed its navigation. He reached Old Point at 7½ A. M. Mar. 9, and learning the condition of affairs, proceeded to the Minnesota, thence to a steamer, from which he witnessed the combat.

It was a cloudless Sabbath morn, without a breath of air to sway the black column of smoke which indicated the position of the Merrimack. The engagement of the day previous had terminated the history of armed sailing ships for fighting purposes, and now for the first time iron-clads were "to join their dark encounter." At 8 A. M. the Merrimack, commanded by Lieut. Catesby Ap R. Jones, supported by three gunboats, stood out to attack the Minnesota, which was lying aground about 1½ miles E. S. E. from Newport News, with her head to the southward and westward. This magnificent frigate therefore became the stake for which the iron-clads fought. The Monitor advanced to cover the Minnesota, and when within one-third of a mile discharged both of her guns at the Merrimack, and received a broadside in return. The advantages were apparently in favor of the Merrimack. She was constructed in conformity with established principles, armed with an approved broadside battery of heavy guns, and manned and disciplined according to naval usages. The Monitor was wholly a fighting machine, constructed on principles which provoked adverse criticism, chiefly because it foreshadowed great naval changes. Neither internally nor externally was there anything

> "Like a stately ship . . .
> With all her bravery on, and tackle trim,
> Sails filled and streamers waving."

Such a novelty was repugnant to naval traditions, and before the officers and crew could become familiarized with it by use, they bravely accepted battle with a victorious and formidable antagonist. As the two iron-clads closed, all other combatants withdrew or were silent, leaving the deep water to the northward and eastward of the middle ground clear for this memorable struggle. The firing was not rapid on either side; the commanders, anxious to waste no shot, fired only in close contact. In manœuvring they were sometimes considerably apart, and once, while the vessels were thus separated, the Merrimack fired three shells at the Minnesota, one of which exploded the boiler of a tug alongside. The attempt to run down the Monitor was futile, owing to her light draft, solid deck, and overhang. The stroke of the Merrimack, hitting at an angle, simply pushed away her lighter antagonist. For more than three hours these mailed warriors interchanged indecisive blows, when near noon the Monitor hauled off, and the writer observed Chief Engineer Stimers and several men go out on deck and surround the pilot-house, where they remained some time. This movement laid open the Minnesota to another attack from the Merrimack, but her commander did not, as previously, avail himself of it; on the contrary, he steamed over to Sewall's Point, passed the bar and the obstructions in Elizabeth River, and so on to the navy-yard at meridian, three hours before high water. The writer immediately boarded the Monitor, and found her gallant commander lying begrimed with powder, bloody, and almost sightless from the explosion of one of the enemy's shells against the lookout spaces in the pilot-house. He gave him the sympathies of a shipmate and friend and congratulations upon his fortitude and success. Afterwards he requested that the officers and crew might be assembled on deck, where he thanked them in the name of the navy department for the great services they had rendered.

At 6.45 P. M. telegraphic communication was established between Washington and Fort Monroe, and the following message was the first one sent:

"FORTRESS MONROE, 6.45 P. M.,
"Mar. 9, 1862.

"The Monitor arrived at 10 P. M. last night, and went immediately to the protection of the Minnesota, lying aground just below Newport News. At 7 A. M. to-day the Merrimack, accompanied by two wooden steamers and several tugs, stood out towards the Minnesota and opened fire. The Monitor met them at once and opened her fire, when all the enemy's vessels retired excepting the Merrimack. These two iron-clads fought, part of the time touching each other, from 8 A. M. to noon, when the Merrimack retired. Whether she is injured or not it is impossible to say. Lieut. J. L. Worden, who commanded the Monitor, handled her with great skill, and was assisted by Chief Engineer Stimers. Lieut. Worden was injured by the cement from the pilot-house being driven into his eyes, but I trust not seriously. The Minnesota kept up a continuous fire, and is herself somewhat injured. She was moved considerably to-day, and will probably be off to-night. The Monitor is uninjured, and ready at any moment to repel another attack.

"G. V. FOX,
"*Assistant Secretary.*

"Hon. GIDEON WELLES,
"*Secretary of the Navy.*"

The next morning the secretary of the navy telegraphed as follows:

"NAVY DEPARTMENT, Mar. 10, 1862.

"It is directed by the President that the Monitor be not too much exposed, and that in no event shall any attempt be made to proceed with her unattended to Norfolk. If vessels can be procured and loaded with stone and sunk in the channel, it is important that it should be done. The San Jacinto and Dakota have sailed from Boston to Hampton Roads, and the Sabine, in tow of the Baltic and a tug, from New York. Gunboats will be ordered forthwith. Would it not be well to detain the Minnesota until other vessels arrive?

"GIDEON WELLES.

"Capt. G. V. FOX,
"*Assistant Secretary of the Navy*, Fortress Monroe."

The Monitor fired 41 solid cast-iron shot at the Merrimack, each weighing 168 pounds, with a charge of 15 pounds of cannon-powder. She was hit 22 times without harm, except the fracture of one of the wrought-iron logs of the pilot-house. Her commander only was wounded. The Merrimack fired 46 shells at the Monitor and 4 at the

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* The navy department, for obvious reasons, had continually pressed for a joint expedition to capture Norfolk, and early in Feb., 1862, Gen. Barnard, chief engineer of the Army of the Potomac, furnished a memorandum of a plan for that purpose, but the land-forces could not be obtained.

Minnesota. The Monitor's shot did not strike the Merrimack at the water-line, where the protection was only one inch of iron, but hit the sloping casemate, which was covered with four inches of iron in two plates. These were always broken by the blow, and sometimes the wooden backing was bulged, but the plates remained in their places, not having been hit twice in the same spot. No one was killed or wounded. The head of her rudder-post was exposed, but it escaped injury. The pounding given to the Merrimack during these two days was without precedent in the history of any vessel, and she was becoming leaky and shaky, besides lightening one inch for every consumption of twenty-four tons. She had exhausted her powers against the Monitor both in battering and ramming, and a wise consultation caused her withdrawal to the dry dock at Norfolk.

The results of this encounter were decisive. The Minnesota was saved with a loss, during the two days' fighting, of but 3 killed and 16 wounded. The Merrimack remained under repairs for more than a month behind the obstructions of Elizabeth River. The Monitor continued in the roads, in conjunction with three large steamers fitted as rams, as the chief reliance in preventing the Merrimack from passing out to destroy the transportation of the Army of the Potomac, which covered the waters between Old Point and Yorktown. To this vital duty she was limited by imperative orders.*

Throughout the North public sentiment was aroused in favor of building more monitors, and Congress responded with liberal appropriations. In a few months improved Ericsson batteries armed with 15-inch guns departed for the Southern coast, and took conspicuous positions on the blockade and in battle. In Great Britain the apathy with which the administration of Lord John Russell had permitted the agents of the rebellion to contract for the building and fitting out of ships in her ports to make war on the U. S., with whom she was at peace, gave place to diligence in the observance of her neutral duties.

At 1 A. M. Dec. 31, 1862, Cape Hatteras bearing N. N. E., distant 20 miles, this little Monitor—whose fame, "following the sun and keeping company with the hours, had circled the earth"—found a resting-place at the bottom of the ocean. (See Ships of War.) G. V. Fox.

Monk. See Monachism, by T. M. Post, S. T. D.

Monk (Gen. George). See Albemarle, Duke of.

Mon'key [generally supposed to be corrupted from the old Italian *monicchio*, the diminutive of *monna*, "ape," but more likely from *monikin* or *monkin*, a "little man"], a name vaguely applied to representatives of the order Primates and sub-order Anthropoidea; generally understood to allude to the small-tailed, active species of the several families, in contradistinction to the larger species called apes and baboons; but also frequently used as a group-name for all the representatives of the sub-order exclusive of man. (See Hominidæ, Primates, Simiidæ, Mididæ, etc.) Theo. Gill.

Monks'hood, the common name of the European aconite (*Aconitum napellus*), also called wolfsbane. This, the most important species of the genus, is a perennial herbaceous plant growing in the mountainous regions of Europe, and cultivated somewhat in our own gardens as an ornamental flower. The root is tapering or spindle-shaped, and is sometimes mistaken for horseradish. The stem is erect, simple, rising several feet. The leaves are dark green on the upper surface, shiny, and are deeply divided. The flowers, which are borne upon a handsome terminal raceme, are large, of a violet-blue color, and with the upper of the five petals developed into a hoodlike appendage. The fruit is of three small pods. All parts of the aconite are highly poisonous, but the root and leaves only are used in medicine. Their virtues depend on an alkaloid, *aconitia*, which is one of the most virulent poisons known. Aconite produces sensory and motor paralysis, and especially affects the heart, directly lessening the force and frequency of its beats. In fatal dose it kills by cardiac paralysis, the symptoms resembling those of death by hæmorrhage. A peculiar effect of aconite is a numbness and prickling which in moderate dose is felt about the lips, throat, and tips of the fingers, but in larger dose extends up the arms and legs. Aconite is used for very much the same purpose for which bleeding used to be employed—namely, to moderate the heart's action in the early stages of acute febrile complaints. It also seems to have a special power over inflammations of the tonsils and throat. From its poisonous properties it requires to be used with caution, especially as there is no antidote to it. Preparations of aconite are also very useful applied externally to relieve local pains. The application produces at the spot the peculiar tingling above referred to. Edward Curtis.

Mon'mouth, town of England, the capital of Monmouthshire, at the confluence of the Wye and the Monnow. It has some trade in bark and timber. Pop. in 1881, 5586.

Monmouth, R. R. centre, cap. of Warren co., Ill. (see map of Illinois, ref. 4–C, for location of county), 182 miles S. W. of Chicago, is the seat of Monmouth College and Preparatory School, 2 libraries, a fine opera-house, and many manufactories. Deposits of bituminous coal exist. Pop. in 1870, 4662; in 1880, 5000.

Monmouth (James **Fitzroy**), Duke of, also duke of Buccleugh, earl of Doncaster and of Dalkeith, Baron Tyndale, Ashdale, and Whitchester, was the reputed son of Charles II. of England by Lucy Walters. He was always a favorite with the king, who, however, denied his legitimacy, which was popularly believed in. His valor in the navy and army—for he served in France, Flanders, and Scotland with much distinction—together with his beauty and engaging manners, made him a general favorite, and in 1667 he married the heiress of the house of Buccleugh, whose titles, family name (Scott), and vast estates came into his possession. He took part in the Whig conspiracies of 1683, and was exiled to the Low Countries, but after his father's death landed at Lyme Regis with a small force and claimed the crown; but was defeated at Sedgemoor July 6, 1685, by the forces under the earl of Faversham; was taken prisoner, and executed at London July 15, 1685.

Monmouth, Battle of, fought (June 28, 1778) between the American forces under Gen. Washington, and those of the British under Sir Henry Clinton. Intelligence of the treaty with France recognizing American independence reaching Sir Henry Clinton, he at once evacuated Philadelphia, and commenced a retreat across New Jersey to New York. The American army, which had wintered at Valley Forge, immediately set out in pursuit, the advance being given to Gen. Charles Lee, whose orders were to harass the enemy and impede his march as much as possible. By the 28th the British occupied the elevated land about Monmouth Court-house, where, on the morning of that day, the American advance became engaged with the rear of the enemy on the plain below, over whom a temporary advantage was gained; but upon the reinforcement of the British line the Americans gave way in some confusion, and Lee now ordered a retreat. Meanwhile, Washington, in ignorance of this disaster, had ordered up the main army, and himself riding forward soon met the retreating body. With much indignation he peremptorily ordered Lee to rally his forces and hold his position; which he was only partially able to do, and was forced to relinquish the ground, when, happily, the arrival of the left wing under Lord Stirling checked the further advance, and Greene, now coming up with the right wing, forced the enemy to retire. Preparations were made for an advance movement, but darkness put an end to the fight, and during the night Sir Henry Clinton silently withdrew, the intense heat securing him against pursuit. Lee alleged in his defence that, unable to hold his advanced position, he ordered the retreat, intending to re-form his command in a more favorable position. For this and subsequent disrespectful conduct to Gen. Washington he was tried by court-martial and suspended from command for one year.

Mon'mouthshire, county of England, bounded S. by the estuary of the Severn and the Bristol Channel. Area, 575 square miles. Pop. 211,267. Along the coast the land is low and level, but the northern and north-western parts are elevated and hilly, the highest point, the Sugar Loaf, rising 1856 feet. Wheat, oats, and barley are grown, coal, iron, and limestone abound, and mines are extensively worked. The Welsh language is in general use in this county.

Monnier' (Henri Bonaventura), b. at Paris June 6, 1799; was first employed as a clerk in the office of a notary, then as a copyist in the ministry of justice; studied afterwards painting under Girodet, and developed his remarkable talent for caricaturing. His illustrations of Beranger's *Chansons* and La Fontaine's *Fables* attracted little attention, but his *Scènes populaires* (1831), *Nouvelles Scènes populaires* (1835), *Bourgeois de Paris* (1854), and *Mémoires de Joseph Prudhomme* (1857), in which both text and illustrations belong to him, proved a great success and have real humor. Some of the comical types represented in these works he brought on the stage, personating them himself, though with mediocre success. D. Jan. 3, 1877.

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* "*Telegram.*

"Fairfax Court-house,
Mar. 12, 1862.

"Capt. G. V. Fox,
"*Assistant Secretary of the Navy*, Fort Monroe:
"Can I rely on the Monitor to keep the Merrimack in check, so that I can make Fort Monroe a base of operations? Please answer at once.
"(Signed) Geo. B. McClellan, *Major-General.*"

Monnier (Marc), b. at Florence about 1828, of French parents; was educated in Italy; settled afterwards in Paris; engaged in journalism; wrote a number of dramas, lyrical poems, and historical sketches of Italy, and made a name for himself by his curious and interesting critical or critico-historical sketch, *Les Aïeux de Figaro* (1868).

Monocen'tridæ [from *Monocentris*—μόνος, "single," and κέντρον, a "spine"—the typical genus], a family of fishes of the order Teleocephali and sub-order Acanthopteri, characterized by the compressed, oblong, and rather elevated body; the scales very large and developed as osseous plates, forming a kind of coat-of-mail; the head provided with large muciferous cavities, the eyes large and lateral; the opercular bones slightly armed; the mouth with a lateral and oblique cleft; the teeth in both jaws and on the palatine bones villiform; the branchial apertures large; the branchiostegal rays eight; the dorsal fins two, the first composed of (six) spines, with scarcely any connecting membrane, the second and anal opposite and alike, the ventrals each with a single strong spine and a few (2–3) very short rays. The family is represented by but a single known species, *Monocentris Japonicus*, which is an inhabitant of the Chinese and Japanese seas. It is most closely related to the genera *Hoplostethus* and *Trachichthys* of the family Berycidæ. Theo. Gill.

Mon'ochord [Gr. μόνος, "one," and χορδή, a "string"], an instrument chiefly used for the computation of musical intervals and the adjusting of their respective ratios with reference to the scale. It consists of a single string stretched over a board or box. At each end the string passes over a bridge, and is fastened to a strong peg or wrench-pin. Underneath the string there is usually placed a scale with numerous divisions and subdivisions, at any of which the string may be stopped by means of a movable or sliding bridge, which serves to divide the string into two parts from any desirable point. The string of the monochord should be of equal thickness throughout, and strong enough to bear a moderately high tension. For practical use, a string of sufficient length to give the sound of C C with clearness will be found most convenient. Such a string, if stopped exactly in the middle by the movable bridge, will sound on either side the octave of the C C—*i. e.* the sound of the *half* length of the string is an octave above that of its *whole* length. When stopped at one-third of its length, the sound is an octave and fifth above that of the open string; and one-fourth of its length produces the C of the second octave, or two octaves above C C. The ratios of all the intervals may be found by pursuing the same process of division. William Staunton.

Monocotyledonous Plants. See Endogens.

Monod' (Frédéric Joël Jean Gérard), b. at Monnaz, Switzerland, May 17, 1794; was educated at Geneva; succeeded his father, Jean Monod (1765–1836), in the pastorate of the National Protestant church of the Oratoire, Paris, but seceded in 1848, and became the leader of the Free Evangelical movement. D. in Paris Dec. 30, 1863.—His brother, Adolphe, succeeded him in the pastorate at Paris, and was an able orator and author of the orthodox school. He was b. at Copenhagen Jan. 21, 1802; d. at Paris Apr. 6, 1856. He published *Lucile* (1841), *Saint Paul* (1851), *La Femme* (1862), and several volumes of sermons.

Monodelphs. See Mammals, by Prof. Theodore Gill, M. D., Ph. D., M. N. A. S.

Monodon. See Narwhal.

Mon'ogram [Gr. μόνος, "single," and γράμμα, "character"], a figure or cipher combining all or the more prominent letters of a person's name or the name of a place or thing. Artists, printers, publishers, and engravers, and in mediæval times civil and ecclesiastical magnates, have made great use of monograms instead of writing the full name. The study of monograms is a distinct and difficult branch of the diplomatic art, for there are great numbers of ancient monograms still undeciphered. The use of the monogram is at least as old as the reign of Philip of Macedon. The first monograms seem to have been made on coins and medals.

Mon'ograph [Gr. μόνος, "single," and γραφή, "writing"], in modern scientific literature, a treatise or paper discussing a single branch or topic of a science, and not treating of the science as a whole. Thus, a treatise on the willows would be a botanical monograph, or a work on the alcohols would be a chemical monograph, or a work on Calvin a historical monograph.

Mo'no Lake, in Mono co., Cal., E. of the Sierra Nevada. It is some 14 miles long and 8 broad, and has no outlet; its waters are intensely salt, highly alkaline, containing also borax and lime. Nevertheless, the larvæ and pupæ of *Ephydra Californica*, an insect, inhabit the waters, and are eaten in great quantities by the Indians. It contains several islands, some having active fumeroles or boiling springs. It is very deep, and seems to have once been a crater.

Monomania. See Insanity, by William A. Hammond, M. D.

Monomya'ria [Gr. μόνος, "single," and μυών, "muscle"], a group of the lamellibranchiate mollusks, including the Ostreidæ or oyster family, are designated as monomyarian or as the Monomyaria, being characterized by possessing but one (the posterior) adductor muscle. Their shells thus present but the one muscular impression. Edward C. H. Day.

Monongahela City, on R. R., Washington co., Pa. (see map of Pennsylvania, ref. 5–A, for location of county), 21 miles S. of Pittsburg. It was incorporated in 1873, and has strawboard paper-mill, manila paper-mill, planing-mills, gasworks, driving park, and an industry connected with the coal-mines in the vicinity. The board of trade offer free building-sites to those intending to erect factories. Pop. in 1870, 1078; in 1880, 2904.

Monongahela River rises in Randolph co., West Va., flows N. 300 miles in a tortuous course, and joins the Allegheny to form the Ohio at Pittsburg, Pa. It is navigable by slackwater improvements 40 miles to Brownsville, Pa., and 200 miles for keel-boats. It flows through a fertile and highly prosperous region, abounding in coal, timber, and various minerals. The navigable Youghiogheny is its most important tributary.

Monoph'ysites, adherents to the doctrine of monophysitism (Gr., one-natureism, antithetical to diophysitism, two-natureism). I. The Monophysites were an Oriental sect originating in the fifth century in the views of Eutyches (which see), concurring in the main with them, though with certain specific differences. They held that though Christ is *of* two natures, which became conjoined at the incarnation, he does not subsist *in* two natures. There is in this sense but *one nature* after the union, though that nature involves and embraces two parts. The human is not annihilated, but is virtually lost, or virtually, though not essentially, absorbed in the divine—"like a little honey mingled with the ocean." The Nestorians virtually argued there are two natures, therefore there must be two persons; the Monophysites, there is but one person, therefore there can be but one nature—both arguing in this way from a true premise to a false conclusion. It is very clear that monophysitism, in its many forms and representatives, covers various degrees of error from a mere confusion of terms—an obstinate logomachy on the one side to a very great perplexity of ideas and obscuration of truth on the other. The logomachies usually involve confusion of ideas somewhere, even if they do not involve real conflicts, and the interests of truth demand not only right things, but right terms—the soul of a sound faith in the form of sound words. Great divines of both the Roman and Protestant churches have maintained that the error of the Monophysites was an ignorant and obstinate battle with sound words, rather than with the things the words really were meant to express, and that their heresies were heresies of phrase rather than of doctrine. Such is the view of De Castro, Vasquez, Le Quien, Combefis, Asseman, and others among the Catholics, and Ludolph, Weissmann, Jablonski, Cotta, Dorner, and others among Protestants. They appeal for evidence to the monophysitic liturgies and confessions, to their comparison of the union of the two elements in Christ to the union of soul and body in man, and to their best writers in general. Basnage, Patavius, Natalis, Alexander, Fuchs, and the majority of writers take the opposite view, and rightly.

The relation of the systems to one of which the Monophysites adhere, to each other, and to the orthodox faith has never been more felicitously stated than by Hooker: "There are *four* things which concur to make complete the whole state of our Lord: his deity, manhood, the conjunction of both, and the distinction of one from the other. *Four* principal heresies have withstood the truth: Arians, against the deity of Christ; Apollinarians, maiming his human nature; Nestorians, rending Christ asunder and dividing him into two persons; the followers of Eutyches, by confounding in his person those natures which they should distinguish. Against these there have been *four* most famous councils: Nice, against the Arians; Constantinople, against the Apollinarians; Ephesus, against Nestorians; Chalcedon against Eutychians. *Four* words—*truly, perfectly, indivisibly, distinctly*, God-man, of both One, in that one Both—comprise Christian belief in refutation of the foresaid heresies. Within which *four* heads all heresies which touch the person of Christ may be brought." (*Works* (Keble), Oxford, 1865, ii. 237.)

II. The spirit of the Monophysites was that of their era, fierce and bloody. Only internal harmony was needed to make them very formidable. But a system which originated in extravagance and confusion of thought ran out of necessity into a number of sects. These multiplied rapidly after the extinction of the hopes of the Monophysites to maintain themselves as the orthodox and catholic Church of the East. The sects which arose were as follows: (1) The Acephaloi; (2) the Julianists; (3) the Severians; (4) the Julianists; (5) from the Severians sprang the Agnoetists; (6) the Tritheists; (7) the Damianists; (8) the Cononites; (9) the Niobites.

III. The most important councils associated with the history of the Monophysites are—(1) the Council of Constantinople (448–449); (2) the "Robber Synod" at Ephesus, which restored Eutyches (449); (3) the Council of Chalcedon, the fourth œcumenical (451). It decided that the two natures are united without fusion, without mutation, indivisibly and inseparably—one Christ *in* two natures. It is remarkable, however, that the common Greek text reads "*of* two natures," which is the precise form preferred by the Monophysites. (See Münscher, *Handbuch d. Dogmen. Gesch.*, iv. 101.) These results were accepted universally in the Western Church, and very generally in the East, but were rejected with great violence, as Nestorianizing, wherever the Monophysites were in force.

IV. The struggle was violent and protracted between the parties. (1) In *Palestine* the disophysite bishops were expelled, and Theodosius was made patriarch of Jerusalem. (2) In *Egypt*, under the presbyter Ælurus and the deacon Mongus, the Monophysites separated themselves. (3) In *Antioch*, Peter the Fuller, from whom the Monophysites are sometimes called Fullonians, attempted to introduce into the Trisagion the formula, "Thou (God) wert crucified for us," which the enemies of the Monophysites insisted must mean that the divine nature was crucified if Christ had but one nature, and called them Theopaschites. (4) The emperor Zeno (482) put forth the *Henoticon*, which was designed to harmonize the contending parties. It used general expressions, which ignored the exact points at issue, avoided equally the phrases "one nature" and "two natures," condemned both Eutyches and Nestorius, and made an allusion to the Council of Chalcedon which was far from respectful. Like all documents of evasive compromise issued while the passions of men are still hot, it widened the breach and inflamed the animosity. (5) Pope Felix III. (483–492) pronounced against the *Henoticon*, and excommunicated Acacius, the patriarch of Constantinople (484). This led to a suspension of communion between the Western and Eastern churches for thirty-four years. (6) The emperor Anastasius I. (491–518) at the beginning of his reign held fast to the *Henoticon*, with an evident leaning to the Monophysites. (7) In addition to the doctrinal interests there was a struggle between Rome and Constantinople for supremacy. Rome and orthodoxy came forth triumphant. Justin I. (450–527), with Pope Hormisdas (514–523), effected the reunion of the Greek and Latin churches (518), the *Henoticon* was set aside, the decisions of the Council of Chalcedon were established, the bishops deposed by the Monophysites were restored, the formula of faith demanded by the pope was acknowledged, Severus and his followers were condemned, the names of the obnoxious patriarchs of Constantinople were stricken from the DIPTYCH (which see), and the names of Leo the Great, and of Euphemius and Macedonius, the patriarchs of Alexandria, were inserted in them (519). (8) The Monophysites were now branded as heretics both by the state and the dominant Church. A thousand of their bishops and other clergy were deposed, imprisoned, and outlawed. Prominent among these was Xenajas (Philoxenus), d. 522. (9) The strength of the Monophysites in Egypt was so great that they were able to find in it a refuge in the time of the terrible storm which had broken on them (Timotheus, Ælurus, Severus, Julian).

The sphere of the Monophysites was the East, where local and political jealousies intensified the disputes which arose with the Church of the West.

(1) Monophysitism was influential in Egypt, from Alexandria as a centre. In that land it continues to this day. (See the articles COPT and ETHIOPIA.) (2) In Syria, Mesopotamia, Asia Minor, Cyprus, and Palestine, under the patriarch of Antioch, the Monophysites take their name from their organizer and restorer, the monk and presbyter Jacob Baradai, and are known as JACOBITES (which see).

The ARMENIAN CHURCH (which see) is nominally monophysite. The total number of the Monophysites is probably about 9,000,000. (For literature see MONOTHELITES.)

CHARLES P. KRAUTH.

Monop'oli, town of Southern Italy, province of Bari delle Puglie. This town is situated on a low promontory on the shores of the Adriatic, about 25 miles S. E. of Bari. It is surrounded by a wall with three gates; the castle was built by Charles V. The harbor, though very small, is safe, and furnishes an opportunity for some navigation, and the town is not without trade and commerce. Pop. 19,993.

Monop'oly [Gr. μόνος, "alone," and πωλεῖν, to "sell;" Lat. *monopolium;* Fr. *monopole*], the sole right of buying, selling, or manufacturing a thing. Monopoly involves an interference with the general laws of trade to rule out competition, and secure to the party having this advantage a profit above the fair average profit of business. The greatest good of the greatest number requires that all commodities be furnished to consumers at a price conformed as nearly as possible to their actual cost. Ordinarily, under free competition, the natural alternations of supply and demand are a sufficient regulator. But individual self-interest prompts effort to override this principle, that one party may, through some control of the market, set on his goods an arbitrary price, irrespective of the cost. The effect of a monopoly is thus to enrich the party possessing it at the expense of the rest of the community.

There are various ways in which a monopoly may be obtained. One may invent a new article of general utility or a new method of producing an article already in use. If he can keep his secret to himself, he may enjoy a monopoly, and his right to do this cannot be contested. But in most cases the secret is revealed when the article is offered for sale. Hence, to secure some reward for the brain-work of thought and invention, laws of copyright and patent-right are enacted. These give to the author or inventor for a term of years a monopoly of his production, which must be regarded as entirely legitimate, though existing abuses under these laws have caused some to question whether this is the best method for attaining the end. In anticipation of a scarcity from natural causes, or to produce an artificial scarcity, a party may buy up the entire supply of an article in the market, and withhold all sales until stern necessity compels people to buy at whatever price the holder may see fit to demand. In such a case the monopoly is a wrongful imposition, little better than downright robbery. Many speculative operations of the corn exchange and the stock exchange partake of this character. Certain natural advantages sometimes give one country or a section of country the monopoly of a particular product. Thus, China and Japan have a monopoly of tea, our Southern States of cotton, and Pennsylvania of anthracite coal. True policy, as well as the golden rule, forbids the abuse of such an advantage.

The most mischievous monopolies are those which are created by special legislation. Thus, feudal laws gave to an aristocracy, few in numbers, a monopoly of lands, the burden of which has been heavy upon England to the present day. In the early development of European commerce the practice was almost universal for governments by special charters to create corporations endowed with strict monopolies. (For illustration see EAST INDIA COMPANY, etc.) The subsidy paid by such corporations to the state was a small consideration for the oppressions which they laid upon the people. After reaching a certain stage genuine commercial enterprise was restricted, rather than fostered, by these measures. Under the old system of banking in this country the same policy prevailed. Special charters were enacted, often on consideration of a bonus to the State, which made the business a monopoly for each bank, and the public was poorly guarded by the conditions prescribed. The same tendency is manifested in the giving of railway charters and the creation by legislative action of great moneyed corporations. The main plea for such legislation is that great enterprises of the highest importance to the public good must be encouraged by special privileges. The mischief of it is that the creature of the state grows into a power to control the state. If the necessity urged in the plea be admitted, it must also be considered that the stimulus is an artificial one, liable to be abused, and therefore to be employed with the utmost caution. The legislature must make responsibility commensurate with privilege, and hold the favored parties always amenable to the law. Statutes granting special favors should be regarded with suspicion, and the popular mind should ever be reasonably jealous of all monopoly.

A. L. CHAPIN.

Monopter'idæ [from *Monopterus*, the typical genus], a family of the order of eels or Apodes. The body is very elongated, even for eels; the anus in the posterior half of the length; the skin quite naked; the head small; the mouth with the cleft moderate; the upper jaw, with its margin, formed by the intermaxillaries, which are in contact at the median line, and behind them and parallel with them are well-developed supramaxillaries; teeth small and in a narrow band; branchial apertures confluent into a median slit below, and with the membrane nearly attached to the isthmus; dorsal and anal fins moderately developed; caudal obsolete, and pectorals wanting; the humeral arch is connected with the skull; "two basal branchihyal pairs" are developed, and there are (third and fourth) superior pharyngeal bones on each side; the branchial arches have rudimentary laminæ, and the slits between are moderately wide; the stomach is nearly siphonal, and there are no pyloric appendages; the ovaries are provided with oviducts. The family thus distinguished has been constituted for the reception of a peculiar species of fish (*Monopterus Javanensis*), found in the East Indian and Chino-Japanese seas. It sometimes attains the length of three feet or more. There are not less than 188 vertebræ in its back-bone—100 abdominal and 88 caudal.

THEODORE GILL.

Mon'otheism [Gr. μόνος, "one," and Θεός, "God"], the doctrine or belief that there exists but one God, as distinguished from polytheism, which teaches the existence of more than one divinity. Judaism, Christianity, and Mohammedanism are the principal monotheistic religions.

Monoth'elites, adherents of monothelitism (Gr., one-will-ism), the doctrine that there is but one Will in the person of Christ. It is opposed to diothelitism (two-will-ism), the doctrine that each nature of Christ possesses a distinct will, both in faculty and exercise.

I. Though monothelitism proceeded from the Catholic side, it is yet an offshoot of the monophysitic influence on the church policy of the Byzantine court. The monophysite struggles of the fifth and sixth centuries had been the sources of uproar and of anarchy throughout the empire. These at last assumed such a shape as to threaten its unity and perpetuity. There seemed to be special ground for the fear that Egypt, where monophysitism ruled almost without restraint, would cut itself loose from the orthodox court in Byzantium and form a separate kingdom. The dangers of the hour were heightened by the prolonged war with the Persians (620–628). Heraclius (610–641) sought to avert the threatening evils by removing the terrible schism which still divided the Church. In his interview with Paul, the monophysite patriarch of Armenia, the expression "the one energy of Christ," had been used, and the impression it made on both sides—it is disputed by which it was first used—suggested that it might be made the basis of a compromise between the Catholics and the Monophysites. With the Catholics, and in accordance with Chalcedon, the two natures were to be asserted, and yet with the doctrine of one theandric energy, one volition, implying one will, virtual provision would be made for the sort of unification for which the Monophysites contended. Protracted conferences followed with the monophysite patriarchs, Arcadius of Cyprus and Athanasius of Hierapolis, subsequently of Antioch, and with the orthodox patriarchs, Sergius of Constantinople and Cyrus, who was placed by the emperor in the see of Alexandria. These men, representing the great divided parties, were willing to concur in the doctrine propounded by the emperor as one which would preserve the truth, for which on each side the contest had been protracted. The first fruit of the compromise was that, under the energetic efforts of Cyrus, the Severians of Egypt were brought back to the orthodox Church (633). The Monophysites, who were not satisfied, were yet forced into compliance.

II. (1) Sophronius, a learned Palestinian monk, who at the time of the union was in Alexandria, maintained, especially against the seventh proposition of Cyrus, that the doctrine was in conflict with orthodoxy. When (634) he became patriarch of Jerusalem, he caused it to be condemned by a synod, on the ground that two natures involve two natural energies of will, two operations, two wills, and that in Christ the energy of each nature, of each will, operates under the coenergy of the other nature, the other will, undivided and unmingled. (2) On the appeal of Sergius, Pope Honorius I. (625–638) advised that the whole question should be dropped as involving fruitless speculation. Nevertheless, he decided in favor of the monothelite view (633). (3) On this declaration the emperor felt himself authorized to put forth a new creed, under the title *Ecthesis pisteōs*, "exposition of faith" (638). It was probably written by Sergius. Its language is ambiguous; it forbids all controversy on the question; and while it confirms the doctrine of Chalcedon, it maintains that we are to "ascribe all the operations in Christ, the human as well as the divine, to the Word incarnate. . . . Every operation proceeded from the same incarnate Word, without division or confusion. . . . Christ's body, though animated with a rational soul, produced no motion whatever of itself." (4) Sophronius had meanwhile been keeping up a correspondence with Rome, but an end was put to all the negotiations in that direction by the Mohammedan invasion of Palestine and Egypt (637–640). While these events cut off Sophronius from connection with the rest of the Christian world, his adherents, Stephen in the East and the abbot Maximus in the West, worked in his spirit. (5) Pyrrhus, the successor of Sergius in the see of Constantinople (639), approved of the Ecthesis, but was led by Maximus (645) to renounce it. An African general synod (646) without a dissenting voice condemned monothelitism. After the death of Honorius (638) Pope Severinus declared against the Ecthesis. Pope John IV. (640–642) condemned the Ecthesis, and urged Constantine III., the successor of Heraclius, to withdraw it (641). Pope Theodore I. (642–649), at the appeal of the African Church (646), made the same demand of the emperor Constans II. (630–668), threatening that if it were refused he would excommunicate the Church of Constantinople. He constituted at the same time Stephen, bishop of Dor in Palestine, apostolic vicar, with orders to depose all the monothelite bishops and clergy. Hemmed in in this way, the Byzantine court yielded; Constans withdrew the Ecthesis (648).

III. (1) In place of the Ecthesis, however, the emperor set forth the "Type of the Faith"—the *Tupos tēs pisteōs*. The Type forbade anew all contention on the will or wills of Christ; men were to be satisfied with the decisions of the five general councils; matters were to be put back to the point at which they stood before the strife: and those who attempted to renew the discussion were to be visited with the severest penalties, ecclesiastical and civil. (2) But principle and party zeal alike made it impossible at this stage to suppress the matter in this way. The reply of Pope Theodorus was excommunication and anathema against Paul, patriarch of Constantinople, who was supposed to be the author of the Tupos. Pope Martin I. (649–655) pursued the warfare against the emperor with yet greater vigor. At the First Lateran Synod (649) diothelitism was established as the Church doctrine; the defenders of monothelitism in general, the patriarch of Constantinople in particular, and the two imperial edicts were put under the anathema. The course of the pope was treated by the emperor as treasonable. He was seized (653) by Kalliopas, imperial deputy, and brought to Constantinople a prisoner. His life was spared only on the intercession of the dying patriarch Paul, but he was sent into exile, where he died of his sufferings, firm to the end. The abbot Maximus was appealed to by every form of persuasion to acknowledge the Tupos, but he could not be moved. Finally, his right hand was cut off, his tongue torn out, and he was sent into exile, in which, at the age of eighty, he died (662). (3) Such savagery would have power for a little time, but for a little time only. Pope Adeodatus (677) excommunicated the Greek patriarchs; the Greek Church in return excommunicated the pope; and the Eastern and Western churches were again sundered. But the fearful growth of the Mohammedan power made the healing of this perilous breach of the most urgent importance. Constantine IV. Pogonatus (668–683) entered into negotiations which led to the convening of the sixth general council, the First TRULLAN (which see), (680–681). A doctrinal writing from the hands of Pope Agatho (680) formed the basis of the conclusions reached. The Monothelites saw that nothing but a miracle could save them. The miracle was attempted, but the dead body would not rise, and the doctrine of one will lay dead with it. The council anathematized all Monothelites. Pope Honorius had been anathematized in the letter of Agatho; the council anathematized him again. It was decided that there is in Christ two natural wills and two natural operations, unseparated, immutable, undivided, unmingled—"two natural wills, not in antagonism, but the human will following, not resisting, but rather subject to, his divine and almighty will." The Church of the West had stood firm for the faith, even at the price of the dishonor of her dead pope. The decrees of the council were confirmed at Rome, and by the Second Trullan Council (692), known as the QUINISEXTUM (which see). (4) The emperor Philippicus (Bardanes) brought about a temporary triumph of the Monothelites at a council held at Constantinople (711), which reversed the decisions of the sixth general council, but at his downfall (713) monothelitism lost the little influence which had been left it, and vanishes out of history. A doctrine which for a century convulsed kingdoms, arrayed popes against emperors, and pope against pope, and council against council, had in a little while no representatives on earth except the poor handful of MARONITES (which see) who gathered about a monastery on Lebanon, and who as a body survive that Byzantine kingdom to whose policy they owed their being, though they have long renounced the doctrine which sundered them from the great body of the Catholic Church.

CHARLES P. KRAUTH.

Monotrem'ata [Gr. μόνος, "single," and τρῆμα, an "opening"], the lowest order of mammals, the sole existing order of the sub-class Ornithodelphia or Prototheria. The name is derived from the fact that, as in the birds, one external orifice, opening into a common cloaca, serves for the discharge of alvine and renal excretions and for reproductive purposes. They also approach the birds in the presence of large coracoid bones, in the absence of true teeth, in the bill-like jaws of one species (*Ornithorhynchus paradoxus*), in the spurs upon the hind legs, and in the characters of the ovaries and the skull. The two species of Echidna, too, are quilled with feather-like spines. There are also other interesting resemblances to birds, and some to reptiles. Their relations to the other mammals are complex. Their non-placental development and the presence of marsupial bones ally them to the true marsupials. The absence of teeth, the character of the claws, and the resemblance in general habits have led some systematists to place them among the Edentata or Bruta, which they represent among the non-placental mammals. There are but three living species, arranged in two families, Tachyglossidæ and Ornithorhynchidæ, which are essentially sub-orders. Some very large fossil species have been found, all Australasian, like the three living ones. None have external ears.

Monovar′, town of Spain, province of Alicante, on the Elda, is well built, and has large salt-works and manufactures of saltpetre. Pop. 8615.

Monrea′le, town of Sicily, province of Palermo, 4 miles S. W. from the city of Palermo. It stands high on the slope of Monte Caperto, and commands a magnificent view of the island and sea. The whole neighborhood is enchanting, but the poorly built town has little of interest except its cathedral, one of the most splendid temples in the world. It is in form a Latin cross; the exterior has undergone modifications, though some original portions remain unchanged; the bronze doors date from 1186. The interior (325 feet long and 125 broad) consists of three naves supported by sixteen gigantic columns of Oriental granite, with capitals of exquisite workmanship. The mosaics which almost cover the inner walls of the cathedral are of the richest and rarest description, and the Moresque ornamentation is beautiful. The roof has been admirably restored since the fire of 1811. Adjoining the cathedral is the great monastery of the Benedictines, one of the most superb convents existing. The cloisters, constituting the most artistic part of the building, enclose a large court, flanked by spacious porticoes, the delicate arches of which are supported by double Moresque columns. It is greatly to be regretted that this exquisite structure is fast falling into ruin. The terrible massacre known as the Sicilian Vespers (1282) began on the road from Palermo to Monreale. Pop. 16,211.

Monro′ (ALEXANDER), M. D., F. R. S., b. in London, England, of Scotch parents, Sept. 19, 1697; studied medicine and surgery at London under Cheselden, at Paris under Bouquet, and at Leyden under Boerhaave; was admitted as a surgeon at Edinburgh 1719; was elected by the town council in Jan., 1720, first professor of anatomy to the new medical school established in connection with the university, and instituted a course of instruction which soon made that school the best medical college in the world. He was one of the two principal promoters of the Royal Infirmary at Edinburgh, where he delivered clinical lectures; founded a society for collecting and publishing professional papers; edited six volumes of *Medical Essays and Observations* (1732), and two volumes of *Essays, Physical and Literary*, for the same body, which had then taken the name of the Edinburgh Philosophical Society. His own publications comprised *Osteology, or Treatise on the Anatomy of the Bones* (Edinburgh, 1726), *Essay on Comparative Anatomy* (London, 1744), *Observations, Anatomical and Physiological* (Edinburgh, 1757), and an *Account of the Success of Inoculation of Smallpox in Scotland* (1765). These, with other tracts left in MS., were printed together in 1781. Dr. Monro resigned the chair of anatomy to his youngest son, Alexander, in 1759, but continued his clinical lectures at the infirmary. D. at Edinburgh July 10, 1767. Dr. Monro is often styled *Primus*, to distinguish him from his son and grandson of the same name, who were also eminent anatomists.—His eldest son, DONALD, b. 1731, was also an able physician and published several medical books, besides a memoir of his father (1781). D. in July, 1802.

Monro (ALEXANDER), M. D., F. R. S. E., son of the above, b. at Edinburgh Mar. 24, 1733; studied surgery in the University of Edinburgh under his father, to whom he became assistant professor of anatomy July, 1756; spent some time at the medical schools of Berlin and Leyden; succeeded his father as full professor in 1759, and also as secretary of the Philosophical Society, which in 1783 took by royal charter the title of Royal Society of Edinburgh. Among his publications were *De Venis Lymphaticis Valvulosis* (Berlin, 1757), which involved him in a controversy with Dr. William Hunter of London; *On the Structure and Functions of the Nervous System*, a large illustrated folio (Edinburgh, 1783); *On the Structure and Physiology of Fishes* (folio, 1785), *Description of all the Bursæ Mucosæ of the Human Body* (1788), and *Three Treatises on the Brain, the Eye, and the Ear* (illustrated, 1797), besides several papers in the *Transactions* of the Edinburgh Royal Society.

Monro (ALEXANDER), M. D., F. R. S. E., son of the above, b. at Edinburgh Nov. 5, 1773; was educated at the high school and university of that city; studied medicine, anatomy, and surgery in London; succeeded in 1808 to his father's professorship, from which he retired with the title of emeritus professor of anatomy in 1847, at which time the post had been filled for 152 years by three generations bearing the same name. Dr. Monro, *Tertius*, as he was called, became in 1828 president of the Royal College of Physicians of Edinburgh, published papers in the *Transactions* of that society, and wrote several medical works. D. at Craiglockart, near Edinburgh, Mar. 10, 1859.

Monroe, on R. R., cap. of Walton co., Ga. (see map of Georgia, ref. 3–H, for location of county). Pop. in 1870, 438; in 1880, 530.

Monroe, city, cap. of Ouachita parish, La. (see map of Louisiana, ref. 7–D, for location of parish), on the Vicksburg Shreveport and Pacific R. R. Pop. in 1870, 1949; in 1880, 2070.

Monroe, city and R. R. centre, cap. of Monroe co., Mich. (see map of Michigan, ref. 8–K, for location of county), 35 m. S. of Detroit, has 2 female seminaries, public library, conservatory of music, machine and engine shop, tobacco factory, flouring-mills, sash and blind factories, saw-mills, and several factories. Good fisheries exist near the city, and extensive vineyards are springing up. Pop. in 1870, 5086; in 1880, 4930; in 1884, 5216.

Monroe, cap. of Union co., N. C. (see map of North Carolina, ref. 4–E, for location of county), on the Carolina Central R. R., has carriage-factory, etc. Pop. in 1870, 448; in 1880, 1564.

Monroe, cap. of Green co., Wis. (see map of Wisconsin, ref. 7–D, for location of county), on the Monroe branch of the Chicago Milwaukee and St. Paul R. R., has wagon-factories and foundry. Pop. in 1870, 3408; in 1880, 3293.

Monroe (ANDREW), b. in Virginia Oct. 29, 1792, the youngest of a family of eleven, four of whom became Methodist ministers; joined the Ohio Methodist Episcopal conference in 1815; was sent by Bishop Asbury to Cumberland circuit, Ky.; stationed in St. Louis in 1824; was a pioneer worker in Kentucky, Tennessee, and Missouri, and was a member of the Missouri conference of the M. E. Church, South, at his death, Nov., 1871. T. O. SUMMERS.

Monroe (JAMES), fifth Pres. of U. S., b. in Westmoreland co., Va., Apr. 28, 1758; son of Spence Monroe, and a descendant of a Scottish Cavalier family; educated at William and Mary College; entered Revolutionary army in 1776; served with distinction in the principal engagements of 1777–78; was wounded at Trenton; studied law under Jefferson; served again in the latter part of the war; was delegate to Congress 1783–86; opposed the adoption of the U. S. Constitution 1788; was U. S. Senator 1790–94; minister to France 1794–96; governor of Virginia 1799–1802, and again 1811; an envoy to France 1802, and to Spain 1805; minister to England 1803–08; was secretary of state 1811–17, and also secretary of war 1814–15; was president of the U. S. 1817–25, elected the first time over Rufus King, the Federalist candidate, and re-elected in 1820 with little opposition; the chief events of this prosperous administration, "the era of good feeling," were the acquisition of Florida from Spain, the inauguration of a system of internal improvements, the enunciation of the Monroe Doctrine, the Missouri Compromise of 1820, the recognition of the independence of the Spanish American states, and the last visit of La Fayette to the U. S. Mr. Monroe's last days saw him much distressed by his creditors, for the free-handed hospitality so characteristic of his native State in her palmy days, together with his lifelong occupation in public affairs to the neglect of his own estate, involved him in debt. In 1831 he removed to New York, where he died, July 4, 1831. Mr. Monroe was a man of plain and unaffected manners, unquestioned purity and honesty, and of very robust and useful though not brilliant qualities as a public officer. He was beloved by all parties, and few men did more than he to remove the animosities and prejudices so rife in the early part of his political life.

Monroe City, Mo. See APPENDIX.

Monroe Doctrine. This name has been given to a declaration of the policy of the U. S. in regard to the interference of European powers in the political affairs of the American continent, made by Pres. Monroe in his message to Congress in 1823. It had been understood that at the Congress of Verona (1822) a project had been discussed of aiding Spain to recover her dominion over her revolted American colonies. Mr. Canning, while making his preparations to go to India as governor-general, received the appointment of secretary for foreign affairs in Sept., 1822, and it was by his influence that the English government was led to take energetic measures against the absolutists' principle of interference in preventing revolution and all political changes proceeding from the people in opposition to the rulers. France early in 1823 was ready to invade Spain for the purpose of overthrowing the revolutionary government. The next measure might be an attempt to subjugate the Spanish colonies, some of which we had recognized as independent nations. The British government is understood to have suggested to the U. S. the policy of making some protest against such interference in the affairs of the American states or colonies. The suggestion, being approved of by the President, by Mr. J. Q. Adams, secretary of state, and by Mr. Jefferson, who was consulted, the annual message of Dec., 1823, contained the following declarations: "That we should consider any attempt on the part [of the allied powers] to extend their system to any portion of this hemisphere as dangerous to our peace and safety," and "that we could not view any interposition for the purpose of oppressing [governments on this side of the water whose independence we had acknowledged], or controlling in any manner their destiny by any European power, in any other light than as a manifestation of an unfriendly disposition towards the U. S." This declaration, together with the known sentiments of the British cabinet and nation, put an end to any designs which may have been entertained looking towards armed interference in American affairs. It was also most consistent with international rights, and was fully justified by self-defence. The balance of power had in such a case no application, for that principle is essentially confined to states forming a circle within moderate distances from one another, and interference on political, doctrinary grounds is unrighteous. And this declaration has received the assent of the country. During the late war, when the French emperor put the archduke Maximilian on the throne of Mexico, we were too busy and too weak to endeavor to prevent the measure; the time was chosen accordingly; but in ordinary times that or a similar step would have roused government and country to opposition. Another declaration of the same message is as follows: That "the American continents, by the free and independent condition which they have assumed and maintain, are henceforth not to be considered as subjects for future colonization by any European power." If those words expressed the intention that the South American republics should be prevented from freely surrendering their territory for the purposes of colonization, this was going altogether too far: it was avowing a rule of interference on our part equally to be condemned with the similar one acted on by European absolutists. But it is probable that the words were not well considered in their import. We are led to take this view by what Mr. Adams, then secretary of state, said in 1825, when he was President, unless he is to be considered as retracting what had been hastily uttered two years before. He says, in reference to a congress of American powers at Panama, that "an agreement between all the parties represented at the meeting that each will guard, *by its own means*, against the establishment of any future European colony within its borders, may be found to be desirable. This," he adds, "was more than two years since announced by my predecessor to the world as a principle resulting from the emancipation of the American continents." But the House of Representatives opposed the principle, even when thus interpreted, by a resolution that the U. S. "ought not to become parties" with any of the republics of South America "to any joint declaration for the purpose of preventing the interference of any of the European powers with their independence or form of government, or to any compact for the purpose of preventing colonization upon the continent of America." The majority of the House was quite willing, without question, to approve of independent action with regard to interference when it should be threatened, but to prevent colonization they seem to have regarded as not worth any diplomatic proceedings. This declaration of Mr. Monroe has since fallen into oblivion. The other will probably always carry with it the approval of the U. S. T. D. WOOLSEY.

Monroe'ville, cap. of Monroe co., Ala. (see map of Alabama, ref. 6-C, for location of county), about 12 miles E. of the Alabama River, has an academy. Pop. in 1880, 122.

Monroeville, Allen co., Ind. (see map of Indiana, ref. 3-G, for location of county), 16 miles E. of Fort Wayne, on the Pittsburg Fort Wayne and Chicago R. R., has stove-factories, etc. Pop. in 1870, 630; in 1880, 578.

Monroeville, R. R. centre, Huron co., O. (see map of Ohio, ref. 2-F, for location of county), 60 miles W. of Cleveland, contains woollen-mills, a foundry, flouring-mills, brewery, and extensive grain-warehouses. Pop. in 1870, 1344; in 1880, 1221.

Monrovia. See LIBERIA.

Mons, town of Belgium, the capital of the province of Hainaut, on the Trouille. It is strongly fortified, has a beautiful cathedral from the sixteenth century and a very interesting town-house built in 1443, extensive manufactures of linen, lace, earthenware, and tobacco, and carries on considerable trade. Pop. 25,600.

Monseli'ce, town of Italy, province of Padua, about 14 miles S. of the city of Padua. This is a walled town, pleasantly situated, and of considerable historic interest. Pop. 9765.

Monson, Hampden co., Mass. (see map of Massachusetts, ref. 3-D, for location of county), on the New London Northern R. R. The Boston and Albany R. R. passes through the N. part of the town. It is 80 miles W. S. W. of Boston, has valuable quarries of gneiss, several woollen-factories, large manufactures of hats and bonnets, a prosperous academy, and is the seat of the State primary school for the children of paupers who are not citizens. Pop. of tp. in 1870, 3204; in 1880, 3758; in 1885, 3958.

Monsoon' [Port. *monção*, from Arabic *mausim*, "season"], a tropical wind which in the Indian Ocean blows half the year from one point of the compass, and for the remaining half in the opposite direction. The causes of the monsoon have not been clearly ascertained, but they are generally referred to the same meteorological phenomena as the trade-winds; in fact, they may be identical. Monsoons rarely coincide with the cardinal points of the compass, their most usual directions being N. W., S. W., N. E., and S. E.

Monstrelet', de (ENGUERRAND), b. at Cambrai about 1390; was provost of his native city and bailiff of Wallaincourt, and d. there July 20, 1453. He wrote a *Chronique*, narrating the history of France from 1400 (at which point Froissart stops) to 1444. Latest edition by L. Douet-d'Arcy (6 vols., Paris, 1857-63): English translation by Thomas Johnes (13 vols., London, 1810).

Monstrosity, in natural history. See TERATOLOGY, by C. G. FISHER, M. D.

Monsumma'no, town of Italy, province of Lucca, lying at the foot of a hill on which stands a ruinous castle. The chief interest of this town is a grotto or cave that furnishes natural vapor-baths, much frequented for rheumatic affections. Pop. 6733.

Montagna'na, town of Italy, province of Padua, about 9 miles S. W. of Este. The walls of this town, with their grand square towers and citadel, are a fine monument of the Middle Ages. Pop. 9178.

Montagnards' [Fr., "mountaineers"], or simply **The Mountain,** in the first French Revolution a name sometimes given to the ultra-democratic members of the National Convention, so called because they originally sat in the highest seats of the hall. The Girondists were, in distinction, called the Plain; and after their destruction the lower part of the house was called the Marsh (*Marais*), and was occupied by the undistinguished rabble of Jacobins, the leaders retaining the high seats.

Mon'tagu (BASIL), b. in London April 24, 1770, was a natural son of the earl of Sandwich by an actress, Miss Ray or Wray, who was shot in Covent Garden Theatre in 1779 by the Rev. Mr. Hackman, a rejected admirer. He graduated at Cambridge 1790; was soon after called to the bar at Gray's Inn, and acquired a large and profitable practice in London, chiefly in bankruptcy cases. He was a member of the literary circle of which Coleridge was the chief ornament, and was carried away by the social theories of William Godwin to such a degree that he contemplated retiring from a profession believed to be prejudicial to society, but was dissuaded from carrying out his purpose by Sir James Mackintosh. In 1806 he was appointed a commissioner of bankruptcy, and exerted himself successfully through a series of years to procure the reform of the law concerning bankruptcy, which was then highly objectionable. Under the new law he became accountant-general of bankruptcy, compelled the Bank of England to pay interest on deposits ordered by a court of bankruptcy, and distinguished himself by his advocacy of other reforms, especially the abolition of capital punishment for minor offences. He was a voluminous author, having published 40 volumes and left in MS. 100 more. His principal professional work was a *Digest of the Bankrupt Laws*, but he is best known as the careful editor of the *Works of Francis Bacon* (16 vols., 1825–34), of which the last volume contains a *Life of Bacon*. D. at Boulogne, France, Nov. 27, 1851.

Montagu (Edward Wortley), son of the celebrated Lady Mary, b. at Wharncliffe, Yorkshire, England, in Oct., 1713; was placed at Westminster School, but ran away three times, making a voyage once as a cabin-boy to Spain; was elected in 1747 to Parliament, but had to resign on account of debt; went to Paris, where he was imprisoned on account of gambling transactions; was a Roman Catholic in Italy; travelled in Arabia and Egypt, and professed to be converted to Mohammedanism; and was returning to England when he d. at Padua, Italy, May 2, 1776. In infancy he had been the first English child inoculated for smallpox. He published some papers in the *Philosophical Transactions*, and a volume of *Reflections on the Rise and Fall of the Ancient Republics* (1759), of which the authorship was claimed by his tutor. The eccentric career of Edward Montagu was related by himself in an *Autobiography* first published in 1869.

Montagu (Elizabeth **Robinson**), b. at York, England, Oct. 2, 1720; was married in 1742 to Edward Montagu, grandson of the fifth earl of Sandwich, and cousin of Edward Wortley Montagu, the husband of Lady Mary, and being possessed of wealth, ambition, and some literary talent, became a celebrated leader of London society in the second half of the eighteenth century. She gave a famous annual dinner on May Day to the London chimney-sweeps, and her magnificent residence in Portland Square was the head-quarters of the so-called "Blue-stocking Club," and figures largely in the diaries of the period. Mrs. Montagu wrote three of the *Dialogues of the Dead* published in the 4th ed. of Lord Lyttelton's work bearing that title (1765), and an *Essay on the Writings and Genius of Shakspeare compared with the Greek and French Dramatic Poets* (1769), but is best known by her *Correspondence*, of which 4 vols. have been edited by her nephew. D. at London Aug. 25, 1800. (See her *Life*, by Dr. Doran, entitled *A Lady of the Last Century*, 1872.)

Montagu (Mary Wortley), Lady, b. at Thoresby, Notts, England, in 1690, a daughter of the duke of Kingston, was second cousin on her mother's side to the novelist Fielding. She was even in childhood a favorite in society from her wit and beauty. In 1712 she married Mr. Edward Wortley Montagu, without her father's consent. In 1716 she went to Constantinople with her husband, then ambassador to the Porte. In 1717 she made a successful trial of inoculation for smallpox upon her only son—a practice common in the East, but unknown before her time in Western Europe. Her successful introduction of smallpox inoculation into England was accomplished in spite of great opposition and personal abuse from all classes. After her return to England followed her bitter quarrel with Pope, who had been her friend. In 1739 she left her husband, and resided chiefly in Italy. D. in England of cancer Aug. 21, 1762. She wrote much that was never published, but is remembered chiefly for her brilliant *Letters*, written during her travels.

Montague, Muskegon co., Mich. (see map of Michigan, ref. 7–H, for location of county), on White Lake and on the Chicago and W. Michigan R. R., has some commerce. Pop. in 1880, 1297.

Montague, cap. of Montague co., Tex. (see map of Texas, ref. 2–H, for location of county), 83 miles W. of Bonham. Pop. in 1880, 328.

Montague (Charles). See Halifax, Earl of.

Montague (William Lewis), A. M., b. at Belchertown, Mass., Apr. 6, 1831: graduated at Amherst College 1855; taught Latin and Greek at Williston Seminary 1855–57; was tutor in Amherst College from 1857 to 1862, when he became associate professor of Latin; was appointed professor of French and librarian, 1864, and of Italian and Spanish (additional) 1868; resigned the office of librarian in 1878. He was licensed to preach in 1860; spent two years (1865–66 and 1871–72) in study and travel in Europe; published a *Manual of Italian Grammar* (1870), *Comparative Grammar of the Spanish Language* (1873), *Introduction to Italian Literature* (1875; 2d ed. 1879), *Biographical Record of the Non-Graduate Members of Amherst College, 1821–1871* (1881), *Biographical Record of the Alumni of Amherst College, 1821–1871* (1883), and also several historical papers and pamphlets.

Montaigne′, de (Michel Eyquem), b. Feb. 28, 1533, at the château Montaigne, near Bergerac, in the department of Dordogne; studied law at Bordeaux, and was appointed councillor in the Parliament of that city in 1554. He early obtained a great reputation for sagacity and integrity, but he had no inclination for public business, and after his father's death in 1569 retired to his château, and occupied himself with philosophical studies and meditations. In 1580 he published the first two books of his *Essais*, and in the same year he undertook a journey through Germany and Switzerland to Italy; a journal which he kept on this tour was found two centuries after his death in the family archives, and published at Paris in 1774 by Guerlon, under the title *Journal du Voyage de Michel Montaigne en Italie, par la Suisse et l'Allemagne.* In 1581 the citizens of Bordeaux chose him mayor of the city, which position he held for four years; and he kept order and peace in the place, although the terrible feuds between Protestants and Roman Catholics raged all around. He had also some influence at court, and acted several times as a mediator between the leaders of the different political and religious parties, he himself being entirely indifferent to the questions at issue, and, on account of the stoical cast of his character, very independent. The third book of his *Essais* he published in 1588. D. at Montaigne Sept. 13, 1592. Subsequently, the *Essais* were republished very frequently, and translated into most European languages. One of the best editions is that by J. V. Le Clerc (Paris, 1865). A copy of Florio's English translation (1603), containing Shakspeare's autograph, and the only book known to have been owned by him, is now in the British Museum. Bayle St. John has given an interesting biography of him (London, 1857).

Monta′le, town of Italy, province of Florence, 6 miles E. of Pistoia. Close by are the ruins of the old castle of Montemurlo, of the ninth century, once an object of fierce contention between Florence and Pistoia. Pop. 8218.

Montalembert′, de (Charles Forbes René de Tryon), Count, grandson of the engineer Montalembert, b. in London May 29, 1810; was educated at the Collége St. Barbe, Paris; became in 1830, with Lamennais and Lacordaire, one of the founders of *L'Avenir*, a democratic periodical, but the papal censure which followed caused Montalembert to join himself more closely to the Ultramontane party. Among his numerous writings the most important are the *Life of St. Elizabeth of Hungary* (1835–36), *Vandalism and Catholicism in Art* (1839), and especially *The Monks of the West* (1860 *seq.*, 6 vols.). Montalembert opposed the doctrine of papal infallibility, but submitted on his deathbed. He d. Mar. 13, 1870.

Montalembert, de (Marc René), Marquis, b. at Angoulême, France, July 16, 1714; d. Mar. 29, 1800. Descended from a noble family, he entered the army at age of eighteen, and served at sieges of Kehl and Phillipsburg and in the war with Bohemia. Subsequently he engaged in the manufacture of cannon for the French navy. At the age of sixty-two he began to publish his great work, *La Fortification perpendiculaire, ou l'Art défensif supérieur à l'offensif.* The use of the casemate in some of its forms goes back to Albert Dürer and San Micheli, in the early part of the sixteenth century, and it was resorted to by Vauban in his second and third systems, of which the tower-bastions are casemated throughout. But it was reserved for Montalembert, in the latter part of the eighteenth century, to give it an extraordinary development, and to make the casemate the essential element of a system of fortification. This "most intrepid of authors upon fortification" (so styled by Chasseloup) boldly attempted to apply to his art the same principles by which Napoleon won his victories—the concentration of superior forces upon decisive points. This concentration he effected, and could only effect, by the use of casemates, upon which, numerous and well constructed, he bases all the strength of his fortifications. Rejected by the French, the principles of Montalembert have been made the basis of the modern German, or "polygonal," system. For sea-coast fortification the casemates of Montalembert had a singular applicability, and he has the merit of being the first writer who has seen in this branch of the art a subject of particular treatment, and who has given special designs for forts and batteries "for the defence of ports." Notwithstanding that the French corps of engineers rejected the system in its intended application, and disclaimed, as an engineer, its author, it nevertheless constructed in 1786, for the defence of the harbor of Cherbourg, forts which are in reality almost copied from his designs. European nations followed the example, and the universal "casemated" forts or batteries which frown upon the waters of almost every important sea-port in the world are legitimate offspring of the thought of Montalembert. The recent immense development of artillery power has modified construction and introduced iron to a certain extent in place of masonry; yet the "casemated" battery still prevails. (See Iron Plating.)

J. G. Barnard.

Montalivet (Murthe Camille Bachasson), Count de, b. Apr. 25, 1801, was educated in l'École Polytechnique, took his seat in the Chamber of the Peers in 1826, and was minister of public instruction and of the interior 1830–40. Sincerely attached to the constitutional monarchy and the Orléans family, he twice had occasion to write in their defence: *Le Roi Louis-Philippe et la liste civile* (1851) and *Dix années de gouvernment parlementaire* (1862). He was, however, a decided adversary of Guizot and the *doctrinaires*, and in 1872 he accepted the republic as the only possible form of free government in France. In 1879 he was elected a senator. D. Jan. 4, 1880.

Montalvan′, de (Juan Perez), b. at Madrid, Spain, in 1602; became in youth intimate with Lope de Vega, under whose guidance he began to write for the theatre at the age of seventeen; was ordained a priest in 1625, and wrote nearly 100 plays, but excessive literary work deprived him of reason in 1637, and he d. at Madrid in June, 1638.

Montalvano Ionico, town of Southern Italy, province of Potenza. Its chief industry is in the produce of silk and honey. Pop. 6225.

Montana (mon-tah′na) **Territory** (see map of Idaho, Montana, and Wyoming, in article Idaho), is bounded on the N. by the British possessions, E. by Dakota, S. by Wyoming and Idaho, and W. by Idaho; it lies between 44° 6′ and 49° N. lat. and 104° and 116° W. lon. Area, 146,080 square miles, or 93,491,200 acres.

Face of the Country, Mountains, Rivers, Lakes, etc.—As its name indicates, it is a mountainous country, in which there are some fine valleys, and has an abundance of timber, such as pine, spruce, cottonwood, and aspen. The streams are skirted with dense thickets, in which at the proper season there is found plenty of serviceberries, currants, and gooseberries. In the Territory is the main range of the Rocky Mountains, with many detached spurs, the Bitter Root Range, the Judith, and the Belt Mountains S. of the Great Falls of the Missouri River. The principal streams are the Gallatin, Jefferson, and Madison rivers, here called the "Three Forks," which unite and form the Missouri. Besides these are the Yellowstone, Musselshell, Milk, Teton, Sun, and Maria's rivers, etc. Flathead Lake is the only considerable lake. The Yellowstone National Park is partly within Montana.

Minerals.—Gold has been found in every portion of the Territory. Silver ore, iron, and coal are also found. Lignite, copper, and petroleum are among the mineral products.

Soil and Vegetation.—The mountains of Montana are usually well covered with forests, but the trees are, if deciduous, almost exclusively willow, poplar, and cottonwood; if evergreen, pine, spruce, fir, cedar, and balsam. There is very little hardwood timber in the Territory. Grass and flowers of great beauty abound in the valleys. As a grazing country this will always maintain a high rank, the "bunch grass," so excellent for cattle, covering all the hillsides and plains.

Zoology.—Great herds of deer, elk, mountain-sheep, and antelope exist and thrive in the mountains and on the plains and foot-hills of the mountain-ranges. The moose is often found in the mountain gorges. Beaver, otter, marten, gray wolves, badgers, bears, and mink are found in the forests and streams. Herds of buffaloes roam through the N. portion of the Territory and S. of the Yellowstone River. In the mountain-streams are salmon and brook-trout and graylings.

The *climate* of Montana is milder than that of States farther E. in the same latitude. The annual mean temperature ranges from 44° to 48°. The climate is very dry. The annual rainfall at Fort Benton is but 12.17 inches, and it is much the same over most of the Territory. Irrigation is practicable and easy in most of the arable lands.

Agricultural Products.—The soil of Montana appears to be best suited to wheat and oats among the cereals. Of wheat (census of 1880), 469,688 bushels were produced; oats, 900,915 bushels: corn, only 5649 bushels. The wool clip of 1880 yielded 995,484 pounds. The area of wheat-culture was very largely increased in 1882.

*Farm Animals.**—By census of 1880, Montana had 35,114 horses, 172,387 cattle, 184,277 sheep, and 10,278 swine.

Manufactures.—The production of the various manufacturing industries of Montana was as follows (1880): Establishments, 196; hands employed, 578; capital invested, $899,390; wages paid, $318,759; aggregate product, $1,835,867.

Railroads.—In Jan., 1882, there were in operation in Montana 232 miles of railway, mostly the Northern Pacific (since completed), which runs through the Territory.

Finances.—The amount of taxable property as assessed in 1880 was: Real estate, $5,077,162: personal, $13,532,640; total, $18,609,802. Rate of tax, 10 cents on $100, producing $54,000 for Territorial expenditure proper; total raised by taxation, Territorial and local, $383,947; Territorial debt, Nov., 1881, $70,000; total indebtedness, including local debts, $759,925.

Banks, etc.—In Oct., 1881, there were 3 national banks in Montana, with capital of $200,000; circulation, $157,800; U. S. bonds to secure circulation, $180,000; deposits, $1,387,056. There were 13 private bankers, with capital of $512,706 and deposits of $904,498.

Education.—The number of children of school-age (four to twenty-one years) in Montana in 1880 was 7070, of whom 4667 were enrolled in public schools, with average attendance of 2986. Total expenditure for public schools, $68,002. The number of newspapers printed in the Territory in 1882 was 12, all weekly.

Churches.—The Methodist Episcopal Church has 8 churches, 6 ministers, and 675 members; Methodist Episcopal Church South, 9 ministers, 232 members; Christians (Disciples of Christ), 6 churches, 4 ministers, 675 members; Roman Catholics, 10 churches, 13 priests; Presbyterians, 6 churches, 7 ministers, 194 members; Protestant Episcopal, 8 churches, 300 members.

Population.—In 1870, 20,595: 1880, 39,159 (white 35,385, colored 3774, including 1765 Chinese and 1663 Indians).

Principal Cities and Towns, Pop. 1880.—Helena (cap.), 3624; Butte City, 3363; Fort Benton, 1618; Deer Lodge City, 941; Bozeman, 894; Glendale, 678; Miles City, 629; Virginia City, 624.

Counties.	† Ref.	Pop. 1870.	Pop. 1880.	County Towns.	Pop. 1880.
Beaver Head......	4–C	722	2,712	Dillon.	
Choteau	2–D	517	3,058	Fort Benton.........	1,618
Custer...............	3–F	38	2,510	Miles City...........	629
Dawson..............	2–F	177	180	Glendive.	
Deer Lodge.........	3–C	4,367	8,876	Deer Lodge City...	941
Gallatin	4–D	1,578	3,643	Bozeman.............	894
Jefferson............	3–C	1,531	2,464	Radersburg..	169
Lewis and Clarke	3–C	5,040	6,521	Helena..	3,624
Madison.............	4–C	2,684	3,915	Virginia City.......	624
Meagher	3–D	1,387	2,743	White Sulphur Sp.	
Missoula	2–B	2,554	2,537	Missoula.	
‡ Silver Bow	3–C	......	......	Butte City............	3,363
‡ Yellowstone	3–E	......	.....	Billings.	
Total...............		20,595	39,159		

History.—Montana had had a few settlers, mostly trappers and hunters and some missionaries, for many years before its organization as a Territory, but its growth dates from the discovery of gold there, in 1861. It was a part of Idaho Territory till May 26, 1864, when it was organized as a separate Territory. After the discovery of gold, people flocked in from all quarters. In the earlier days there was, of course, a very mixed population, among which were a number of noted robbers and desperadoes, who at one time seemed to have complete possession of the Territory. This state of things continued until the respectable portion of the community could endure it no longer, when they formed themselves into an organization known as the "Vigilantes," who administered the law without partiality or favor, and many a miscreant was hanged by them. It was once a favorite hunting-ground for hunters and trappers, and Fort Benton, on Missouri River, at head of navigation, was a fur-trading post.

Governors.

Sidney Egerton............	1864–65	Benjamin F. Potts.........	1870–82
Francis Meagher (act.)...	1865–66	J. Schuyler Crosby........	1882–84
Green Clay Smith..........	1866–69	B. Platt Carpenter.........	1884–88
James M. Ashley	1869–70		

Revised by A. R. Spofford.

Montanel′li (Giuseppe), b. at Fucecchio, in Tuscany, in 1813; d. in 1862. He was educated at the University of Pisa, and in 1838 published a volume of poetry; from 1837 to 1839 practised successfully as an advocate, and in 1848 was appointed professor of civil and commercial law in the University of Pisa. Even before 1848 he had excited much attention by his proposed liberal reforms, by the political association known as Fratelli Italiani, and by the *Italia*, a journal edited by him at Pisa in 1847 with the motto "Riforma e Nazionalità." On the breaking out of the revolution in 1848 he volunteered, and distinguished himself by his valor. A report of his death became current, and he was universally lamented. Mazzini wrote a splendid eulogy upon him. He was, however, only severely wounded and a prisoner. On his return to Tuscany he became a member of the constitutional ministry, and on the flight of the grand duke in 1849 he was chosen triumvir with Guerrazzi and Mazzini. At this time he exerted himself for the union of Tuscany with Rome. While he was on a mission to Paris the restoration took place, and Montanelli remained an exile until 1859, during which time he published two volumes of memoirs upon the events in Tuscany. Among his poems are mentioned with praise *La Tentazione*, and a tragedy entitled *Camma*. In 1859 he declared himself for the autonomy of Tuscany, rather than for the unification of Italy. *La Nuova Europa*, a journal founded by him, was the special organ of his peculiar political ideas, and its publication ceased at his death.

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* On farms only.

† Reference for location of county. See map of Montana, in article Idaho.

‡ Organized since census of 1880.

Montanism. See MONTANISTS.

Mon'tanists, an early Christian sect, the followers of Montanus of Pepuza in Phrygia. He appears to have been a priest of Cybele, was converted about 150 A. D., and soon after began to fall into fits of ecstasy and utter prophecies. He was joined by two women (Maximilla and Priscilla) of wealth and high social position, who deserted their husbands and became prophetesses. Expelled from the Church, he set up for himself, organizing a body of preachers to be supported by the voluntary contributions of his followers. He established a singular hierarchy, consisting of (1) a patriarch, residing at Pepuza, which was to be the metropolis of the millennial kingdom; (2) cenones, which have not been described; (3) bishops. Orthodox in respect to the cardinal doctrines, his teaching, in substance, was that the Mosaic and Christian dispensations having failed to save the world, a new revelation had been made through him and his two prophetesses. This revelation pertained not to doctrine, but to discipline. The points were—(1) fasting, at first two and afterwards three annual fasts of a week, instead of one such fast; (2) forbidding second marriages; (3) refusing restoration to such as had been guilty of murder, adultery, or idolatry; (4) requiring the veiling of virgins in the assemblies of the Church. The novelty was not in the things themselves, which were already popular, but in *prescribing* them in obedience to what was claimed to be a new express revelation. The system was received at first with some favor at Rome. Irenæus of Gaul was tolerant towards it. But finally it was treated everywhere as a heresy. Its strongholds were in Asia Minor and Northern Africa; Tertullian was its ablest champion. Severe laws against the sect were enacted (*Cod. Just.*, 1:5:18–21) as late as 530 and 532 A. D. (The original sources of information in regard to Montanism are, mainly, Eusebius, *Hist.*, v. 3, 14–19; Epiphanius, *Hær.*, 48, 49; and 22 of the 37 *Treatises* of Tertullian. (See *Montanism and the Primitive Church*, by John De Soyres, 1878.) R. D. HITCHCOCK.

Montanus. See MONTANISTS.

Montanus, Arias. See ARIAS MONTANUS.

Montargis', town of France, in the department of Loiret, on the Loing, has manufactures of serges, calicoes, and cloth, and extensive trade in wine, wax, honey, saffron, and wool. Pop. in 1881, 11,164.

Montauban', town of France, cap. of the government of Tarn-et-Garonne, on the Tarn, is an old but well-built town, founded in the twelfth century, and containing a still older cathedral. It has large manufactures of beetroot sugar, extensive dyeworks, breweries, and distilleries, and carries on a considerable trade. It was one of the Protestant strongholds in France, and has a flourishing Protestant theological school with 7 professors. Pop. 28,335.

Montauk' Point, a high, fertile headland, the extreme eastern point of Long Island, is a part of the township of East Hampton, Suffolk co., N. Y. It was once the seat of the Montauk Indians, of whom a few representatives are still living. It has a stone lighthouse with a flashing white light of the first order, 172 feet above the sea, and also a fog-trumpet; lat. 41° 4′ 13″ N., lon. 71° 51′ 6″ W.

Montbéliard', an old but well-built town of the department of Doubs, France, has extensive tanneries, manufactures of watches, and an active trade in wood, timber, and cheese. Pop. 8784.

Mont Blanc [Fr., "White Mountain"], the highest mountain in Europe, except Mt. Elburz in the Caucasus, is a part of the Graian Alps, in the department of Haute-Savoie, France. It covers an area of 98 square miles, with the Vale of Chamouni on the W. and that of Ferret on the E. side, and rises into a plateau 11,500 feet high, whence it splits into three peaks, of which the highest, La Bosse du Dromedaire, forms a narrow ridge 15,781 feet high. The snow-line descends to the height of 8000 feet, and from its thirty-six glaciers the waters are carried E. through the Dora Baltea to the Po, and W. through the Arve to the Rhone. It was ascended for the first time in 1786.

Montbrison', town of France, department of Loire, on the Vizezy, has a seminary and other educational institutions, and cold mineral springs in its vicinity. P. 7006.

Montcalm, de (LOUIS JOSEPH SAINT VERAN), MARQUIS, b. near Nismes, France, in 1712. Descended from a noble family, he received a careful education, and at fourteen years of age entered the army, and was distinguished in Italy, Bohemia, and Germany, attaining the rank of colonel. In 1756 he was appointed to the chief command of the French troops in Canada, and three months after his arrival captured Fort Ontario (Oswego), and a year later Fort William Henry (Lake George); in July, 1758, he occupied Fort Ticonderoga, where he successfully repulsed a quadruple British force under Abercrombie. To protect Quebec, threatened by the forces of Gen. Wolfe, Montcalm assembled the main body of his troops on the Montmorency, where (July 31, 1759) he repulsed Wolfe, who, retiring, secretly reached (Sept. 13) the Heights of Abraham, in rear of the army of Montcalm. With numbers nearly equal, Montcalm gave battle to the British, but, though displaying the utmost personal bravery, his troops gave way, and were entirely routed by a charge which followed. Wolfe fell rejoicing in his victory, while Montcalm, who had received a fatal wound, d. the following day, exulting that he should not live to see the surrender of Quebec. A monument stands in Quebec to the memory of the two heroes.

Mont Cenis', a remarkable mountain-pass of the Alps, is situated on the boundary between the Italian province of Turin and the French department of Savoie, at the junction of the Graian and Cottian Alps. It forms a plateau 6773 feet high, with a peak 11,451 feet high. In 1803–10, Napoleon I. laid an elegant and comfortable carriage-road over the plateau, connecting France with Italy. In 1867 a railway, on the Fell system, was carried over the pass, running for the most part by the side of the carriage-road. It never paid well, and was discontinued in 1871, with a loss to the shareholders of their entire capital, about £640,000. The famous tunnel was begun in Aug., 1857, completed Dec. 25, 1870, and opened for traffic in Sept., 1871. It is 8 miles long, lacking only 30 yards. Its N. end is 3942 feet above the sea, its S. end 4380, and the middle about 15 feet higher than the S. end. The cost was £3,000,000. Trains run through in about twenty minutes. (See FRÉJUS, COL DE.) REVISED BY R. D. HITCHCOCK.

Montclair, R. R. centre, Essex co., N. J. (see map of New Jersey, ref. 2–D, for location of county), on the Newark and Bloomfield branch of the Delaware Lackawanna and Western and the New York and Greenwood Lake R. Rs., is 14 miles W. N. W. of New York City. Pop. in 1870, 2853; in 1880, 5147.

Mont-de-Marsan', town of France, department of Landes, manufactures blankets, sailcloth, and leather, and carries on an active trade in wine, brandy, oil, wool, and grain. Pop. in 1881, 10,878.

Mont de Piété [Fr. for "mount of piety;" It. *Monte di Pietà*], an institution for the loaning of money at a low interest to the poor, pledges being taken for security. The earliest seems to have been that of Padua, founded in 1491 in opposition to the usurious practice of the Jews. The ancient Lombard houses and modern loan-funds are in principle the same. The *Monti di Pietà* at Rome are among the best managed in the world. The *Mont de Piété* may be regarded as a public system of pawnbrokerage. A similar system has prevailed in China for ages.

Montebel'lo, a v. of Northern Italy, province of Pavia. Here the Austrians were defeated by Napoleon I. June 8, 1800, and by Napoleon III. May 20, 1859.

Montebellu'na, town of Northern Italy, province of Treviso. Its strong castle sustained many sieges before 1320, when Montebelluna became a portion of the republic of Venice. Very interesting Etruscan, Roman, and mediæval objects were found here in 1856. Pop. 7906.

Monte Casino. See CASSINO.

Montecati'ni di Val di Nie'vole, town of Italy, province of Lucca, about 20 miles E. of the city of Lucca. This town, once pestilential, has been made healthy by skilful drainage, and its mineral waters have not only an Italian, but a European, reputation. The accommodations for invalids are excellent, and the waters, which are sent to all parts of the Continent, retain their medicinal virtues remarkably. Pop. 6791.

Montecuc'coli (RAIMONDO), COUNT, b. near Modena in 1608; entered the Austrian army in 1627; distinguished himself in the Thirty Years' war, and afterwards in the Polish war against the Swedes, and received in 1660 the command of the allied Austrian and French army in Transylvania, with which he defeated the Turks in the great battle of St. Gothard, on the Raab, Aug. 1, 1664. In the war between France and Holland he again commanded the Austrian army, and distinguished himself much in the campaigns between 1672 and 1676. In 1679 the emperor made him a prince of the empire, and the king of Naples gave him the duchy of Melfi. D. at Lintz Oct. 16, 1681, in consequence of a wound received by the fall of a beam. He left a memoir on the Turkish war, written in Italian, and translated into Latin, German, and French, and several other writings, even sonnets.

Montefio're (Sir Moses), Bart., F. R. S., b. at Leghorn, Italy, Oct. 26, 1784. Soon after, he was taken to England by his parents, who gave him and their other children an excellent education. He rose to prominence as a successful merchant, and was especially remarkable for his integrity and benevolence. Evincing the warmest interest in Jewish affairs, he was elected, in April, 1828, a member of the board of deputies of British Jews (an organization founded in 1760). On the resignation of Moses Mocatta, Esq., in 1835, he succeeded as president. In 1837 this most popular Israelite was preferred to the office of sheriff of London and Middlesex, and in the same year Queen Victoria created him a baronet with the privilege of using a coat-of-arms—an honor conferred only on peers of the realm. In 1840 was laid the foundation-stone of his greatness, which immortalizes his name particularly among his co-religionists. The cry of misery from Damascus touched the heart of every Jew, and Sir Moses stepped forward in the defence of a persecuted race maliciously charged with a heinous crime. He proceeded at once to the East, in company with Lady Montefiore, his private secretary, and other personages. His mission was successful, and some time after his return he was presented with a testimonial by his British brethren, and subsequently with a handsome gift by the Jews of Germany, for his noble efforts. He was a bulwark of defence to his own people whenever needed, and endowed colleges, hospitals, asylums, and places of worship which did not belong to his persuasion. The amount expended on these, as well as on poor families in all climes, cannot be calculated. His piety exceeded all praise; to perform his devotions with the prescribed number he supported the synagogue erected at his expense and attached to his country residence at Ramsgate. Sir Moses undertook a seventh voyage to Jerusalem in his ninety-second year, and gave in book-form a narrative which affords much information respecting men and places. The anniversary of his hundredth birthday was celebrated Oct. 26, 1884, in every synagogue throughout the civilized world, especially at Ramsgate, where Sir Moses was honored by prolonged demonstrations of respect and affection. D. July 28, 1885. (See his *Centennial Biography*, by Lucien Wolf, New York, 1884.) M. P. Janes.

Montégut' (Émile), b. at Limoges June 24, 1826; studied law at Paris, but devoted himself after 1847, when he became a contributor to *Revue des Deux Mondes*, to literature, and wrote a number of essays on philosophy and literature. He translated Emerson, Macaulay's *History of England*, and Shakespeare. He has also published *Souvenirs des Bourgogne* (1874), *En Bourbonnais et en Forez* (1875), *L'Angleterre et les colonies australes* (1879), etc.

Monteleo'ne di Cala'bria, town of Southern Italy, province of Catanzaro, situated on an eminence and containing some fine buildings. This town occupies the site of the ancient *Hipponium* of Magna Græcia, was known under the Romans as *Vibo Valentia*, and took a prominent part in the Neapolitan wars of the Middle Ages. In 1783 it suffered fearfully from an earthquake which destroyed nearly the whole town, including the magnificent castle erected by Roger the Norman. Pop. 11,840.

Montele'pre, town of Sicily, province of Palermo, 13 miles from the city of Palermo. This town commands a fine view of the sea and the adjacent country, and the old feudal castle is uncommonly well preserved. In the vicinity of Montelepre are found rare Phœnician and Greek coins, also human skeletons of almost gigantic size. In 1865 a fossilized elephant was discovered here, a portion of which is now in the Museum of Natural History at Palermo. Pop. 5706.

Montélimar', town of France, in the department of Drôme, at the confluence of the Roubion and Jabron. It is traversed by canals and surrounded by old walls. Its manufactures of tiles, shoes, flour, and silk are very large, and its vicinity is rich in vines, mulberry trees, and truffles. Pop. 12,894.

Montel'lo, on S. division of Wisconsin Central R. R., cap. of Marquette co., Wis. (see map of Wisconsin, ref. 6–D, for location of county), at the junction of the Fox and Montello rivers, on the line of the unfinished ship-canal between the Mississippi River and Lake Michigan, has flouring-mills, large woollen-mill, and possesses good water-power. Pop. in 1880, 394.

Montemayor', de (Jorge), b. at Montemor, Portugal, about 1520; served in the army; became chorister in the chapel of the infante of Spain; afterwards King Philip II., whom he accompanied in his progresses through Italy, Germany, and the Netherlands, and wrote much, both in prose and verse, in the Castilian language. His *Diana Enamorada* (1542) was the earliest successful pastoral romance in Spanish, had many imitators, and was translated into Latin, French (six versions), Dutch, and English. D. about 1564, probably in a duel at Turin, Italy.

Montene'gro, a small independent principality of Europe, situated between Bosnia and Albania and Dalmatia. The area of the country was considerably increased by the Treaty of San Stephano and the Congress of Berlin; it now amounts to 3680 square miles. Pop. 236,000, according to the official returns of 1882, which, however, were not based on a census, properly speaking. The surface is everywhere mountainous, the highest peaks, Kutsh-Kom in the E. and Mount Dormitor in the N., rising respectively 9300 and 8500 feet. The mountains are covered with dense forests of oak, beech, poplar, and fir, which yield excellent timber; the sumach tree grows here. The inhabitants are a tribe of the Servian race, and belong to the Greek Church. They lead a simple and rough life. Agriculture, fishing, and hunting are their occupations, but all their industry is carried on in a very primitive way. The products fit for exportation, such as wool, hides, tallow, dried and smoked fish and flesh, are carried by the women, or sometimes on mules, down to the Austrian port of Cattaro. The country has no roads and no villages. The inhabitants live in clans, always ready to fight each other when there is nobody else to fight. After the conquest of the Servian kingdom by the Turks in the fourteenth century, the Montenegrins maintained their independence in their mountains, and the attempts of the Turks to conquer them were defeated. They were aided, however, by the Russians, who pay their hospodar an annual pension of 7000 ducats in order that he shall be ready to attack or harass the Turks whenever the czar wishes to get that people into trouble. The hospodar can raise an army of more than 20,000 excellent soldiers in the course of a few days, and in the wars of Russia he has more than once proved himself worth his pension.

Montepulcia'no [*Monte Policiano*], town of Italy, province of Siena, situated on the summit of a hill about 3200 feet above the sea. The Roman and Etruscan antiquities found in this neighborhood have led some to suppose that it was the *Clusium Novum* of Pliny, but this is disputed. A famous wine, produced in the vicinity of Montepulciano, takes its name from this town. Pop. 13,160.

Montépin', de (Xavier Aymon), b. at Apremont, in the department of Haute-Saône, Mar. 18, 1824, is noted for his unexampled prolificacy as a writer of fancy. Besides founding a journal, *Le Canard*, contributing to several others, *Le Pamphlet*, *Le Lampion*, etc., and arranging sixteen dramas, generally in five acts and ten tableaux, he wrote, between 1847 and 1857, 169 volumes of romances, which were eagerly devoured by a certain class of readers in Europe and America, and of which one, *Les Filles de Plâtre* (7 vols., 1855), became famous because it was forbidden by the police. His fertility has not abated, but of late his power of striking the secret instincts of the uneducated imagination of his readers has gone.

Montereau', town of France, in the department of Seine-et-Marne, at the junction of the Seine and Yonne. It has large manufactures of faïence and earthenware. Pop. 7306.

Monterey', city of Mexico, cap. of the state of Nuevo Leon, on a small river of the same name, 450 miles N. N. W. of Mexico, situated on a fertile table-land enclosed within the northern cordillera of the Sierra Madre, 1626 feet above the sea, is well built, chiefly of stone, has a handsome public square, numerous and commodious public edifices, and a considerable manufacturing industry. The commerce with the U. S. is prosperous and rapidly increasing, especially in machinery. The climate is equable, and the vicinity abounds in gardens and orchards. Founded in 1590, Monterey is the oldest and most important city of Northern Mexico. Pop. about 37,000. The American army under Gen. Taylor, having been reinforced, left Matamoras Aug. 5, 1846, some 6500 strong, and Sept. 9 appeared before Monterey, strongly fortified and held by some 10,000 Mexicans, under Gen. Ampudia. W. of the town, and on a hill, was the bishop's palace, also fortified. Gen. Taylor opened his attack on the 21st; the next morning the bishop's palace was carried by Gen. Worth, and by the close of the 23d the whole city was occupied after a fight from square to square to the centre of the city. The next day Ampudia surrendered the city and garrison.

Monterey, Monterey co., Cal. (see map of California, ref. 5–B, for location of county), formerly capital of California, is on R. R. and Monterey Bay, 80 miles by sea from San Francisco, with which it is connected by a line of steamers. Its harbor is safe and capacious. Its light on Point Pinos is in lat. 30° 37′ 52″ N., lon. 121° 55′ W. Monterey is beautifully situated, and is the seat of a Roman Catholic bishop. It is an old Mexican town, with many of its houses built of adobe, and with tiled roofs. Among the interesting localities near are the old fort and the ruined Carmelite mission. The town has declined since the rise of San Francisco. Pop. in 1870, 1112; in 1880, 1396.

Monterey, cap. of Highland co., Va. (see map of Virginia, ref. 5–F, for location of county), 45 miles N. W. of Staunton. Pop. in 1880, 154.

Mon′te Ro′sa, next to Mont Blanc the highest mountain in Europe, is situated on the boundary between the Swiss canton of Valais and the kingdom of Italy, at the junction between the Pennine and Lepontic Alps. It rises in nine peaks, the four central ones of which are more than 14,000 feet high, the highest 15,217 feet. It is rich in metals. Gold, copper, and iron mines are worked. The highest of these mines is situated at an elevation of 10,500 feet, in the region of perpetual snow. The highest peak was ascended for the first time in 1851.

Monteroton′do, town of Italy, province of Rome, occupying the site of the ancient *Eretum*. It stands on a hill about 17 miles N. W. of Rome, is a walled town with many large and substantial buildings, but is now chiefly known for the engagement which took place here between the volunteers of Garibaldi and the French and pontifical troops in 1867. Pop. 3730.

Mon′te San Giovan′ni Campa′na, town of Italy, province of Rome, about 9 miles from Frosinone. It stands on a high hill, and its mediæval walls, towers, and baronial palace are still very imposing. This town was for a time the feudal possession of the house of Aquinas, and the dungeon in which St. Thomas was imprisoned by his father is still shown. Pop. 5988.

Mon′te San Giulia′no, town of Sicily, province of Trapani, about 7½ miles from the town of Trapani. It is finely situated on a mountain of the same name nearly 5000 feet above the sea, and is considered the most healthy place in the whole island. This town is of very great but uncertain antiquity, and the old cyclopean walls are still standing. Pop. 17,496.

Montesa′no, cap. of Chehalis co., Wash. Ter. (see map of Washington Territory, ref. 4–A, for location of county), on the S. bank of Chehalis River, 60 miles S. by W. of Olympia. Pop. in 1884, about 1000.

Mon′te San Savi′no, town of Italy, province of Arezzo, about 13 miles S. W. of Arezzo. The municipal palace and the loggie opposite it have great architectural merit. Pop. 7975.

Mon′te Sant′ An′gelo, a large town of Southern Italy, province of Foggia. This town is built on a high hill not far from the sea, and contains some good buildings, especially churches. Among its many mediæval remains are an old castle and an immense tower known as Il Gigante. There are also many traces of the Roman period. Pop. 17,242.

Montesar′chio, town of Southern Italy, province of Benevento. The inhabitants are industrious and given to commerce. It is a very ancient town, was defended by a strong castle during the Middle Ages, and interesting antiquities are often found here. Pop. 6688.

Montescaglio′so, town of Southern Italy, province of Potenza. This town is situated on a hill about 8 miles from Matera, and commanding the Ionian Maremma. The town contains many grand buildings, among them a monastery founded by the house of Anjou, which, with the exception of La Casa and Monte Casino, is the largest in Southern Italy. Pop. 7089.

Montesi′nos (FERNANDO), b. at Ossuna, Spain, about 1600; went in youth to Peru; became a member of the "audiencia" or supreme administrative council at Lima; was twice "visitador" or judge empowered to pronounce upon the entire administration of the colony; became acquainted in the exercise of these functions with the descendants of the ancient royal families of Peru, from whom he derived important information on history and archæology, from which he compiled his *Memorias Historicas del Antiguo Perú*, a work which has supplied much of the currently received materials upon the ancient incas, first published quite recently by Ternaux-Compans (Paris, 1849). This work was written about 1652, and the author is supposed to have died soon afterwards in Peru. He was also author of several treatises upon mining.

Montesquieu′, de (CHARLES DE SECONDAT), BARON, b. at the château of Brêde, near Bordeaux, Jan. 18, 1689; studied jurisprudence; was appointed councillor in the Parliament of Bordeaux in 1714, and president in 1716, but occupied himself more with philosophical studies and literary pursuits than with parliamentary business, and published in 1721 his *Lettres Persanes*, which made a great sensation, ran through twenty-two editions in the first eighteen months, and were translated into most other European languages. In 1726 he resigned his office in the Parliament, and travelled through Italy, Austria, Germany, and England, where he resided for two years. On his return he settled at Brêde, and only occasionally visited Paris. In 1734 appeared his *Considérations sur les Causes de la Grandeur et de la Décadence des Romains*, which made much less sensation, but a much deeper impression, than *Lettres Persanes*, and which may be considered as the first attempt at a philosophical conception of history. At last, in 1748, after twenty years' preparation, his *Esprit des Lois* followed, and almost immediately it put all the social and political ideas of the age in thorough fermentation, and became the basis of modern political science. His minor works, *Dialogues de Sylla et de Lysimaque* (1748), *Essai sur le Goût*, etc., are of less interest. Collected editions are very frequent. D. at Paris Feb. 10, 1755.

Montevar′chi, town of Italy, province of Arezzo, situated at the foot of a hill on which stands the ancient castle of Montevarchi, famous in the mediæval wars of Florence. Pop. 9694.

Montever′de (Gen. JUAN DOMINGO), b. in Spain about 1772; served in the Spanish navy; became captain in 1811, when he was sent by the junta of Cadiz to suppress the revolt in Venezuela; landed at Coro; rapidly took several large towns, and compelled Gen. Miranda to capitulate July 25, 1812, after which he sent that celebrated patriot to Spain as a prisoner, in violation of the terms of the agreement; treated the principal native chieftains and their families with similar perfidy. His severities were a principal cause of the second insurrection, headed by Bolivar, by whom Monteverde was defeated and driven from Venezuela. D. in Spain in 1823.

Montevid′eo, capital of the republic of Uruguay, is on the northern shore of the mouth of the Rio de la Plata, where it enters the Atlantic. The *cerro* or mount from which the city derives its name is the distinguishing mark of the port. It rises on the western side of the bay to a height of 463 feet. Cerro lighthouse is situated in lat. 34° 53′ 15″ S. and lon. 56° 14′ 36″ W. Pop. 110,106. The position of the city is so favorable that, free of civil wars, its importance would soon equal that of Rio de Janeiro. In recent times the city has improved in every respect; it is supplied with water, gas, and a system of sewers. The streets are regularly laid out and very well paved. They run down in all directions from a rather steep hill, on which the city is situated, toward the sea, which surrounds the city on three sides, and here in the lower parts, adjoining the quays, stand the custom-house and the warehouses. The principal building is the cathedral. It has a beautiful front façade, with a great portal composed of three round arches and flanked by two towers crowned with cupolas. The Plaza de la Constitucion, the gathering-place of the elegant world, extends in front of the cathedral, and is planted with fine trees. There are three more Roman Catholic churches—San Francisco, La Caridad, and Los Ejercicios; a Protestant church, built in 1846 and connected with the British consulate; and a Methodist mission chapel. The most noteworthy among the other public buildings are the opera-house, several theatres, and the hospital, the best in South America. The hotel accommodations are superior to those of any port of Brazil. The shops are well provided with all kinds of necessaries and luxuries. There are a small public library, several schools, and a college. The population, of which the Italians form the predominant part, is distinguished for politeness and kindness, and makes a very agreeable impression on visitors. The commerce is considerable. During the five years 1877–81 the average value of the exports was £2,303,061, and that of the imports £3,469,997. Of the 1044 vessels, of 780,870 tons, which entered the harbor in 1879, 285 were English, 157 Spanish, 145 Italian, 112 German, and 99 French. The principal articles of export are wool, skins, dried fish, tallow, oil, bones, meat-extract, and living animals (to Brazil); of imports, dry goods, jewelry, wine, spirits, flour, tobacco, furniture, etc. By telegraph Montevideo communicates with the U. S. and Europe; a submarine line leads to Buenos Ayres and Rio Grande do Sul; two overland lines to Brazil. The city was founded by families from the Canary Islands, which settled here in 1717. It had 15,000 inhabitants in 1800; 37,000 in 1860; 73,353 in 1879. Epidemics and civil wars are the enemies of the prosperity of the city. (See Hadfield, *Brazil, the River Plate, etc.*, 1854, and Mulhall, *Handbook of the River Plate Republics*, 1874.) AUGUST NIEMANN.

Montevideo, cap. of Chippewa co., Minn. (see map of Minnesota, ref. 9–B, for location of county), on the Chicago Milwaukee and St. Paul R. R. and the N. E. bank of Minnesota River, at the mouth of the Chippewa. Pop. in 1880, 862; in 1885, 1150.

Mon'tez (Maria Dolores **Porris**), countess of Landsfeld, known as Lola Montez, b. at Limerick, Ireland, in 1824; was married at an early age to a Capt. James at Dublin, from whom she soon separated; appeared as a *danseuse* at Paris 1840; proceeded soon afterwards to Munich, where she became mistress of King Louis and received the title of countess of Landsfeld (1846). She took an active part in politics, but was compelled to leave the country by the popular outbreaks of 1848; came to the U. S. in 1851; appeared for some years as an actress and lecturer, and published her *Autobiography*, besides various other writings. D. at New York Jan. 17, 1861.

Montezuma, on R. R., cap. of Poweshiek co., Ia. (see map of Iowa, ref. 5–I, for location of county), is in the vicinity of extensive coal-deposits, and is the seat of a fine agricultural section. Principal occupation, farming, dairying, and stock-raising. Pop. in 1870, 555; in 1880, 921.

Montezuma, or **Moctezuma** [Mex. *Moteculzoma*, "the sad or severe one"], the name of two Aztec rulers, who were dignified by the Spaniards and succeeding historians with the title of emperors of Mexico.—Montezuma I. Ilhuicomina, b. about 1390, was a valiant general; succeeded to the throne about 1436; fought successfully against the Mixtecas and the Tlaxcalans; extended his dominions to the Gulf of Mexico, and d. in 1464.—Montezuma II. Xocoyotzin, b. about 1480, succeeded his uncle, Ahuizotl, 1502; had been distinguished both as a soldier and as a priest; ruled with great splendor and military success until 1519, when Hernando Cortes arrived in Mexico with his small band of adventurers, by whom the monarch was imprisoned in his own capital, gave his allegiance to the king of Spain, and was killed by his own subjects during a tumult, June 30, 1520. His descendants were ennobled in Spain.

Montfaucon', de (Bernard), b. at Soulaye, in Languedoc, Jan. 13, 1655; served for some years in the army, but entered in 1675 the Benedictine congregation of Saint-Maur, devoting himself exclusively to studies; travelled in Italy, and settled in 1701 in Paris, where he d. Dec. 21, 1741. The first fruits of his extensive learning were new critical editions of several of the Greek Fathers, but he distinguished himself also as an original author; and of his many works the *Palæographia Græca* (1708) and *L'Antiquité expliquée et representée en figures* (French and Latin, 15 vols., 1719–24) are still valuable.

Mont'fort, de (Simon), Count, subsequently count of Toulouse, b. about 1150; took part in the fourth crusade; was appointed leader by the pope of the crusade against the Albigenses in 1208, and became famous for the unheard-of cruelty with which he suppressed this movement. In 1213 he took Toulouse from Count Raymond, but was afterwards driven from the city, and when he returned to besiege it he was killed by a stone thrown from the wall, June 25, 1218.

Montfort, de (Simon). See Leicester, Earl of.

Montgolfier. See Aëronautics.

Montgomery, city and R. R. centre, cap. of Montgomery co. (see map of Alabama, ref. 5–D, for location of county), and also of the State of Alabama, has 12 churches, 2 banks (national) and 5 private banking-houses, 1 daily and 2 weekly newspapers, many private schools and academies, and an excellent system of free public schools, an orphan home, a widows' home, 1 large flouring-mill, several large machine-shops and foundries, 1 cotton-factory, 3 oil-mills, and manufactures of soap, crackers, and fertilizers; business in 1884, $20,000,000. The city has gas and electric lights, handsome county court-house, fine U. S. government buildings, a handsome Masonic temple, ample water-works, railroad connections with all points South and West, steamboat navigation by Alabama River at all seasons to Mobile and Gulf of Mexico, and is situated within 60 miles of extensive deposits of coal and iron. The neighboring soil is very rich and productive, cotton being the staple product. The Capitol buildings are situated on high ground overlooking the entire city and surrounding country. Pop. in 1870, 10,588; in 1880, 16,713; in 1885, over 20,000.

W. W. Screws, Ed. and Prop. "Montgomery Daily and Weekly Advertiser and Mail."

Montgomery, Orange co., N. Y. (see map of New York, ref. 7–J, for location of county), 12 miles W. of Newburg-on-Hudson, is on the Erie and the Wallkill Valley R. Rs., in a fine agricultural and dairy region, and has large paper-mill, etc. Pop. in 1870, 960; in 1880, 935.

Montgomery, cap. of Montgomery co., Tex. (see map map of Texas, ref. 5–J, for location of county), on Gulf Colorado and Santa Fé R. R., in a good farming district. Pop. in 1880, 414.

Montgomery (George Washington), b. in Valencia, Spain, in 1804, was the son of an American merchant of Alicante; was long in the U. S. service, consul at Porto Rico and at Tampico, etc. Author of a novel, *Bernardo del Carpio* (*El Bastardo del Castilla*), in Spanish and English; Spanish translations of some of Irving's works; Spanish tales, and a *Narrative of Travels in Central America* (1839), in English. D. June 5, 1841.

Montgomery (James), b. at Irvine, Ayrshire, Scotland, Nov. 4, 1771, and was the son of a Moravian preacher; was educated at the Fulneck School, Yorkshire, and apprenticed to a grocer, but ran away in 1789, and in 1792 became clerk to Joseph Gales, a famous journalist of Sheffield, who soon after was compelled to escape to the U. S., having been accused of treason. Montgomery then founded *The Sheffield Iris*, which he edited thirty-one years, 1794–1825. He began in early youth to write poetry, in which he won great popularity, notwithstanding the opposition of the critics. In 1835 he received a pension, and declined the professorship of rhetoric at Edinburgh. D. at Sheffield Apr. 30, 1854. His principal works are *Prison Amusements* (1797), written during an imprisonment for seditious libel; *The West Indies* (1809), an anti-slavery poem; *The World before the Flood* (1812), *Greenland* (1810), *Prose by a Poet*, *Lectures on Poetry and English Literature* (1830–31), *Original Hymns* (1853). Mr. Montgomery is best known as a hymn-writer and a devotional poet.

Montgomery (Admiral John B.), b. at Allentown, N. J., about 1796; entered the navy as midshipman 1812; was a midshipman on board the flagship Niagara at Perry's victory on Lake Erie, Sept. 10, 1813, receiving a sword and the thanks of Congress; was with Decatur in the naval campaign against Algiers 1815; commanded the sloop-of-war Portsmouth on the Pacific coast 1845–48, during which cruise he took possession of Lower California, occupied Guaymas, and blockaded Mazatlan for some months; was commissioned captain 1853; was in command of the Pacific squadron 1860–61; made commodore July 16, 1862, and rear-admiral July 25, 1866; commanded the naval station at Sackett's Harbor 1867–69, when he was placed on the retired list. D. Mar. 25, 1873.

Montgomery (Richard), b. near Raphoe, Ireland, Dec. 2, 1736; educated at Dublin University; entered the British army in 1754, and served with distinction in North America and the West Indies. Retiring from the army in 1772, he came to America; settled at Rhinebeck, N. Y., and married a daughter of R. R. Livingston; was a member of the first provincial congress in 1775, and the same year was appointed a brigadier-general in the Continental army. In the expedition for the invasion of Canada, Montgomery was second in command to Schuyler, until, owing to the illness of the latter, he succeeded to the chief command, capturing Fort Chambly, St. John's, and Montreal in rapid succession. After toilsome marches the forces of Montgomery and Arnold united near Quebec Dec. 4, 1775. On the 9th, Montgomery was made a major-general. Advancing upon Quebec, the demand for a surrender of the city was refused, and with their limited numbers and inadequate artillery a *coup de main* seemed to be the only hope of obtaining Quebec. This being decided upon, a favorable moment occurred on the morning of Dec. 31, 1775. During a blinding snowstorm Montgomery with his little band started at 2 A. M., and had without opposition passed the first barrier when a discharge (the only one made) from the enemy's battery instantly killed the brave Montgomery and others, and the disheartened troops fell back in confusion. A monument erected by Congress was placed in front of St. Paul's church, New York, beneath which his remains now rest.

Montgomery (Robert), M. A., b. at Bath, England, in 1807, was the son of one Gomery, a low comedian; graduated at Lincoln College, Oxford, in 1833; entered the Anglican ministry in 1835; held various rectorships, mostly in London and Glasgow. D. at Brighton Dec. 3, 1855. He was a voluminous writer of prose and verse, and notwithstanding the severe criticisms and ceaseless ridicule of some of the best critics of his day, his poems attained and maintained a wide popularity. His best-known poems are *Omnipresence of the Deity* (1828) and *Satan* (1829).

Montgomery (Sir Robert), K. C. B., LL.D., b. in Londonderry, Ireland, in 1809; educated in that city; entered the civil service of the East India Company 1828; rose to the commissionership of the Punjaub 1849; disarmed the native forces at Lahore May, 1857; became chief commissioner of Oude 1858; restored that province to tranquillity, for which he was knighted and received the thanks of both Houses of Parliament; was lieutenant-governor of the Punjaub 1859–65, and became a member of the council of India 1868.

Montgomery (Gen. William Reading), b. in Monmouth co., N. J., July 10, 1801; graduated at West Point 1825; served in the infantry, chiefly on the Western frontier, until 1838, when he was sent as captain to the Canada border; was engaged in the Florida war 1840–42; accompanied Gen. Taylor in the Rio Grande campaign 1846, and Gen. Scott in the campaign of the Valley of Mexico; was brevetted major for gallant conduct at Palo Alto and Resaca de la Palma, and lieutenant-colonel for gallantry at Molino del Rey, where, after the death of his two senior officers, he led his regiment to the assault of the enemy's works, and was severely wounded; served in Texas and on the Plains until 1855, when he resigned; raised and commanded the 1st New Jersey Vols. 1861; rendered good service at Bull Run, for which he was commissioned brigadier-general; was successively military governor of Alexandria, Annapolis, and Philadelphia; resigned on account of failing health Apr., 1864, and d. at Bristol, Pa., May 31, 1871.

Montgomery City, Montgomery co., Mo. (see map of Missouri, ref. 4–I, for location of county), 82 miles W. of St. Louis, on the Wabash St. Louis and Pacific R. R., has a college, parish school, public library, a mill and manufactory. Principal employment, farming and dairying. Pop. in 1880, 1165.

Montgom'eryshire, county of North Wales, England, comprising an area of 755 square miles, with a population of 65,718. The surface is mountainous, and the soil (with exception of the valleys of the Severn, Wye, and Dee) not fertile. On the mountain-pastures many sheep are reared, and the county is the chief seat of the Welsh flannel manufacture. Chief town, Montgomery.

Month [Sax. *mona*, "month"], a period of time corresponding in length to one revolution of the moon around the earth, employed almost universally in the infancy of civilization to measure intervals in chronology. The length of a mean lunation from new moon to new moon again is 29 days 12 hours 44 minutes 2.84 seconds, exceeding thus 29½ days by about three-quarters of an hour. It was early ascertained that this period corresponded very nearly to 29½ days, but as for chronological purposes fractions of days cannot well be counted, the months were made alternately 29 and 30 days, the slight outstanding error being unknown or disregarded. Twelve lunar months of 29½ days amount to only 354 days, or fall short of the length of a year by about 11¼ days. By the employment of a year of twelve lunar months, without any allowance for the discrepancy between this and the solar year, the places of the successive months in the seasons go backward, so as in about thirty-two or thirty-three years to occupy every possible position in the natural year. To avoid the inconvenience arising from this cause, the Egyptians made all their months 30 days each, and added five uncalendered days at the end to complete the deficiency. The Jews, who employed alternate months of 30 and 29 days, added a month of 30 days, called an embolismic month, every three years. The ancient Greeks used a similar month, without such allowance. The Roman months, before the reformation of the calendar by Julius Cæsar, were somewhat irregular, four of them being of 31 days, seven of 29 days, and one of 28 days. The Arabic and Turkish months were alternately 30 and 29 days, eleven uncalendered days being added at the end of the year. The Church, both Eastern and Western, has always continued to employ the lunar year of 30 and 29 days alternately, and in this respect has been followed by the Protestant Episcopal Church of England and of the U. S., embolismic months being added as often as the error thus introduced exceeds 30 days. The French, under the First Republic, divided the year into 12 months of 30 days each, with five uncalendered days at the end, called complementary days and also *sans culottides*, which were made holidays. In the reformation of the calendar by Julius Cæsar, which took place about 46 years before the Christian era, the year, which began on the first of March, was divided into 12 months of 30 and 31 days each, with the exception of February, which had but 29. The entire year thus consisted of 365 days, to which every five years an intercalary day was added immediately after the 23d day of February, so that the 24th, which in the Roman calendar was called the sixth calends of March, was twice counted, and hence the year received the name of bissextile. In this year the month of July was called Quintilis, the fifth, but the Roman senate gave it the name of Julius, which it continues to bear. In imitation of this action the senate under Augustus gave to the month Sextilis the name of the emperor, which name is also still preserved. The Roman months to the end of the year bear the same names which they bore in the Roman calendar, but by the change of the beginning of the year from the first of March to the first of January the numbers have ceased to indicate their place in the series. In our calendar the months of January, March, May, July, August, October, and December have each 31 days, the months of April, June, September, and November have 30, and the month of February 28 days in a common year and 29 in leap-year. As for business purposes it is necessary that a calendar should be definitely fixed, this distribution of days has received the sanction of law. It is greatly to be desired that there should be a reform which should make the division of the year more systematic. The most suitable distribution would seem to be to give to all the odd months 30 days, and all the even months 31, except the last, which in a common year would have 30, and in leap-year 31. (For further information on this subject see Calendar, and also Easter and Epact.)

F. A. P. Barnard.

Montholon', de (Charles Tristan), Count, b. at Paris July 21, 1783; entered the army in 1798; distinguished himself in the battle of Wagram 1809; was attached to the personal staff of Napoleon; acted as his aide-de-camp during the Hundred Days; followed him to St. Helena, and was appointed one of his executors. After 1830 he re-entered the French army; took part in the attempt of Prince Louis Napoleon at Boulogne; was imprisoned together with him at Ham, but afterwards pardoned; became a member of the Legislative Assembly after 1848, and d. Aug. 21, 1853. In connection with Gen. Gourgaud he published *Mémoires pour servir à l'Histoire de France sous Napoléon, écrits à Ste. Hélène sous sa dictée* (8 vols., Paris, 1823); and in 1847 *Récits de la Captivité de l'Empereur Napoléon à Ste. Hélène.*

Mon'ti (Vincenzo), b. at Fusignano, Italy, Feb. 19, 1754; studied literature with the poet Onofrio Minzoni in Ferrara, and imitated Varano and Dante; at Rome obtained the position of secretary to Duke Luigi Braschi, himself secretary of Pope Pius VI. Inspired by the tragedies of Alfieri, Monti became a tragic poet, and wrote *Galeotto, Manfredi, Aristodemo,* and *Caio Gracco.* Basseville, the representative of the French republic, having been assassinated at Rome, Monti, to please the papal court, wrote a poem entitled *La Bassvilliana,* which gave him great celebrity. This poem was followed by two others, *La Musogonia* and *La Feroniade.* On the triumph of Bonaparte, Monti sought the protection of the rising genius, and obtained at Milan the post of secretary of the executive directory. From thence he was sent to Bologna as commissioner of the Cisalpine republic. After the battle of Marengo, Monti published three poems on the death of the mathematician Lorenzo Mascheroni. He was appointed professor in the Brera at Milan and of Italian rhetoric in the University of Pisa. In 1805, Napoleon named him historian of the kingdom of Italy. Then followed certain adulatory but unsuccessful poems—*Il Bardo della selva nera, La Spada di Federico,* afterwards an indifferent translation of Persius, and an elegant translation of the *Iliad* of Homer. Napoleon having fallen in 1815, Monti was ready to compose a poem in honor of the emperor of Austria, Francis I. In the last years of his life he prepared a voluminous *Proposta di alcune correzioni ed aggiunte da farsi al vocabolario della Crusca.* D. Oct. 13, 1828.

Monticello, on R. R., cap. of Drew co., Ark. (see map of Arkansas, ref. 5–D, for location of county), 40 miles W. by N. from Arkansas City, on the Mississippi River, has an academy and female seminary. Pop. in 1880, 891.

Monticello, on R. R., cap. of Jefferson co., Fla. (see map of Florida, ref. 1–D, for location of county), 30 miles E. of Tallahassee. Principal business, cotton-planting. Pop. in 1870, 1052; in 1880, not in census.

Monticello, cap. of Jasper co., Ga. (see map of Georgia, ref. 3–H, for location of county), 18 miles W. of Eatonton. Pop. in 1880, 511.

Monticello, city and R. R. junction, cap. of Piatt co., Ill. (see map of Illinois, ref. 6–F, for location of county), 60 miles E. by N. of Springfield, has steam flouring-mill and a steam-elevator. Pop. in 1870, 871; in 1880, 1337.

Monticello, R. R. junction, cap. of White co., Ind. (see map of Indiana, ref. 4–C, for location of county), 21 miles W. of Logansport, on the Pittsburg Cincinnati and St. Louis R. R., has furniture and woollen manufactories and a paper-mill. Pop. in 1870, 887; in 1880, 1193.

Monticello, city and R. R. junction, Jones co., Ia. (see map of Iowa, ref. 4–K, for location of county), is the centre of a large trade. Pop. in 1870, 1337; in 1880, 1877.

Monticello, cap. of Wayne co., Ky. (see map of Kentucky, ref. 5–H, for location of county), 23 miles S. W. of Somerset, has some manufactures. Pop. in 1880, 354.

Monticello, cap. of Lawrence co., Miss. (see map of Mississippi, ref. 8–F, for location of county), on the Pearl River. Pop. in 1870, 200; in 1880, not in census.

Monticello, cap. of Lewis co., Mo. (see map of Missouri, ref. 1–H, for location of county), 12 miles from Canton. Pop. in 1870, 301; in 1880, 324.

Monticello, cap. of Sullivan co., N. Y. (see map of New York, ref. 7–I, for location of county), the terminus of the Monticello and Port Jervis branch of the Erie R. R., has an academy and a foundry. Pop. in 1870, 912; in 1880, 941.

Monticello, in Albemarle co., Va. (see map of Virginia, ref. 5–G, for location of county), 3 miles W. of Charlottesville, was once the home of Pres. Thomas Jefferson, author of the Declaration of Independence. The mansion, now much dilapidated, stands upon an eminence. Near by, in a family cemetery, lie the remains of the President, over which rises a granite obelisk eight feet high.

Monti'lla, town of Spain, province of Cordova, the birthplace of Gonzalo de Cordova, and situated on an elevated and very fertile plain, which produces a celebrated wine. Pop. 13,207.

Montluçon', town of France, department of Allier, on the Cher, with large manufactures of glass, mirrors, and chemicals. In its vicinity is Neris, whose mineral springs are much used for bathing in certain diseases; they were known to the Romans, and much used by them. Pop. 26,079.

Montmoren'cy, a small river in Canada, rises in Snow Lake, Montmorency co., and flows S. into the St. Lawrence, 8 miles below Quebec. Near its mouth it falls nearly perpendicularly 250 feet, with a width of 50 feet, forming a beautiful and celebrated cataract, which is one of the chief attractions to tourists in the province of Quebec. A cone of ice is formed every winter below the falls, and sometimes attains a height of 200 feet.

Montmorency, the surname of an ancient and illustrious French family, traced back as far as 950 to Bouchard, Sire de Montmorency, a great French feudatory, nephew of Edred, king of England. The Montmorencies were long known as the premier barons of France, and among those of this name were six grand constables, twelve marshals, four admirals, many cardinals, generals, grand chamberlains, and other high magnates. Belgium and Luxembourg have still several princely and ducal lines of this family. Count Horn and Marshal Luxembourg were both Montmorencies.

Montmorency, de (ANNE), FIRST DUKE, grand constable of France, b. at Chantilly Mar. 15, 1492; was one of the leading generals in the wars of Francis I., and was afterwards distinguished for cruel hostility to the Huguenots. He was mortally wounded in the battle of St. Denis, and d. at Paris Nov. 12, 1567.—HENRY, fourth duc de Montmorency, a grandson of the preceding, was b. at Chantilly Apr. 30, 1595; was godson of Henry IV., and when sixteen years old became admiral of France and viceroy of Canada. He served with distinction in Italy and against the Huguenots; took part in the rebellion of Gaston of Orleans, and was executed by command of Richelieu at Toulouse, Oct. 30, 1632.

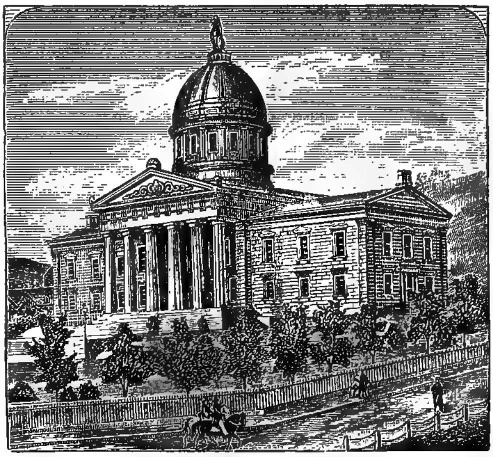
Montmorillon', town of France, department of Vienne, has celebrated paper manufactories, large tanneries, and a trade in cattle and wine. Pop. in 1881, 5128.

Montoire', town of France, department of Loire-Inférieure, has noted vitriol manufactures. Pop. in 1881, 5412.

Monto'ro, town of Spain, province of Cordova, on the Guadalquivir. Its vicinity is covered with olive-groves, from which annually 50,000 cwts. of oil are exported. Pop. 13,293.

Montpelier, R. R. centre, cap. of Washington co. (see map of Vermont, ref. 4–C, for location of county) and of the State of Vermont, situated 205 miles N. N. W. from Boston, on the Central Vermont and the Montpelier and Wells River R. Rs., is the commercial centre of a large territory, and its trade is quite extensive. It has an excellent union school, the Washington County Grammar School, and the Vermont Methodist Seminary and Female College, and its churches are the finest in the State. There are 5 weekly newspapers, and the Lane and Montpelier manufacturing companies have extensive works here. It has 2 national banks, the Vermont Mutual Fire Insurance Company, the National Life Insurance Company, and the Farmers' Mutual Fire Insurance Company. The State Capitol is one of the finest buildings in the U. S., which, combined with the pleasant drives and fine views surrounding the town, renders it more and more popular every year as a resort for summer tourists. The Montpelier and Wells River R. R., built mostly by the citizens of Montpelier, has opened up a new part of the State, and affords travellers a new route to the White Mountains from the W., as well as greatly facilitating the means of transit to the capital for that part of the population residing in the northeastern portions of the State. Pop. of tp. in 1870, 3023; in 1880, 3219, including 1847 in village.

W. W. PRESCOTT,
ED. "VERMONT WATCHMAN AND STATE JOURNAL."



State Capitol (Montpelier, Vt.).

Montpel'lier, city of France, capital of the department of Herault, on the Lèze, 6 miles N. of the Mediterranean. The city itself was formerly indifferently built, with narrow, crooked, and steep streets, but has of late been much improved; its promenades afford the most splendid views of the Mediterranean, the Pyrenees, and the Alps; and as its climate is remarkably mild and salubrious, its vicinity is covered with villas and cottages. Remarkable among its buildings are the cathedral and the aqueduct; and among its institutions, its medical school, founded in the Middle Ages by Arabian physicians and enjoying a world-wide fame; a botanical garden, the first established in France, and many excellent collections, are connected with the school. Montpellier has large distilleries and manufactures of woollens and cottons, and it carries on an important trade in wine, olive oil, fruits, and grain. Pop. 56,005.

Montpensier', de (ANTOINE MARIE PHILIPPE LOUIS D'ORLÉANS), DUKE, the fifth and youngest son of the late king Louis Philippe, b. at Neuilly July 31, 1824; educated at the Collége Henri IV., and in 1842 was appointed *sous-lieutenant* of artillery; captain in 1843. He served in Africa in 1844 in the expedition against Biskara, and somewhat later, as chief of artillery under the duc d'Aumale, he directed it with efficiency upon an Arab fort, leading an assaulting column, receiving a wound in the face, and exhibiting great bravery, for which he was named chevalier of the Legion of Honor. In the subsequent year (1845), having in the interim accompanied the king on his visit to Queen Victoria, he so distinguished himself at the battle with the Kabyles as to establish a solid military reputation and attain the rank of lieutenant-colonel. A tour through the East followed, on his return from which he received the grand cross of the Legion of Honor, and was promoted to the colonelcy of the 5th regiment of artillery, and in 1846 appointed to the command at Vincennes, with the rank of *maréchal de camp* (brigadier-general). At this period the famous negotiations took place by which the duke was betrothed to the sister of the queen of Spain. These alliances and the famous "Spanish marriages" produced a great sensation in France and dissatisfaction elsewhere, especially in England. After his marriage (Oct. 10, 1846) he took up his residence at the palace of the Tuileries, from whence in 1847 the revolution which dethroned the king made him, with the rest of the royal family, an exile. He finally fixed his residence, with the duchess, in the palace of San Telmo at Seville. Here, constrained to inactivity, he passed many years, exhibiting his taste and love of art in the embellishment of his grounds and in making his palace a rich collection of works of art. Agriculture, the fine arts, and the study of the politics and events of his adopted country and of France engaged his time. The duchess, always with him, "endowed with the most engaging qualities of a mother and wife, adorned by her life and example his abode, setting to their children the example of the purest domestic virtues."* Besides honorary appointments, he was made by Queen Isabella, in 1858, captain-general of the Spanish army, and in 1859 she conceded to him the honors due to "infants" of Spain. This cordiality was disturbed by political troubles accumulating about the queen's government. In 1859 he was exiled to the Balearic Islands. The dethronement of the queen (Sept., 1869) only changed the character of the embarrassments which have since beset him and the duchess, both of whom stand in dangerous prominence as *Bourbons* nearly allied to the royal family. The most marked event of this period is the death of Duc Henrique, brother of Don Francisco, the husband of Isabella II. Violent by nature, he, affecting to regard Montpensier as a "pretender," repeatedly and conspicuously insulted him. A duel ensued, in which the duke, after twice receiving his adversary's fire and twice firing in the air, forced to a third exchange, aimed, and with fatal effect. The duke, with the duchess and their six children—the fourth of whom, Maria Isabella, is married to the count of Paris—now resides in Paris. J. G. BARNARD.

Montreal′, city of the Dominion of Canada, in the province of Quebec, in lat. 45° 31′ N., lon. 73° 35′ W., on the left bank of the St. Lawrence, 600 miles from its mouth, 180 above Quebec, 200 below Lake Ontario, 335 from New York, on an island formed by the two arms through which the Ottawa enters the St. Lawrence. It derives its name from Mont Réal (or Royal), which rises immediately behind it to a height of 750 feet, and it is generally a neat and well-built town, with several elegant quarters, though its streets are mostly narrow and tortuous. The largest public square is the Champ de Mars, a military parade-ground, situated behind the court-house. Of the public buildings, the most remarkable are the Roman Catholic parish church of Notre Dame, a parallelogram 241 feet long, 135 feet wide, flanked with six towers, of which the two on the main front rise 213 feet, built from 1824–29, and the English cathedral, a cruciform structure in Gothic style, 112 feet long, 70 feet wide, the transept 100 by 25 feet, and the spire 224 feet. The city contains in all 64 churches—21 Roman Catholic, 9 Episcopalian, 5 Presbyterian, 5 belonging to the Church of Scotland, 5 Methodist, 4 Wesleyan, 4 Baptist, 2 Jewish, 2 Congregational, 1 French Evangelical, 1 German Protestant, 1 Unitarian, 1 belonging to the Society of Friends, 1 New Jerusalem, 1 Christian Advent, and 1 belonging to the St. George's Hall congregation. The university, McGill College, founded as a college in 1811, erected a university in 1821, reorganized and enlarged in 1852, comprises an excellent medical school and a fine museum; and besides this and the seminary of St. Sulpice the city has several other good educational and numerous benevolent institutions. The harbor extends for nearly 3 miles, from the village of Hochelaga to the famous tubular Victoria Bridge, which, about 2 miles long, crosses the St. Lawrence on twenty-four piers. It has a line of wharves more than a mile long and of solid masonry, is perfectly safe, as it is situated 90 miles above the influence of the tide, and is open generally from the end of April to the beginning of December. Great improvements have been made in the last fifty years in the river navigation belonging to the city. In the beginning of the present century only vessels of less than 300 tons burden could reach the city, but by deepening the shallow places of the St. Lawrence between Quebec and Montreal, the latter has been made accessible for vessels of 1800 tons burden. On the other side, towards Lake Ontario, costly locks and canals have been constructed. The census of 1881 gives the following statistics of all industries in Montreal: Capital employed, $30,943,743; number of hands employed, 32,132; amount of yearly wages, $8,630,500; value of raw material, $31,345,496; total value of articles produced, $50,598,879. The principal articles of exportation are grain and lumber. When Jacques Cartier arrived here in 1535, he found an Indian village named Hochelaga. In 1642 the town was founded, in 1758 it was fortified, and in 1779 it contained 1200 houses. It was, however, merely an outpost of Quebec, under both French and British rule, until 1832, when it was made an independent port. Since that time its growth has been very rapid; it had 27,297 inhabitants in 1840, 57,716 in 1852, 90,323 in 1861, 107,225 in 1871, 140,747 in 1881, of whom 103,579 were Roman Catholics, 36,208 Protestants, and 811 Jews.

Montrose′, town of Scotland, county of Forfar, on the South Esk. It has a good harbor, lined with wet and dry docks and handsome quays; its bleaching-works, flax-spinning mills, and manufactures of linens are important, and it carries on some shipbuilding and a considerable trade. Pop. in 1881, 16,280.

Montrose, cap. of Montrose co., Col. (see map of Colorado, ref. 4–B, for location of county), on Denver and Rio Grande R. R., 353 miles S. W. of Denver. Pop. not in census of 1880.

Montrose, on Montrose R. R., cap. of Susquehanna co., Pa. (see map of Pennsylvania, ref. 2–H, for location of county), 8 miles W. of Montrose Station on the Delaware Lackawanna and Western R. R., is the centre of a fine agricultural district. Pop. in 1870, 1463; in 1880, 1722.

Montrose (JAMES GRAHAM), FIRST MARQUIS OF, b. at the family estate of Montrose, Scotland, in 1612; was educated at the University of St. Andrew's; travelled in Italy and France; returned home in 1637, and joined the Covenanters, as it is said, on account of the cold reception Charles I. had given him. In 1639, after a new interview with the king, Montrose left the Covenanters and became one of the king's most zealous partisans. He was created a marquis, and in 1644 he gathered an army of about 5000 men, partly Highlanders, who followed him from hatred to the Campbells, partly Irish mercenaries. With this army he made a most successful campaign, defeated the Covenanters several times with great slaughter, and took several towns, which were given up to plunder and massacre. But on Sept. 13, 1645, he was defeated at Philiphaugh by David Lesley; in July, 1646, he capitulated at Middleton, and soon after left Scotland for the Continent. Having been authorized by Charles I., and afterwards by Charles II., to raise a force and invade Scotland, he travelled from Austria to the Scandinavian kingdoms, busy in the king's interest. In Mar., 1650, he landed at the Orkneys with a small force, but having proceeded as far to the S. as the border of Ross-shire, his army was scattered and he himself taken prisoner, condemned to death as a traitor against the Covenant, and hanged at Edinburgh May 21, 1650.

Montross′, cap. of Westmoreland co., Va. (see map of Virginia, ref. 5–I, for location of county), 52 miles E. S. E. of Fredericksburg. Pop. of dist. in 1870, 1862; in 1880, 2156.

Monts, de (PIERRE DU **Guast**), SIEUR, b. in Saintonge, France, about 1560, of an Italian Catholic family; became a Protestant, and attached himself to the fortunes of Henry IV., by whom he was given a high post in the royal household. He had already made a voyage to Canada with Chauvin when in 1603 the king appointed him director of the Canadian Company, to which he granted, under the name of Acadia, the region between lat. 40° and 46° N. De Monts fitted out a considerable expedition; took Samuel Champlain, Poutrincourt, Biencourt, and Pontgravé as his chief officers; sailed from Havre Mar. 7, 1604; explored the Bay of Fundy; discovered Annapolis harbor and the river St. John, which he ascended; visited the St. Lawrence, and returned to France in October, while his colony established itself at Port Royal (now Annapolis) under Poutrincourt. On his arrival at court De Monts found his monopoly ended; various other grants were made to different individuals, and he failed to obtain indemnification. He despatched a vessel in command of Lescarbot to the relief of Poutrincourt Mar., 1606; despatched Champlain and Pontgravé on a new voyage to the St. Lawrence 1607; sent them other vessels 1608, by the aid of which Quebec was founded. On the death of Henry (1610), De Monts lost favor at court, and d. at Paris in 1611.

Montserrat′, one of the Lesser Antilles, in the West Indies, belonging to Great Britain. Area, 47 sq. miles. Only one-third of it is fertile and under cultivation; sugar, cotton, arrow-root, and tamarinds are produced. Pop. 7645.

Montyon′, de (ANTOINE JEAN BAPTISTE ROBERT AUGET), BARON, b. at Paris Dec. 26, 1733; held different offices in the civil service; emigrated to England during the Revolution; returned in 1816, and d. at Paris Dec. 29, 1820. His large fortune he distributed for philanthropic purposes. The French Academy and the Academy of Sciences give each two annual Montyon prizes.

Monument. See APPENDIX.

Mon′za, town of Northern Italy, province of Milan, situated on the Lambro, about 10 miles N. N. E. of the city of Milan. It is a favorite summer and autumn retreat, and the crown prince and princess of Italy generally pass a part of each year at the royal palace, situated in an extensive and beautiful park, through the midst of which flows the Lambro. Monza, though for a time the royal residence of the great Theodoric, is best known as the capital of the old Lombard kings, and especially as the favored seat of the renowned Theodolinda, who adorned it with magnificent buildings. Very interesting memorials of this queen are still preserved in the cathedral; also the famous Iron Crown, so long used for the coronation of the kings of Lombardy. The mediæval history of Monza is full of interest, and, as well as its modern story, is intimately connected with that of Milan. Pop. 28,012.

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* Yriarte, *Les Princes d'Orléans.*

Moo'die (Susannah), a sister of Agnes Strickland, b. at Brydon Hall, Suffolk, Dec. 6, 1803; removed in 1832, with her husband, Mr. J. W. D. Moodie, to Canada West, where they led a life of much hardship for some years as pioneers. Mrs. Moodie had some fame as a poet in her youth, and afterward produced *Roughing it in the Bush* (1852), *Mark Hurdlestone* (1852), *Life in the Clearings* (1853), *Flora Lindsay, Matrimonial Speculations* (1854), *The Monctons* (1856), etc. D. April, 1885.

Moody (Dwight Lyman), b. in Northfield, Franklin co., Mass., Feb. 5, 1837; received a meagre education; worked on a farm till seventeen, when he became clerk in a boot and shoe store in Boston; joined the Congregational Church soon after, and in 1856 went to Chicago, where he engaged zealously in missionary-work among the poor classes; in less than a year he built up a Sunday school which numbered over 1000 children; was in the service of the Christian Commission during the late civil war, and subsequently became city missionary of the Young Men's Christian Association of Chicago; a church was built for his converts, and he became its unordained pastor; in the Chicago fire of 1871 the church and Mr. Moody's house and furniture, which had been given him, were destroyed; a new church, with sittings for 2500 persons, now stands in the place of the old church. In 1873, accompanied by Ira D. Sankey, Mr. Moody went to Europe, and excited great religious awakenings at Edinburgh, Glasgow, Dublin, London, and other cities of Great Britain; in 1875 they returned to the U. S., and held large meetings in various cities. They afterward made another visit to Great Britain and Ireland for the same purpose with great success, returned to the U. S. in 1884, and continued there in the same work. Among the published works of Mr. Moody are *Arrows and Anecdotes* (1877), *Heaven* (1880), and *Secret Power* (1881). J. B. Bishop.

Moody (Col. James), b. in New Jersey about 1746; was a celebrated leader of a band of Tories during the war of the Revolution; was captured and imprisoned at West Point, but escaped and went to England, where he published in 1783 *Lieut. Moody's Narrative of his Exertions and Sufferings in the Cause of Government since 1776*, reprinted at New York in 1865. He subsequently settled in Nova Scotia, became a colonel of militia, and d. at Sissibon Apr. 3, 1809.

Moody (Joshua), b. in England in 1633; came to Newbury, Mass., in infancy; graduated at Harvard College 1653; began to preach about 1658; became pastor of the church at Portsmouth, N. H., 1671; was involved in quarrels with the government of the colony, and imprisoned, but released on condition of leaving the colony; settled in Boston 1684 as assistant minister of the First church; declined an invitation to become president of Harvard College; published a treatise on *Communion with God* (1685); was dismissed from his church 1692 on account of having opposed the witchcraft trials; removed to Portsmouth, and d. there July 4, 1697.

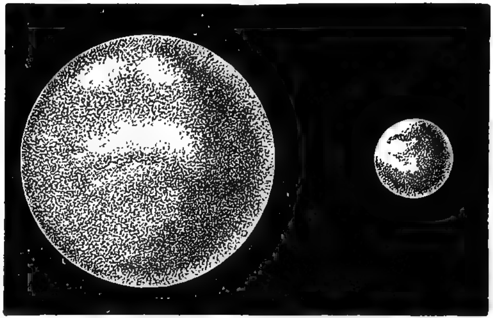
Moody (Samuel), b. at Newbury, Mass., Jan. 4, 1676; graduated at Harvard College 1697; was for many years minister of York, Me.; was chaplain to Sir William Pepperell's expedition against Cape Breton; was a benevolent and useful man, but extremely eccentric, and many curious stories of "Parson Moody" are still current in Maine. D. at York Nov. 13, 1747. He published *The Doleful State of the Damned* (1710) and other religious treatises.

Mooers (Gen. Benjamin), b. at Haverhill, Mass., Apr. 1, 1758; entered the Revolutionary army as an ensign; became lieutenant and adjutant of Hazen's regiment to the close of the war, in which capacity he kept an *Order Book*, printed in 1876; was present at the surrenders both of Burgoyne and of Cornwallis; settled in 1783 near Plattsburg, N. Y., then a wilderness; was many years in the State legislature; discharged numerous county offices; became major-general of militia, and commanded at the battle of Plattsburg, Sept. 11, 1814. D. at Plattsburg Feb. 20, 1838.

Moon [Sax. *mona*], the conspicuous luminary of the night. The moon is one of a class, or rather description, of secondary planets which respectively revolve about some of the (primary) planets of the solar system, while both the primary and its secondaries together revolve about the sun. "Satellites" is the common term to designate all these (Lat. *satelles*, an "attendant" or "dependant").

Comparative Size of the Moon and the Earth.—The moon is much smaller than the earth, her diameter being 0.2729 (between one-third and one-fourth) of that of the earth; or if the earth be, in like manner, compared with the moon, we shall find that the diameter of the earth is a little more than 3.66 the diameter of the moon. Hence, the surface of the earth must be somewhat more than 13.4 that of the moon, and the volume of the earth be fully forty-nine times that of the moon. The moon's mean or average distance from the earth is something more than 30 diameters or 60 radii of the earth's equator. The relative size of the two bodies is exhibited in the annexed diagram. The mean distance of the one from the other, on the same scale, would be represented by very nearly 4 feet 11 inches, English or American. Some of the dimensions here alluded to, as well as others, stated in English miles are very nearly as follows, the diameter being corrected for its "exaggeration," due to irradiation: diameter, 2159 miles; mean distance, 239,000 miles. But the eccentricity of the moon's orbit being 0.0549, the moon's greatest distance from the earth nearly equals 252,000 miles, and its least distance is somewhat less than 226,000 miles.

Fig. 1.



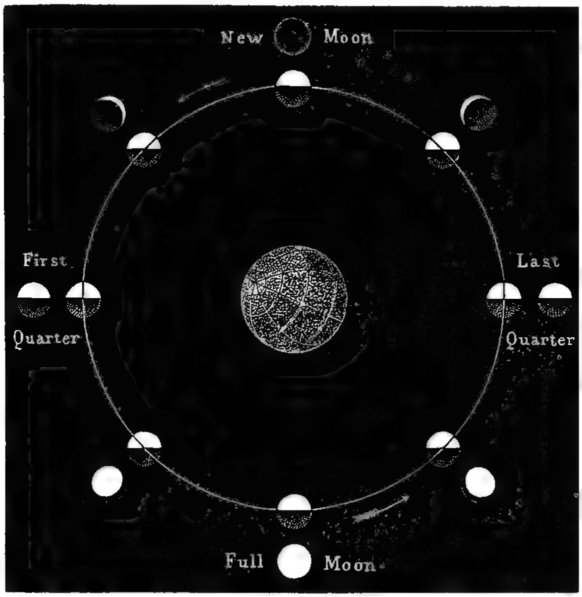
Comparative dimensions of the earth and the moon.

Mass and Density of the Moon, and Intensity of Gravity at her Surface.—The *volume* of the moon—as appears from what has been already stated—is scarcely $\frac{1}{49}$th of that of the earth, and her *mass* is less than that, being about $\frac{1}{81}$st of that of the earth. From this it is at once apparent that the mean *density* of the moon must be less than that of the earth, or she must be made of a lighter material. Accurately stated, her density, that of the earth being 1, is 0.55654, which is just about 3.27 that of water. Such being the case, gravity at the surface of the moon is but one-sixth as great as gravity at the surface of the earth, notwithstanding the advantage which is found at the surface of the smaller body in consequence of its being so much nearer to its own centre, the attractive force outside varying inversely as the square of the distance from such centre. With gravity only one-sixth as great, a heavy body will descend scarcely more than 2 feet 8 inches in the first second of the time of its fall; and one who could jump but 3 feet high would, with a similar application of force on the moon (if attainable), jump 18 feet high, and be 6 times as long in coming down as (but for the resistance of our atmosphere) he would be in coming to the earth in such a fall here.

Baron Humboldt remarks that "the moon is strikingly large in proportion to the diameter of its primary planet. This proportion is $\frac{1}{3.7}$; whereas the largest of the satellites of Saturn (the sixth, Titan) is probably only $\frac{1}{15.5}$, and the largest of Jupiter's satellites (the third) $\frac{1}{25.8}$ of their respective primaries." (*Cosmos*, Mrs. Sabine's translation, vol. iii. part ii., p. 340.)

Form of the Moon.—Why the Moon shines.—Phases of the Moon.—Were the moon a smooth globe, or were even any considerable portion of its surface covered with a liquid, then under certain circumstances we might see a brilliant image of the sun, as we do in a convex mirror. But instead of being like a globe of polished metal, the appearance of the moon in a good telescope, when the amplifying power is not too great, is that of the roughened surface of enchased silver, which thus presents small surfaces for reflection in a vast variety of directions, and thus renders the light that falls upon them from the sun more or less visible on whatever part the sun may shine. All this in itself shows the moon to be *rough*, apart from other and more striking evidence. A rough globe, or that which is nearly a globe, will present the same *phases* with those which the moon actually exhibits. The sun being supposed to shine in the direction downward, as represented in the annexed diagram, it will be seen that the moon as represented at the top will have its illuminated portion wholly turned away from the earth, and will ordinarily be nowhere traced in the sky, being dark, like the *new moon* in the figure. But with the moon on the opposite side, nearly all the enlightened portion will be turned toward us, and we have the *full moon*. When in the position represented at the extreme left of the diagram, the *right-hand* half of the moon will appear luminous, as in the *first quarter*. In the opposite position it will be the *left-hand* portion that will shine, as in the *last quarter;* the circle of the lunar globe which divides the light from the dark part being seen on its edge in both cases, and so would appear as a *straight* edge if the moon were smooth. A careful attention to the representations of the other positions here exhibited will moreover make it plain that a sufficiently rough globe, or approximation to a globe, like the moon, will present the various *phases* represented in the diagram in their appropriate positions; the globular form and roughed surface being by these very circumstances clearly made out.

FIG. 2.

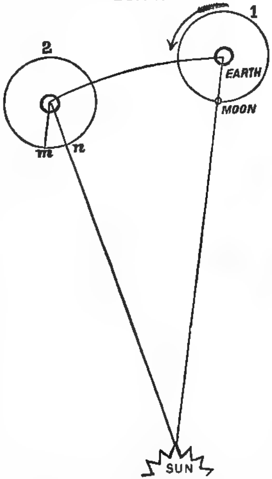


Orbit of the moon, showing the lunar phases.

Sidereal and Synodical Revolutions of the Moon.—Let the positions of the sun, the moon, and the earth, respectively, be those represented and marked in the figure. Then if the earth were stationary as respects a revolution around the sun, the moon, having left the position here shown, and revolved around, will just have completed an entire revolution, when it returns to its first position. Such a complete revolution is termed a *sidereal* revolution, the distinguishing term being derived from the Latin *sidus*, a "star," for it would also mark very accurately the time elapsed from the date when the heavenly body was opposite to any star until it returned opposite to the same star again. But now, if the moon, thus circumstanced, while it is revolving as already described, move also with its central body, the earth, to 2, the position on the left, then, when in the position immediately *beneath* that central body, like that marked *moon* at position 1, it will not yet be, as before, in line with the *sun* in the middle, but must revolve a considerable distance farther (from *m* to *n*) to come into the direction of the *sun;* as was the case at first. Now this, which thus represents a complete revolution of the moon from sun to sun again, is styled the *synodical* revolution of the moon; and the same term is applied in the case of other satellites and of planets, etc., the appellation being derived from two Greek words—*συν*, "together," and ὁδός, "pathway." And as it is the position with respect to the *sun* that, as already shown, determines the *phases* of the moon, the series of the various phases or "changes" will be completed in a *synodical* revolution, which is hence denominated a *lunation* or lunar month. The respective lengths of the sidereal and the synodical revolutions are very nearly as follows, that of the synodical being the mean or average length:

Sidereal revolution..............	27*d*.	7*h*.	43*m*.	+.
Synodical revolution..........	29	12	44	+.

FIG. 3.



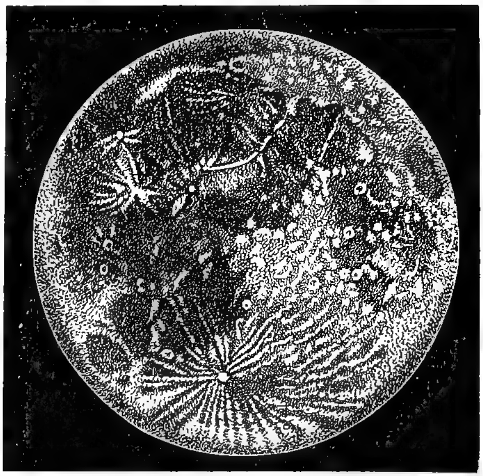
Sidereal and synodical revolutions of the moon.

Now, as we have thus a sidereal revolution (from star to star) and a synodical revolution (from sun to sun or other apparently moving body), so on a smaller scale of rotation of the moon or other heavenly body, or of the earth on its *own axis*, we have a *sidereal day* (from a star to the same again), and a *solar* day (from sun to sun), the latter, as in the other case, *longer* than the former.

Bright and Dark Spots on the Surface of the Moon.—Lunar Mountains.—The moon, even at the time of full moon, is far from appearing everywhere equally bright. Dark spots are readily discernible even by the bare eye. The most simple explanation of this is, that some portions of the moon reflect light less copiously than do others. The general appearance of the spotted surface at the time of full moon is shown in the annexed engraving. At this very time scarcely any *shadows* are discernible. For the sun then, as we may say, looks upon the moon very nearly in the same direction in which we view the moon ourselves; so that what is hidden from him (*i. e.* is in shade) is concealed from us. The appearance of the dark portion is, in its conformation as well as its extent in latitude and longitude, not wholly unlike our eastern hemisphere, as was pointed out by the author of this article to the American Association for the Advancement of Science at their meeting in 1852. An examination of the dark spots on the right-hand side of the figure will enable one to trace a rude resemblance to a short, thick-set human figure, with an inordinately large head covered with a species of helmet—"the man in the moon." Baron Humboldt remarks that "the spots on the moon, in which Western nations thought they could make out a face, represent, in the view of the Indians, a roebuck or a hare; hence, the Sanskrit names of the moon 'roe-bearer' (*mrigadhara*) or 'hare-bearer' (*sa'sabhrit*)." (*Cosmos*, vol. iii. pt. ii., note 565.)

Why the Moon always presents nearly the same Face to the Earth.—Some have hastily supposed and confidently asserted that this was because the moon had no rotation about an axis of her own. But a very simple illustration will readily show that such a supposition will entirely fail to account for the phenomenon in question. Let a person be seated in the middle of a room, while another walks around him, the latter facing always in the same general direction—say, for example, toward the north. Such being the arrangement, when the traveller around the room has arrived at the middle of the northern side of the apartment, then, always looking north, he will have his *back* turned to the man remaining immovable at the centre. But when in the course of his march the man moving around the other, but still looking north, has arrived at the middle of the west side of the apartment, he will present the *right side of his*

FIG. 4.



The full moon.

face in profile to the man at the centre; at the middle of the south side the *full face* of the moving man will be directed to his friend at the centre; at the middle of the east side of the apartment it will be the *left side* of the face that will be shown *in profile* to the man at the centre; and at the middle of the north side the *back* of the moving man will be turned as before. The case here realized will be that of a body *revolving* about another, but having no rotation about an axis of its own. *All sides* of the *non-rotating* body will in their turn be visible to the spectator situated in the position of the central body. But this is precisely the reverse of what happens in the case of the moon, our satellite confessedly presenting always nearly the *same face* to the earth. A little variation of these conditions would make the comparison more accurate. The central body and the non-rotating but revolving body should both be borne along together around a more distant centre, as though both the men in the case supposed had been smoothly carried along in some sailing vessel moving in a larger curve. But this latter circumstance would not interfere with the result. All sides of the non-rotating body would, in the end, have been visible from the central position. It is plain, then, that the phenomenon in question is not to be explained by the hypothesis that the moon has *no* rotation upon an axis of her own.

Next let the case be considered in which the revolving body has the *same* face constantly *kept* turned toward the central body. Such will be the case if the two bodies be fastened together by a wellnigh inflexible rod, as in the instance of the two balls of a dumb-bell. When one of these is revolved around the other, the revolving ball will have every side very nearly presented *just once* in *every direction* around the whole circuit of the sky—*i. e.* the revolving body will be turned just *once* around its own axis in the *same time* in which it *completes its revolution* around the central body. Now, let the connecting bar be *removed*, and the revolving body itself *rotate once* in *the selfsame time* as before, and the same effect will be produced—viz. of keeping nearly *the same side* of the revolving body *turned toward the central body.* This, with the superadded condition that both bodies are *together* borne around the sun, is then the case of the moon with one side constantly turned nearly toward us. Our limits will not permit a more particular analysis of the phenomenon.

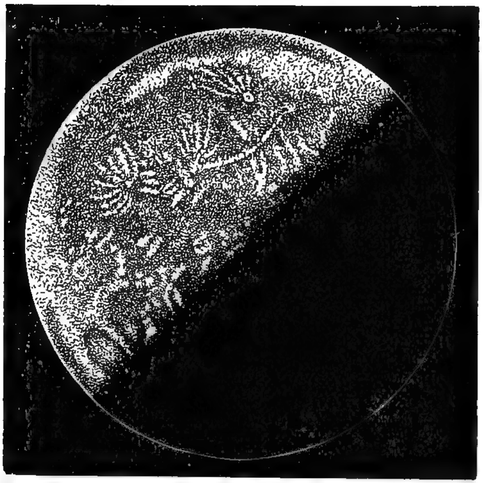
The Moon's Librations.—If the *rotation* about the moon's axis and her revolution in her orbit were both *uniform* motions, and so that the one always *kept pace* with the other, then as regards the eastern and the western edges of the moon they would always remain the same, the middle of the face turned toward us being continually the same. But as the moon sometimes revolves *faster* in her orbit than at other times, the *uniform* eastern motion around her axis will then *fail* to *keep pace* with the motion of revolution, and thus somewhat *less* of the *eastern* side be seen than usual, or *more* of the *western* side; and when the movement of revolution is too slow, then more of the eastern side. The moon, then, from time to time will seem to have oscillated, in these respects, like the beam of a balance; and this is termed the *libration* in *longitude.* Then, as the moon, in her inclined orbit, is sometimes seen to the *south* of our own orbit around the sun (viz. the ecliptic), we then look *over and beyond* the N. pole of the moon, as the sun looks over and beyond the N. pole of the earth in our northern summer. And when the moon is seen to the *north* of the ecliptic, we look over and beyond the S. pole of the moon. All this takes place with the axis of rotation of the moon nearly perpendicular to the plane of the ecliptic itself. The moon thus seems to have a balancing motion alternately toward the S. and toward the N.; and this is the *libration* in *latitude.* Lastly, when the moon is not actually in the zenith, we, standing upon the earth instead of at its centre, have our *central point of view* of the moon's disk *higher up* than it would be if we could look from the centre of the earth. And so we look *over* and *beyond* what would be the upper edge as seen from the earth's centre; and as this effect has its varieties repeated every day, or rather a little longer space of time, we have in all this a third description of libration, styled the *diurnal libration.* Here, as before, our limits will not permit a more particular analysis of the phenomena.

Portions of the Moon's Surface brought into view by the various Librations.—According to M. Arago, these enable us to see altogether $\frac{57}{100}$ths of the moon's surface. But the parts thus brought into view are very much foreshortened by being seen so near to the edge of the disk. Of course, $\frac{43}{100}$ of the surface remain always invisible.

Length of the Moon's Sidereal Day, and also of her Solar Day.—As the moon's rotation about her axis nearly keeps pace with, and is the end completed in, the same time with her revolution around the earth (but on a smaller scale), her sidereal day is thus more than 27 days long. And as her solar day will be determined by similar changes to those which gave us the *phases* of the moon, as heretofore, but on a smaller scale, the *solar* day will last a whole lunation, or lunar month of more than 29 days. Then, as there is but little variety in the duration of daylight, the moon's axis being nearly perpendicular to the plane of the ecliptic, instead of being considerably inclined, as is true of the earth's axis, the duration of daylight is almost everywhere nearly for a fortnight, and the (dark) night for a like interval of time.

Has the Moon any Liquid on her Surface? or has she any Atmosphere?—Both of these questions seem to be answered in the negative by the absence of the appropriate phenomena. Were there large collections of liquid there, the outline of light and shade (the boundary or limit between day and night, called the terminator) would at the quarters appear as a straight line, as has heretofore been intimated. But, on the contrary, the terminator is visibly somewhat ragged in its outline, even in the case of the large dark spots, which were anciently supposed to be seas, and were so named; which names are still continued. The light from these, moreover, is polarized in a way that would be true of a rough surface of a solid. These great plateaus, however, appear as if they had been formed by the cooling of what was heretofore liquid. Some of them appear, at times at least, of a greenish-gray tint, which is deeper where the sun is lower. If the moon have any atmosphere, it must be very rare, as scarcely anything like the refraction or absorption of light can ordinarily be discerned when the moon occults a star. (See OCCULTATION.) And nothing like clouds can be asserted to have been seen. The steep mountains, of which there are many, shine in the morning light at sunrise with a surpassing brilliancy; the early morning to them has the brightness of noon. E. Neisson, Esq., has recently supposed that he found traces of a lunar atmosphere having a density $\frac{1}{400}$th of that of the earth. "If then," says Baron Humboldt, "the moon is without any gaseous envelope, the entire absence of any diffused light must cause the heavenly bodies, as seen from thence, to be projected against a sky *almost black* in the daytime. No undulation of air can there convey sound, song, or speech. The moon, to our imagination, which loves to soar into regions inaccessible to full research, is a desert where silence remains unbroken." (*Cosmos*, vol. iii. part ii., p. 358.)

FIG. 5.



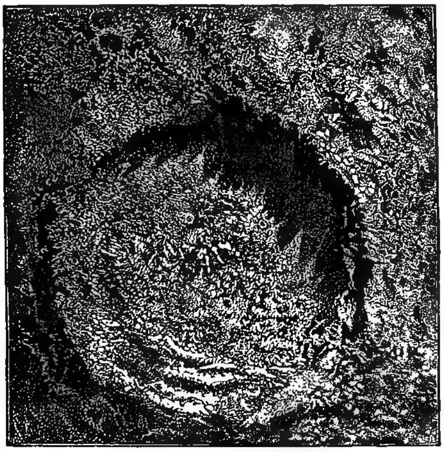
Last quarter of the moon.

Lunar Mountains.—The existence of these is not a matter of mere conjecture. The rays of the rising sun tip their tops as with silver as he looks upon their elevated summits before he enlightens the regions below; and so they appear like islands in the yet dark portions, as is seen in the engraving, Fig. 5, of the moon in her last quarter. And when the lower portions of the mountains also become enlightened before the surrounding regions, the whole slant-height portion of the mountain is projected, so as to intrude upon those dark regions and present an exaggerated roughness. Then, the shadows of both elevated and of inordinately depressed portions have all the characteristics, at all hours of the lunar day, that they ought to have.

In the engraving that follows we have a representation of the huge "crater" Copernicus as it appeared when modelled in accordance with accurate measurements, and then photographed—all by Mr. Nasmyth.

Special Form of the Lunar Mountains.—This is specifically that of the crater (and its surroundings) of an enormous volcano. The features are altogether those which might be due to volcanic action. And in the case of the moon the effects of such an action could hardly have been other than enormous, the force being supposed the same as on the earth. For gravity, as heretofore stated, is six times as feeble at the surface of the moon as it is here, the mean density of the material there is not very much more than one-half as great, and there is almost no atmosphere to resist. "In Lord Rosse's magnificent reflector the flat bottom of the crater called Albategnius is seen to be strewed with blocks, not visible in inferior telescopes, while the exterior ridge of another (Aristyllus) is all hatched over with deep gullies radiating towards its centre." (Chambers's *Descriptive Astronomy*, p. 77.) The height of these mountains is altogether disproportionate to the size of so small a globe as the moon. Thus, Dörfel and Leibnitz, according to Mädler, are 24,300 English feet in height; Newton, "where a part of the deep excavation is never shone upon, either by the light of the sun or that of the earth," 22,822 English feet; and the same is the height of Casatus, E. of Newton. Mountains on the earth, in the same ratio to its diameter, would be not far from eighteen miles high. Then, as to their extent otherwise, Galileo was reminded by them of the configuration of entire countries surrounded by mountains. Some of them have diameters of from 100 to 120 English miles.

FIG. 6.



View of Copernicus.

Heat of the Moon.—The heat of the moon's surface, exposed for more than a fortnight to a bright sun in a cloudless sky, must be very considerable. Sir John Herschel estimates that it may possibly exceed that of boiling water. The radiation of heat received from its surface has been measured by a delicate thermo-electric pile.

Is the Moon habitable—that is, the visible portion of it?—Neither vegetable nor animal life, such as that with which we are acquainted, could, as it would seem, exist where not only such vicissitudes of temperature are to be found, but where there is neither atmosphere nor liquid. But as there is some reason to suppose that the invisible portion of the moon may be *lower* than the part which we see, it has been concluded that liquids and a gaseous envelope may have both run to the lower level on that side.

Does the Moon influence the Weather?—This might seem somewhat like a question whether the moon, conspicuous as her influence on the tide is, does not also influence the mighty currents of the ocean, in which the tide, unless when crowded into narrow channels, etc., is but as a ripple. The influence of the moon upon the weather seems to be but slight, and after careful investigation hardly to be distinguished; unless it be, indeed, that the low heat radiated from the moon may have some influence in the absorption of vapor, giving the clouds a tendency to disappear at the time of full moon. (See Sir J. Herschel's *Outlines of Astronomy*, 11th ed., art. 432.)

The Harvest Moon.—The moon every month rises successively after comparatively short intervals of time when in that part of her orbit which is least inclined to our horizon. This, in September, is about the time of *full moon*, and the same is measurably the case in August. The full moon thus favored is styled the "harvest moon."

Are any Changes of the Moon's Surface now taking place?—Something of the kind has been more than suspected in the instance of the spot Linné. If real, the changes would seem to be accounted for in the most simple way by the falling in of the sides of the deep crater there. To suppose, as has been supposed, that a viscous material may have exuded from the interior, involves a twofold hypothesis, difficult to establish.

Earth-Light.—An examination of the diagram of the phases will show that when the moon is a new or nearly new moon to us, the earth is occupying the place of a very large full moon, or nearly so, to the moon. The light reflected from the earth, made ruddy by passing three times through the earth's atmosphere, shows us what is termed the old moon in the arms of the new, by making the part of the moon visible which is not then in sunshine.

Changes in the Moon in Ancient Times.—The moon not only seems to exhibit traces of some changes such as geology has made out as having occurred on the earth, but also, as insisted upon by the author of this article at the meeting of the American National Academy some years ago, of a change *subsequent* to any such as geology makes known, the surface having very extensively cracked open, and the fissures partly filled up; while a white material would seem to have exuded, which now forms the tops of the highest mountains. Other strata are thus cut through. Something like this view, entertained in a modified way by others, seems to be gaining credit. S. ALEXANDER.

Moon'stone, a variety of adularia, or transparent potash-feldspar (*orthoclase*), so called because when polished it presents an opalescent appearance due to its internal chatoyant or pearly reflections. A variety of oligoclase occasionally presents a similar appearance. (See FELDSPAR and ORTHOCLASE.) E. C. H. DAY.

Moorashki'no, a v. of Russia, government of Nizhnee-Novgorod, has extensive tanneries, and is celebrated for its leather and dyed lambskins. Pop. 6500.

Moor'croft (WILLIAM), b. in Lancashire, England, about 1780; was engaged in surgical studies at Liverpool when his attention was directed to an epizootic disease which had attacked the horses, and giving the subject his entire attention, he studied in Paris and became one of the earliest veterinary surgeons in England. In 1795 he published a pamphlet of directions for the medical treatment of horses, with special reference to India, and in 1808 he went to India as superintendent of the East India Company's stud in Bengal, and being of an adventurous disposition made two daring journeys to Balkh and Bokhara in Central Asia in the disguise of a Hindoo pilgrim (1812 and 1819). He was one of the earliest explorers of the Himalayas and the lakes, rivers, and valleys of Chinese Tartary. Especially his second journey promised to be of great importance. He reached Lahore on May 6, 1820, and Leh, the capital of Ladak, on Sept. 24, same year. Pushing onward, he reached Kashmir on Nov. 3, 1822, Cabool on June 20, 1824, and Bokhara on Feb. 25, 1825. He carried with him a considerable amount of English merchandise, and everywhere he bought horses for the company and tried to establish trade relations. With the government of Ladak he concluded a commercial treaty which virtually opened the whole of Central Asia to English commerce. Of almost equal importance were his numerous geographical discoveries, and his journey seemed to be a great success, when, on his return, he was seized at Andkhui, between Bokhara and Cabool, with malignant fever, and d. Aug. 27, 1825. His papers were recovered by Alexander Burns, and his *Travels* were edited by Prof. H. H. Wilson in 1841. Though published so long after they had been written, they proved valuable and interesting contributions to a knowledge of Central Asia.

Moore (ALFRED), b. in Brunswick co., N. C., May 21, 1755; was educated in Boston; served in the Revolutionary war with much credit; was chosen attorney-general of North Carolina in 1790, and, though he had never read law, he soon mastered its principles; became a judge in 1798, and was, 1799–1805, an associate justice of the U. S. Supreme Court. D. at Belfont, N. C., Oct. 15, 1810.

Moore (ANDREW), b. in South Carolina; became a lawyer of Perry co., Ala.; was often in the legislature, and was Speaker 1843–45: was a judge in a State circuit court 1851–57; governor of Alabama 1857–61; called the convention which passed the ordinance of secession, and also sent troops to seize the U. S. forts at Pensacola.

Moore (BENJAMIN), D. D., b. at Newtown, L. I., Oct. 16, 1748; graduated in 1768 at King's College, N. Y.; took holy orders in 1774 in England; was assistant minister of Trinity church, N. Y., 1774–1800; became rector in 1800; Protestant Episcopal bishop of New York 1801; was professor of logic and rhetoric in Columbia College, and its president 1800–11. D. at Greenwich, N. Y., Feb. 27, 1816.

Moore (CHARLES WHITLOCK), b. at Boston, Mass., Mar.

29, 1801; became connected in 1822 with the Masonic order, in which he attained the highest degrees; was for thirty-four years recording secretary of the grand lodge of Massachusetts; edited the *Masonic Mirror* 1825, the *Amaranth* 1828, and commenced in 1841 the publication of the *Freemason's Monthly Magazine*, which he afterward conducted; founded *Zion's Herald* in 1823, and published several Masonic manuals.

Moore (Clement Clarke), LL.D., son of Bishop Benjamin Moore, b. at New York July 15, 1779; graduated at Columbia College in 1798; in 1821 became professor of biblical learning in the Protestant Episcopal Seminary; afterward professor of Hebrew and Greek, and then of Oriental and Greek literature. Author of a Hebrew and Greek lexicon (1809), a volume of poems (1844), *George Castriot, surnamed Scanderbeg, King of Albania* (1850), and of the well-known ballad called *The Visit from St. Nicholas*, and beginning: "'Twas the night before Christmas, when all through the house," etc. He also edited a collection of his father's sermons (1824, 2 vols.) and was a contributor to Philadelphia and New York newspapers. D. at Newport, R. I., July 10, 1863.

Moore (David), D. D., b. in Westmoreland, England, Mar. 28, 1822; came to the U. S. in 1834; was educated at Clarkson and Albion academies, N. Y., and for seven years under eminent private instructors; ordained a Baptist minister June, 1852; pastor of Gaines and Murray Baptist church, N. Y., 1852–55; of Le Roy Baptist church 1855–60; of Washington street Baptist church, Buffalo, N. Y., 1860–64; of Washington avenue Baptist church, Brooklyn, 1864–76. In consequence of ill-health he removed in Oct., 1876, to Geneva, N. Y., where he became pastor. He received the degree of D. D. from Rochester University in 1866.

Moore (Edward), b. at Abingdon, Berkshire, England, Mar. 22, 1712, was a poet and dramatic writer, the son of a dissenting minister, and was brought up as a linendraper in London, but abandoned that business and engaged in literary pursuits. He published *Fables for the Female Sex* (1744), *The Trial of Selim*, the unsuccessful comedies of *The Foundling* (1748) and *Gil Blas* (1751), and the very successful tragedy *The Gamester* (1753; often reprinted). A collected edition of his *Poems, Fables, and Plays* was published in 1756, and his *Dramatic Works* appeared in 1788. He became the editor of a paper called *The World*, in which he was assisted by Lords Lyttelton and Chesterfield and other able writers. D. Feb. 28, 1757.

Moore (Edwin Ward), b. at Alexandria, Va., in 1811; entered the navy as midshipman in 1825; had become first lieutenant in 1836, when he was engaged by the government of Texas to organize a squadron for that republic, and succeeded in fitting out at New Orleans two small vessels of war, with which he defeated and dispersed the Mexican fleet of eight vessels, including two steamers, in a series of engagements in the Bay of Campêche 1843. Notwithstanding his gallantry, Com. Moore was dismissed the service by Pres. Houston for disobedience to orders, but the Texan congress indemnified him for pecuniary losses and granted him a large tract of land. He subsequently resided many years in New York City, engaged in mechanical inventions, and d. there Oct. 5, 1865.

Moore (Erasmus Darwin), b. at Winsted, Conn., Sept. 30, 1802; studied theology at New Haven 1830–33; held Congregational pastorates at Natick, Mass., 1833–38, at Barre, Mass., 1840–42; edited the *Boston Recorder* 1844–46, the *Boston Reporter* 1846–49, the *Congregationalist* 1849–51; edited also the *Old Colony and Massachusetts Bay Record*, published by the State; took a position in the Boston custom-house 1861. Author of *Life-Scenes in Mission Fields* (1857) and other works.

Moore (Frank), b. at Concord, N. H., Dec. 17, 1828, a son of Jacob Bailey Moore; published *Songs and Ballads of the American Revolution* (1856), *Cyclopædia of American Eloquence* (1857), *The Rebellion Record* (11 vols., 8vo, 1862–68), and other volumes, mostly containing matter designed as materials for future history; was for a time secretary of legation at Paris.

Moore (Gabriel), b. in Stokes co., N. C.; was M. C. from Alabama 1822–29; governor of Alabama 1829–31; U. S. Senator 1831–37. D. in 1844 at Caddo, Tex.

Moore (George H.), LL.D., b. at Concord, N. H., Apr. 20, 1823; graduated at New York University 1843; assistant librarian of the New York Historical Society 1841–49; became librarian in 1849. Author of *Treason of Charles Lee* (1860), *Employment of Negroes in the Revolutionary Army* (1862), *History of Slavery in Massachusetts* (1866), *History of the Jurisprudence of New York*, etc. He is a son of Jacob Bailey Moore, the historian, and became librarian of the Lenox Library.

Moore (Sir Henry), Bart., b. in Jamaica in 1713; became governor of Jamaica in 1756; received a baronetcy for suppressing a slave insurrection; was governor of New York 1764–69.

Moore (Henry), b. in Dublin, Ireland, in 1751; joined the Methodists in 1799; preached as a revivalist several years in Ireland; became the confidential associate of John Wesley during his later years, and published a *Life of John and Charles Wesley, and Memoirs of their Family* (1824). He was the last survivor of the ministers ordained by Wesley. D. in 1843.

Moore (Henry Eaton), son of Dr. J. B. Moore, b. at Andover, N. H., July 21, 1803; was apprenticed as a printer to his brother, the eminent antiquarian writer; edited a newspaper at Plymouth, N. H., 1825–26; became a teacher of, and an adept in, musical science; published a *Musical Catechism*, the *Merrimack Collection of Instrumental Music*, the *New Hampshire Collection of Church Music*, the *Northern Harp*, and other popular collections. D. at E. Cambridge, Mass., Oct. 23, 1841.—His brother, John Weeks Moore, b. at Andover Apr. 11, 1807, also became a printer; edited the Bellows Falls *Gazette* for several years; published *A Complete Encyclopædia of Music* (1854) and other works on the subject.

Moore (Jacob Bailey, Jr.), b. at Andover, N. H., Oct. 31, 1797, was the son of Dr. J. B. Moore, U. S. army (1772–1813), a musical composer and song-writer, and brother of Henry Eaton Moore and of John Weeks Moore (b. Apr. 11, 1807), both authors and musical writers of distinction. Mr. J. B. Moore became a partner and brother-in-law of Hon. Isaac Hill; was long a printer and journalist of New Hampshire; librarian of the New York Historical Society 1845–48; postmaster of San Francisco, Cal., 1848–52; was one of the editors of the *Historical Collections of New Hampshire* (1822–24), author of *Memoirs of American Governors* (1846), *Gazetteer of New Hampshire*, and valuable works of local history. D. Sept. 1, 1853.

Moore (Jesse Haile), b. near Lebanon, St. Clair co., Ill., Apr. 22, 1817; graduated at McKendree College Aug., 1842; was teacher two years at Nashville, Ill., when he was appointed principal of Georgetown Seminary; licensed to preach in 1846, he accepted in 1848 the pastorate of the M. E. church at Shelbyville; was principal of Paris Seminary 1848–54, and president of Quincy College 1854–56; then for two years in charge of the M. E. church at Carlinsville. At the outbreak of the war he was located at Decatur. Resigning his charge in 1862, he raised the 115th Illinois Vols., which he commanded at Chickamauga, Tunnel Hill, Resaca, etc., at Franklin, Nashville, and subsequent pursuit of Hood, part of the time in command of a brigade; brevet brigadier-general 1865; was presiding elder of Decatur district, Illinois conference, in 1868, when he was elected to Congress; re-elected in 1870. Became U. S. consul at Callao 1881. D. July, 1883.

Moore (John), M. D., b. at Stirling, Scotland, in 1730; studied medicine and surgery at Glasgow, London, Paris, and in Holland; was for a time physician to the British embassy in Paris; spent five years in travels as medical attendant of the duke of Hamilton; settled at London 1778; published in 1779 and 1781 his travels on the Continent, which passed through seven editions, and in 1789 a very successful novel, *Zeluco*, the work by which he is best remembered. Dr. Moore was a witness of some of the atrocities of the French Revolution during a residence at Paris in 1792, wrote two works upon that subject, and two other novels, which were much less successful than *Zeluco*. He edited Smollett's works, with a life of the author (1797), and d. at Richmond, Surrey, Feb. 20, 1802. Dr. Moore was an early friend of Burns, and was father of Sir John Moore, killed at Corunna. A uniform edition of his *Works* was published by Robert Anderson, with a prefatory memore (7 vols., 1820).

Moore (Sir John), K. B., son of John Moore, M. D., b. at Glasgow, Scotland, Nov. 13, 1761; entered the army in 1776; served in the Mediterranean, in America, and the West Indies, and sat in Parliament for a time; was governor of St. Lucia 1796–97; served in Ireland 1798; was badly wounded in the Netherlands 1799; served in Egypt, and became major-general and K. B. 1801; served afterwards in Sweden (1808) as envoy and commander of the British contingent; took (Oct. 6, 1808) chief command of the British troops in the Peninsula, numbering 23,000, managing the campaign against Napoleon with consummate skill and boldness; but the failure of the Spanish to co-operate with him compelled him to fall back upon Corunna. He conducted the retreat with masterly skill. He was killed at the battle of Corunna by a cannon-shot, Jan. 16, 1809. This battle was an extremely spirited one, and the victory was claimed by both sides. The British troops at once took ship for England, and the town was evacuated. *The Burial of Sir John Moore*, by the Rev. Charles Wolfe, has immortalized both its subject and its author.

Moore (Joseph), b. in Virginia in 1767; was a pioneer of Methodism in Virginia and North and South Carolina; was sixty-five years in the ministry, and at his death (Feb. 14, 1851) was a venerated patriarch of the South Carolina conference of the M. E. Church, South. T. O. Summers.

Moore (Martin), b. at Sterling, Mass., Apr. 22, 1790; graduated at Brown University 1810; was for thirty years Congregational pastor at Natick, and afterwards at Cohasset; edited the Boston *Recorder* twenty years; was author of a *History of Natick* (1817) and a *Life of John Eliot*, and vice-president of the New England Genealogical Society 1861–66. D. at Cambridge Mar. 12, 1866.

Moore (Nathaniel F.), LL.D., a nephew of Bishop Benjamin Moore, b. at Newtown, L. I., Dec. 25, 1782; graduated at Columbia College 1802; was admitted to the bar 1805; became in 1817 adjunct professor, and in 1835 professor of Latin and Greek in Columbia College; was its librarian 1837–42, and its president 1842–49; was author of *Lectures on the Greek Language and Literature* (1835), *Ancient Mineralogy* (1834), an *Historical Sketch of Columbia College* (1846), and other writings. D. 1872.

Moore (Richard Channing), D. D., b. in New York Aug. 21, 1762; was educated at King's College, N. Y.; went to sea; became a physician; took orders in the Protestant Episcopal Church 1787; was pastor at Rye, N. Y.; for twenty years rector of St. Andrew's, Staten Island; rector of St. Stephen's, N. Y., 1809–14; consecrated bishop of Virginia 1814. D. at Lynchburg, Va., Nov. 11, 1841. (See *Memoir*, by J. P. K. Henshaw.)

Moore (Thomas), b. at Dublin, Ireland, May 28, 1779, of Roman Catholic parents; was in youth distinguished for his skill in lyric poetry; studied at the Dublin University and at the Middle Temple, London. His first volume of poems, the *Anacreon* (1800), was a success; the *Poetical Works of Thomas Little* (1801) was vastly more popular, though disgraced by a vein of licentiousness which Moore lived to regret. He was in the civil service in the Bermudas 1803–04; made the tour of the U. S. and Canada; married in 1811 Bessy Dyke, an actress and a woman of admirable character. For many years his principal writings were political satires in the Whig interest, full of wit and of general interest in their own day, but of small value now, and often disgraced by the repetition of scandalous stories and innuendoes regarding the private affairs of his adversaries. His subsequent works of permanent value are the *Irish Melodies* (1807), *Lalla Rookh* (1817), *Loves of the Angels* (1823), *Life of Sheridan* (1825), *The Epicurean*, a romance (1827), *Life of Byron* (1830), and the *History of Ireland* (1827–35). Moore as a song-writer and anacreontic and erotic poet is without a single rival in the English language. His muse, as he advanced in life, flew in a purer and serener air than in his youth. For choice diction, thorough finish, wit, and melody few poets can compare with him, yet his topics are never of the highest. His thoughts are seldom grand. His sentiments are usually generous, rather than noble or exalted. Moore had brilliant powers in conversation, was a talented singer, and often sang his own compositions in society. Late in life his mental powers declined. D. Feb. 25, 1852.

Moore (William), a merchant of Philadelphia, was president of the executive council and *ex-officio* governor of Pennsylvania 1781–82; his daughter Elizabeth became Marchioness de Marbois.

Moore (Zephaniah Swift), D. D., b. in Palmer, Mass., Nov. 20, 1770; graduated at Dartmouth College in 1793; became pastor of the Congregational church in Leicester, Mass., in 1800, and in 1811 professor of languages in Dartmouth College; in 1815 was president of Williams College, and in 1821 of Amherst College. He took a special interest in the natural sciences. Overwhelmed by the cares, labors, and conflicts attending the new institution, he d. in the second year of his presidency. (See Sprague's *Annals of the American Pulpit*, vol. ii. p. 393, and *History of Amherst College*, by the writer of this sketch, p. 91.) W. S. Tyler.

Moorefield, cap. of Hardy co., West Va. (see map of West Virginia, ref. 4–F, for location of county), on the S. branch of the Potomac River, has 2 high schools and some manufactures. Pop. in 1880, 554.

Moorestown, N. J. See Appendix.

Moor-Fowl, incorrectly called **Red Grouse**, a ptarmigan of the British Islands (*Lagopus Scoticus*), which is one of the most highly prized of British game-birds. It is not only shot extensively by sportsmen, but it is snared for market, and even bred in confinement for food. It is about sixteen inches long, mostly of a red-brown color, and feathered to the toes.

Moorhead, city and R. R. junction, cap. of Clay co., Minn. (see map of Minnesota, ref. 5–A, for location of county), on the Red River and on the Northern Pacific R. R. Pop. in 1885, 2536.

Moorhead (James K.), Gen., b. at Halifax, Pa., in 1806, was educated on his father's farm, but was in 1828 appointed superintendent of the Juniata branch of the Pennsylvania Canal. He took an active part in public life, and was appointed adjutant-general of the State in 1839. In 1858 he was elected a member of Congress, and was returned for five terms. He was president of the Pittsburg chamber of commerce and of the Monongahela Navigation Company. D. at his residence in Pittsburg, Mar. 6, 1884.

Moor-Hen, the *Gallinula chloropus*, a European, African, and Asiatic wading bird of the rail family (Rallidæ). The moor-hen swims well, and makes a singular nodding motion with the head. It is some thirteen inches long, and of a brown and gray color. It is domesticated, or rather bred extensively in a half-domesticated state, in England. Its flesh is prized as food. Many of them may be seen on every river in England, and mostly on every pond or sheet of water where the reedy or rushy banks offer it a refuge. It is a bold bird, though sufficiently wary on occasions; and, while it will quickly slip out of sight of a dog or of a man with a gun, it will swim about with perfect unconcern in a pond beside a railway. The moor-hen builds a large and very peculiar nest, generally very conspicuous, composed of sedges, sticks, and leaves, and situated near the water.

Moorhouse (James), b. at Sheffield, England, in 1826, was educated at Cambridge; studied theology; held various charges in the Church of England; and was in 1874 made chaplain in ordinary to the queen, in 1875 prebendary of St. Paul, and in 1876 bishop of Melbourne. He has published collections of sermons (*Nature and Revelation* and *Jacob*) and the Hulsean lectures for 1865 (*Our Lord Jesus Christ the Subject of Growth in Wisdom.*)

Moors, the name generally given to the Mohammedan race who invaded the southern part of Spain in the early part of the eighth century A. D., though by no means accurately expressing either the character or the genealogy of these conquerors. There can be no doubt that all the leaders of this famous invasion were Arabs, just as much as those who had previously overthrown Egypt on the West and Persia on the East; but as their forces were largely recruited from the African population of the neighborhood, the old *Mauri* of *Mauritania*, the whole of the invaders were called by the popular name of Moors; so, too, in early English writers Mohammedans are constantly thus designated. In like manner, when Vasco da Gama sacked the sea-coast cities of India, his chronicler, Correa, calls the unoffending objects of his cruelties Moors. Other names given to them were Saraceni, from Al-Sherki, the Easterns; Hagareni, or the children of Hagar; and Ishmaelitæ, Ishmaelites. They were a very mixed race, of different African tribes, though principally the people of Barbary, but comprising also Numidians, Phœnicians, Romans, and Arabs. In modern history they appear first as the allies of the Vandals in their invasion of Africa, and hence at all times as opposed to the rulers of the Byzantine empire; about A. D. 707 they were finally conquered by the Arabs, but not without a desperate struggle, in which they exhibited the usual stubborn courage of a race who had never, even by the Romans, been crushed out of existence. The history of their invasion of Spain is the simplest possible, and needs not, to account for it, the poetical tales invented afterwards. Roderick, the last of the Goths (or rather Visigoths) of Spain, was probably not worse than his predecessors, and if he did insult a daughter of a Count Julian, it is probable he only acted as any other Visigoth would have acted had he had the chance. Food was scarce among the Berber tribes; much discord prevailed in the waning kingdom of the Visigoths; the Jews, cruelly oppressed by the Spanish rulers, as everywhere else, were for aiding any who might help them; above all, the Arab chiefs, who had swept the seaboard of Africa to the waters of the Atlantic, had warriors at their disposal hard to restrain under peaceful bonds, but ready to undergo any toils for the hope—indeed, certainty—of further plunder. Hence, the invasion of Spain was naturally on this wise: Musa, the Arab viceroy of Western Africa, sent his freedman Târik A. D. 711 to survey its southern provinces, and in less than one year the whole of Andalusia, then the richest part of the Peninsula, had submitted to his arms, while he had himself left behind him for all time a sure record of his prowess, the ancient Calpe, which he had captured, being named from him Gebêl-al-Târik (the hill of Târik), now shortened into Gibraltar. In the course of the next year Musa himself came over, jealous of the fame of his lieutenant, and for the next five-and-forty years all Spain, except the Asturias, submitted to the rule of successive warriors with the title of emirs, the deputies of the viceroys of Africa. Many of these men (they were twenty-one in all) were able administrators, and revived agriculture and the arts, which had fallen into abeyance towards the close of the feeble sway of the Visigoths; while some of them carried their arms into France, and attempted, but in vain, to establish there a similar Arab kingdom. The fate of perhaps their greatest leader, Abd-er-rahman, and the crushing victory over him in A. D. 732 by Charles Martel in the plains of Tours, is known to every student of history. In later days, though Arab hosts ravaged Carcassonne and Narbonne and burnt Marseilles, they were never able to secure a permanent footing on French soil.

The subsequent history of the Moors in Spain is the history of certain dynasties they founded there, which maintained for more than seven centuries a strong or a weak sway over the whole or parts of that country, according as they were or were not supported by the bulk of their own people; internal treachery in the end accomplishing what all the arms or valor of the Christians had failed to achieve. Indeed, the first efforts of Ferdinand the Catholic were crowned with glory chiefly because the Arabs, divided among themselves, were unable to oppose a steady front to enemies far more merciless than themselves. The first, indeed the only, dynasty who swayed the whole of Spain and Portugal with the exception of the Asturias, was that of the Ommiade khalifs from A. D. 756 to A. D. 1036. This dynasty was founded by Abd-er-rahman, a military adventurer who had escaped from the final massacre of his relatives of the house of Ommiah, who, as the first khalifs or successors of Mohammed, had reigned for the most part at Damascus. Abd-er-Rahman was well received by the population of Spain, who had little reason to love the Abbasside or second family, who had destroyed their Ommiade predecessors. Abd-er-Rahman, who reigned thirty-four years, was a man of ability, and during his rule his capital, Cordova, was a centre of learning—not for Arabs only, but for Christians. Many able rulers followed him, the most eminent being the second and the third of that name. Abd-er-Rahman II. was distinguished as a warrior of great prowess, which is shown by his recapture of Barcelona from the Franks (A. D. 827), his burning of Marseilles (A. D. 839), and his successful encounter with the first Scandinavian vikings who had reached Spanish coasts (A. D. 844–845). Like the still greater Abd-er-Rahman III., he executed many noble and useful works, and was a warm friend of the arts. Abd-er-Rahman III., whose reign extended over the long period of fifty years, from A. D. 911 to 961, was probably, with the exceptions of Haroun-al-Raschid and Akbar of Delhi, the ablest ruler who has ever governed the followers of the Prophet. As a warrior he was pre-eminent, but as an administrator he was even greater. He was, too, the first of the Western rulers to adopt the title hitherto reserved for the khalifs of Bagdad alone, that of "commander of the faithful," and to rule his own dominions without reference to the original seat of Islam. Many of the works he executed still attest his power and munificence—notably, the great mosque at Cordova, with many roads, canals, aqueducts, and bridges. Many colleges and schools were also founded by him or by his son, Al-Hakem II., who, more perhaps than he, was an enthusiastic lover of literature, the great library he formed at Cordova being, according to all the best authorities, unrivalled at that period elsewhere. After the death of Al-Hakem (A. D. 976) the Ommiade power rapidly declined, chiefly from internal quarrels or from the ill-regulated ambition of individual princes. Indeed, on the dissolution of this family the Mohammedan power in Spain may be said to have been in a state of decay more or less rapid; and though from time to time men of vigor arose and for a while restored the sinking fortunes of Islam, the attacks of the Christians to the N. became more and more persistent, ending, as all know, in the final capture of Granada by Ferdinand in 1492. The Ommiades were succeeded by a series of independent chieftains, who ruled as separate kings over Seville, Saragossa, Toledo, Valentia, Badajoz, and Tortosa during about a century (A. D. 1031–1138); and these, again, were followed by the Al-Moravides, a set of religious reformers, who, having reduced the isolated tribes on Mount Atlas, invaded Spain on the invitation of their co-religionists, then hard pressed by the Christians. The Al-Moravides (sometimes called Morabetin and Marabut) held the southern part of Spain for about fifty years (A. D. 1099–1146), and then gave way to another religious sect, calling themselves the Al-Mohades, a feeble race, who have left behind them but few relics of their sway except the great mosque at Seville (now the cathedral), erected by Yoosuf-Aboo-Yakoob in A. D. 1171. At the close of their rule the Christians were in possession of almost all the chief cities and castles of Spain, even the king of Granada, Mohammed, being in 1238 the tributary of Ferdinand III.

From this time to the ultimate fall of the Moorish empire in 1492, under the rule of their last king, Aboo-Abdallah (the *Boabdil* of Western story), the chronicles of the kings of Granada record little but incessant wars with the Christians and a succession of rulers, each weaker or more worthless than his predecessor. Learning, so conspicuous in the earlier days of the Mussulman government in Spain, rapidly decayed. After the taking of Granada, the Moors who desired to remain still in Spain were required to accept the outward forms of Christianity and to be baptized, and those who did so were called by the *Moros* (or adherents to the ancient faith of Islam) *Christianos Moriscos*, or *Moriscos* alone, in derision. The atrocious cruelty with which these poor people were treated after every solemn promise had been broken by the Catholic party is a grievous blot on the memory of Ferdinand and of his successors. The Inquisition had nowhere more victims for its abominable tribunal. W. S. W. VAUX.

Moo'ruk ("the swift"), an ostrich-like bird of the cassowary genus (*Casuarius Bennetti*), but differing from the cassowary of North Australia (*C. australis*) and related species in having the helmet-shaped crest of its head much less elevated and flattened behind, and the absence of cervical wattles. Compared with its newest allies (*C. Westermanni* and *C. picticollis*), it is distinguished by the blue color of the throat as well as the back of the neck. It is an inhabitant of the Australasian island of New Britain. It is very easily tamed, and, like the ostrich, swallows stones, iron, and whatever else it can pick up. It is some five feet high. When hard pressed it kicks, giving a severe blow. The natives regard it with affection and reverence, carrying it about in their arms like a pet—a circumstance which accounts for its domesticated state in its native country. When seen in full face, the mooruk has a fine eagle-like expression of countenance, with the same vivid, piercing eyes and curved beak. Its attitudes are much more various and its form is more flexible than would be supposed by persons who have not seen the bird in a living state. Like the emeu, it is often seized with an ebullition of joyousness, and then it dashes about as if half insane.

Moose. See ELK.

Moose'head Lake, the source of the Kennebec River, lies in Somerset and Piscataquis cos., Me. It is 36 miles long, from 3 to 10 miles wide, and is surrounded by a picturesque forest-region sparsely inhabited. It is a favorite resort for sportsmen and anglers. Its waters abound in fine trout and are navigated by steamers.

Moque'hua, or **Moquega,** town of Peru, capital of a province of the same name, is beautifully situated in a valley at the foot of the Andes, traversed by the Tambapalla, and is well built. Pop. 7000.

Moqui' Indians, a body of Pueblo Indians in Arizona, inhabiting seven villages in the region S. W. of the Navajoes. They are an interesting people, but seem to be less civilized than the other Pueblo Indians. Their houses are of stone and mortar. Their progress has been impeded by the aridity of the region they inhabit.

Mora, on R. R., cap. of Kanabec co., Minn. (see map of Minnesota, ref. 7–E, for location of county). Pop. not in census of 1880.

Mora, cap. of Mora co., N. M. (see map of New Mexico, ref. 5–K, for location of county), 18 miles W. of Fort Union, on Mora Creek, in a fertile and beautiful valley shut in by mountains, and its inhabitants are mainly of Mexican origin. Pop. in 1880, 915.

Moradabad', town of British India, capital of a district of the same name, belonging to the North-western Provinces, stands on the right bank of the Ramgunga, about 100 miles N. E. of Delhi. It is ill built, but has a large state prison, extensive barracks, and an active trade in sugar, cotton, wheat, etc. Pop. about 60,000.

Moraine' [Fr.], a mass of stone and earth deposited by a GLACIER (which see), either along the sides of its track (lateral moraines) or at the termination of its course (terminal moraine). A *medial* moraine is one which is deposited within the glacier's track, but below the union of two glaciers into one. Recent moraines in the Alps are frequently thirty or forty feet high and miles in length; they are generally destitute of vegetation, and can be traversed only with peril. Geological exploration discovers many ridges and hills which were originally moraines. In some instances a terminal moraine stretching across a valley serves as a natural dam, supporting a small lake. The town of La Grange, Me., affords some remarkable ancient moraines, and smaller ones are abundant in the U. S.

Moralities. See MYSTERIES.

Moral Philosophy. Moral philosophy is the science which treats of duty or of duties. *Mos*, Lat., *ἦθος*, Gr., each signifies a way or manner of acting, and therefore of choosing or desiring to act; hence the appellations morality, moral philosophy, and ethics. Action in this connection signifies an appropriate or becoming or right action, and right action implies an obligatory action, which is duty. The science which treats of duty must necessarily treat of the endowments or faculties and the conditions which are requisite for the performance of duty. It must therefore include or assume a knowledge of the nature of man as a moral being, and so far must involve psychological analyses as fundamental and preliminary to its special inquiries. It must also rest upon certain *a priori* intuitions or fundamental relations, commonly called metaphysical, otherwise it cannot be truly scientific or authoritative. It must also assume that man has an ascertained place in the system of nature, in order to deduce the modes of action which are appropriate to his position and the ends for which he exists. In other words, moral philosophy, like every other science, must rest upon certain fundamental principles. These may be facts which are affirmed of the constitution of the soul, and which are attested by human consciousness as essential elements in the nature of man as a moral being, as reason, sensibility, and a responsible will, or they may be certain general propositions concerning the kind of actions which are obligatory. From these principles conclusions are derived by the processes of deduction. These principles and conclusions, properly arranged and connected, become a moral or ethical system. Such a system, when designed for instruction or other intellectual ends, is called theoretical morality, or moral science proper. When these principles are stated in such a form as to be directive of the purposes or actions of men, they are called rules. Principles are primarily designed for conviction and instruction; rules are intended for the conduct. A system of practical rules, when so arranged as to provide for and enforce the various duties of man, is called *theoretical morality*, sometimes *ethics*. The term *ethics*, however, when used in a broad sense, is a synonym for moral philosophy, and is subdivided in the usage of some writers into *scientific and practical ethics*.

Casuistry is the branch of moral philosophy which treats of questions concerning duties which appear to conflict or to be incompatible with one another. These are called cases of conscience, and the principles and rules for the adjustment of these are known as *casuistry*. Traces of casuistry are met with very early in the history of the Christian Church.

Christian ethics is an appellation for those principles and rules of duty which are formally sanctioned by Christianity or are indirectly derived from its facts and motives.

Theological ethics is a term peculiar to German theologians, who designate by it the theory and rules of those characteristically spiritual exercises and actions which are to be referred to the truths and motives of Christian theology for their origin and sustentation.

It is obvious that moral philosophy is somewhat peculiar as a science, in that it is directly applied not to actions as they are, but as they *ought to be*. Every other science concerns itself with the actual phenomena of matter or spirit, and endeavors to ascertain the forces which originate them and the conditions or laws by which they are produced. This science is limited to phenomena which are largely ideal and unreal. The actualities with which it concerns itself are man's capacities for these actions, and the motives or impulses which impel to them. In one view its sphere would seem to be unreal and imaginary. In another its motives and authority are the most real and important of all the forces which are either known or can be conceived. It contemplates that side of man's nature which is the most exalted, and it discusses principles and questions which are concerned with the most valued human interests: not alone with the relations which man holds to his Creator and to immortality, but to those rights of property, of liberty, and of life which are the most sacred and important of man's nature, and those duties of truth, gratitude, and humanity which are essential to human society, and those sentiments of honor and self-respect, of loyalty and courtesy, which are the support and ornament of human civilization.

Moral philosophy may be considered as speculative and practical. As speculative it is concerned with two classes of questions: (1) with those which respect the capacities or endowments which qualify man to act morally, such as these: What is the so-called moral nature of man? Is it a separate faculty which is capable of certain experiences that are called moral over and above the functions which are peculiar to the intellect, sensibility, and will, or is it an appellation for these powers when exercised in a certain manner and peculiarly related to one another? Or, again: Is it an appellation for a something other than these three—a *quartum quid*—by union with which man exercises moral volitions, experiences moral feelings, and pronounces moral judgments? Akin to this, if it be not the same, is the question, What is conscience? Is it intellectual and emotional, or both? What is its authority? Is it infallible or subject to error? Is it capable of progress and improvement, and of retrogression and deterioration? Are any of man's moral judgments infallible and uniform? If so, what and why? Are any fallible and diverse? and if so, what and why? Questions of this nature are either plainly psychological or are answered by means of psychological analyses and the inferences founded upon them. Is the freedom of the will essential to the sense of moral responsibility? Is it conceivable? Is it actual? How can it be reconciled with the domain of law? How with the influence of motives? What is moral character as distinguished from moral actions? What is a moral disposition? and what relation does it hold to the special emotions, desires, or volition? How is the supremacy or authority of moral judgments explained? What is the sentiment or the sense of obligation? Is it intellectual or emotional? Whence is it universal and assertory in character?

(2) The second class of inquiries with which speculative moral science is concerned comprises those which relate to the correct definition and ultimate analysis of ethical conceptions and the accurate statement of ethical principles. Examples of these: What is the nature of virtue? Are right and wrong original, simple, and indefinable intuitions, or are they derived, complex, and definable concepts? If the first, what relations do these intuitions hold to the emotional nature? Are they simply intuitions of intellectual relations, or are they intuitions of emotional experiences? If the second, what are their elements? How can their universal presence and their necessary origination be explained? What is the relation of the feeling of obligation to the desire of happiness? How can the universal and authoritative character of moral judgments be explained on the theory that ethical conceptions are complex?

Moral philosophy on its practical side is occupied with the determination of those rules or principles which are required for the guidance of the conduct and the formation of the character. Men owe certain duties to themselves growing out of their natural or acquired capacities, their position and prospects in life, and the ends and aims for which they exist. They also owe manifold duties to their fellow-men, which are determined by those permanent or changing relations in which they are connected with them. Supreme above all, and in a sense controlling all other relations, are those in which they stand to the Creator. To define and classify and enforce the duties which grow out of these relations are the functions of practical ethics. Should these duties appear to conflict, and questions of doubt and difficulty arise, it is its office satisfactorily to adjust the claims of each and to relieve the inquirer and doubter of his difficulties, so that he may be satisfied as to what he ought to do. Even if no difficulty or doubt should embarrass the mind, the explanation of the grounds of our duties is often most salutary and satisfying, as it increases the confidence and zeal with which duties are performed. It imparts an intellectual interest and enlightenment to our moral activities, and elevates the ethical life by the consciousness that it is justified and enlightened by intellectual convictions. For the purposes of instruction practical ethics is indispensable. It teaches those who have not learned what their duties are. It leads those to think who have not thought before, and by awakening thought secures conviction. It brings facts and truths to mind which have not been considered, and by appeals to the reason it affects the character and conduct. It arrays the motives which are fitted to influence the conduct before the sensibilities and will, and arouses men to the right and deters them from the wrong. All teachers and reformers, all preachers and prophets, more or less consciously and systematically avail themselves of ethics in their practical work.

Moral philosophy, both in its speculative and practical forms, is capable of progress. It has actually made progress with the advancement of reflective or scientific thought. In this department of knowledge and of thought, as truly as in every other, man can observe and discriminate facts unobserved before. He can discern in these facts relations before unnoticed; he can form more exact definitions and devise more fundamental and comprehensive principles. The science of duty has made as conspicuous progress as any other science, and the history of the successive steps of its advancement is marked by the changes which attend all science. In speculative morals these changes involve the clearer and the more confused observation of facts, a sharper and a more obtuse analysis, a greater or less exactness of definition, a more or less profound and comprehensive statement of principles, and a more or less consistent arrangement of these products into a system. These changes depend largely upon the general scientific culture and progress of the age or period, upon the correctness and profoundness of its psychology and metaphysics, and, more than all, upon the soundness and thoroughness of its prevailing religion. Practical ethics in a certain sense may be said to follow in the train of speculative morality. They must necessarily do so, so far as the practical rules of life and conduct are logically derived from scientific axioms and speculative doctrines. It is only when a breach is effected between the speculation of a generation and its rules of duty that practical morality can be saved from the degeneracy which attends superficialness in its speculative science and morality.

The beginnings of moral science are found in those proverbs or practical sayings which embody the sagacious observations of the wise men of their time, who are interested in the improvement of their fellow-men and of society. The sayings of the wise men of Greece, the proverbs of Solomon, the moral teachings of Confucius and of other Oriental prophets and reformers, represent the beginnings of speculative and practical ethics. These usually rise no higher than certain practical generalizations, which are often striking by a brief and antithetic statement, a pointed example, or attractive by imaginative fervor or sacred by divine authority. If the sages who write them have a crude physics or psychology, they must necessarily clothe their moral teaching in the scientific terminology of their scientific theories of nature or of man. If they confine themselves to those views of man and of nature which are expressed in the language of common life and are the common stock of poetry in all ages, they need never be outgrown or abandoned. Thus: to Thales were attributed the sayings, "Know thyself," and "What is difficult? To know one's self; and what is easy? To advise another." To Solon: "Speak not falsely," "Learn to command by first learning to obey," "Nothing in excess." To Bias: "The possession of power will bring out the man." Sayings similar to these are to be found in all literature. Those of the wise men of Greece have a special interest, because in Greece only were they followed by the beginnings of ethical science. Socrates, in originating that movement of scientific thought which has never been arrested, assigned to ethics the supreme place as the only worthy subject of philosophical investigation. He taught that moral excellence rests on true knowledge or insight as its ground, that all virtues are in their essence one, and that wickedness proceeds from ignorance. He recognized the presence of conscience under the appellation of a Genius. The immediate followers of Socrates were—*first*, Antisthenes and the Cynics, who emphasized the doctrine that virtue elevates man above dependence upon any special desires; which doctrine was caricatured by the offensive extremes of Diogenes. These were the natural forerunners of the Stoic school. *Second*, Aristippus and the Cyrenaic school, who like the Epicureans carried the Socratic doctrine that virtue and happiness must coincide to the one-sided extreme that pleasure is the supreme good. *Third*, Euclid and the Megarics emphasized the doctrine that good of every species is self-identical and one. Plato's ethics is founded on his metaphysics and psychology. Metaphysically, it is the attainment of the supreme good, which is another phrase for the realization and manifestation of the idea of humanity. Virtue in general involves the domination of the higher or governing power, the reason over the sensuous or animal, intermediate between which is the impulse of courage, the virtue of the heart; the virtue of reason is wisdom, of the heart is courage, of the senses is temperance. The virtue which regulates these three is justice. The principal sphere for the exercise of morality is the state. Plato emphasizes the doctrine, which was practically accepted by all the ancients, that the state is supreme over the individual, and that to its interests the happiness, the rights, and the interests of the individual should be sacrificed; also, that all the duties which the individual owes to his fellow-men or to humanity are limited by the organized community to which he belongs. This generally-accepted theory Plato applied with the extremest logical consistency and vigor, setting aside the relation of marriage and the rights and affections of parents and children, and giving education entirely into the hands of the state. The ethics of Aristotle is characteristic of the man and his philosophy. He finds the *summum bonum* in the highest end of which man is capable. This end is happiness—*i. e.* rational happiness, at once a well-being and a well-doing, a perfect activity in a perfect life. He recognizes virtue as dependent on activity, and defines it as an acquired moral capacity of the soul, following the definition of Pythagoras, that virtue is the habit of duty. All virtues are either ethical or dianoetic. Ethical virtue is the permanent direction of the will, which guards the *mean* between two opposite excesses, as this is determined by the intelligence. The highest of these is justice, which in its wider sense is the union of all the virtues with which our fellow-men are concerned; and in the narrower it respects the equitable in gain or loss. Dianoetic virtue is the correct ordering of the theoretical reason, either in itself or in reference to the other psychical functions.

Man is by nature a political being. The state exists not only for the life, but for the higher ends of man. Its basis is the family, and therefore the rights of the family, and in turn of the individual, must be regarded by the state.

With Aristotle the ethical science of the ancients may be said to have reached its culmination. The Nicomachean ethics, the most conspicuous of his ethical treatises, and the one oftenest referred to, has influenced the opinions of thinking men down to the present time, and it continues to command their notice and respect. The first Aristotelian schools, especially the Stoics, the Epicureans, and the neo-Platonists, introduced new practical teachings, but in principle brought no essential modifications of the doctrines of the leaders of the Socratic school.

The Stoics taught that virtue is a life conformed to nature—that virtue is sufficient for happiness, but happiness should not be made the end of human endeavor. The cardinal virtues are practical wisdom, courage, discretion, and justice. To the perfect performance of duty a right disposition is required, as well as right action. The wise man alone attains to the perfect performance of duty; he is without passion, but not without feeling; he is free, he is king and lord even over his own life.

The Epicureans taught the same system with the Cyrenaics. Happiness is the highest good. Happiness results from motion or rest. Pleasure and pain are both mental and bodily. The virtuous man is he who proceeds rightly in the quest of pleasure. Duration of existence does not affect happiness.

The neo-Platonists defined the perfection of man as consisting in his return to God by emancipation from sense and matter. This is accomplished by virtue, through the ecstatic imitation of God and union with him.

Christianity in its forms and claims was not a system of ethics, but a religion. And yet in setting forth Christ as a perfect example of moral excellence and the founder and head of a new moral or spiritual kingdom, it had an important significance in the science of morals. It is true, neither Judaism with its commands of exclusive worship of one God and of supreme love to him, and its requisition of sincere and disinterested love of man, nor Christianity, with its profoundest conceptions of love to the heavenly Father and its message of forgiveness through Christ, asserted any peculiar scientific principles or rules in either speculative or practical ethics. But the truths and facts which they taught could not but furnish both materials and impulse for the progress of moral science so soon as scientific thought should be applied to the truths of the newly-received religion. We find in the New Testament and in the teachings and practice of the Christian Church not only a purer practical morality in spirit and life, but we find that this morality implied a profounder and truer principle concerning the moral nature of man and the end of his existence, concerning his destiny, his relations to his Creator, to his fellow-men, concerning the family, the state, and the Church, than any of the ante-Christian systems had recognized. As fast as ethics, as such, became the field of special inquiry the new Christian material was viewed after the Aristotelian or Platonic method, and was assimilated, so far as was possible, with the ethical systems already received in the schools. As each writer was predominantly Platonic or Aristotelian, such would be his ethical philosophy. The doctrines of grace, of free-will, and of original sin could not be explained or defined without more or less distinctly implying an ethical system. Now and then a conflict ensued between the new and the old elements. When this happened the unscientific Christian ethics was in part adjusted to the doctrines of Aristotle and Plato, and in part was added to or modified them. The Fathers and doctors of the Church could not but discuss ethical questions and inculcate moral duties in their discourses and writings, and in the light of the history and teachings of the Scriptures and of the Church. So far as the authority of the Church was recognized as supreme in matters of duty, it introduced another disturbing element. After philosophy—*i. e.* the philosophy of Plato and Aristotle—was recognized in the schools as supplementary to the teachings of the Church, the greatest of the Scholastics, Thomas Aquinas, produced an elaborate treatise on speculative and practical ethics. This achievement may be taken as the best example of Scholastic Aristotelian ethics as modified by the Latin Christianity. Thomas Aquinas follows Aristotle in his definition of virtue and the division of the virtues into ethical and dianoetic, the latter being ranked as the higher. To the philosophical—chief among which he reckoned the four cardinal virtues—he adds the theological virtues of faith, love, and hope, the first class being natural and the last being supernatural. The moral faculty is not destroyed by the fall of man, and is both a habit of certain principles and the act by which we apply them. Perfect happiness is the supernatural gift of God.

After the Protestant Reformation the distinction between two sorts of truth—viz. philosophical and theological—was gradually abandoned; the relation of the truth of reason and the truth of revelation was more clearly discerned. Natural was separated from revealed theology, and ethical truth as discerned by the moral nature of man was gradually recognized as the necessary assumption and foundation of supernatural religion. Jural and political discussions, however, had no inconsiderable part in developing and stimulating ethical inquiries. The writings of Grotius and Puffendorf are important in the early history of modern ethics. The early Protestant writers accepted in general the Aristotelian ethics as modified by Christian ideas, but taught no coherent scientific system. Even Descartes and Spinoza treated of ethics only in the most incidental fashion, the *Ethica* of Spinoza being a misnomer for a purely metaphysical treatise.

Modern ethics began with the discussions which were occasioned by Thomas Hobbes. Hobbes wrote primarily in the interest of his political theory of despotism, contending that all ethical distinctions are the product of positive legislation, and are consequently, in a certain sense, changeable and arbitrary. In consistency with this theory he taught that man as an individual is naturally hostile to his fellow, and is incapable of sympathetic or benevolent affections. He is also incapable of voluntary action or freedom in any proper ethical signification of the term. The boldness with which these positions were asserted, and the rigor with which they were applied, aroused a host of adversaries. In thus originating modern ethics Hobbes to a certain degree determined its form. As against Hobbes, Cumberland, his earliest and one of his ablest antagonists, taught that nature manifests and enforces ethical laws. The laws of right or practical reason are certain propositions of unchangeable truth which direct our voluntary actions, and impose an obligation to external actions without civil law. The general law which is thus imposed is that "the greatest benevolence of every rational agent towards all forms the happiest state of every and of all the benevolent, so far as is in their power; and it is necessarily requisite to the happiest which they can attain; and therefore the common good is the supreme law." The law of nature is immutable because it cannot be changed while the nature of things remains unchanged. But the nature of things depends on the Divine will. Ralph Cudworth also wrote against Hobbes a *Treatise on Eternal and Immutable Morality*, published after his death, and a *Treatise on the True Intellectual System of the Universe.* In both he contends against necessity, and for the proposition that moral good and evil cannot possibly be arbitrary things. These ideas are discerned by the reason, and not made by will. Henry More agreed with Cudworth that moral goodness is simple and absolute, and that right reason judges of its nature and truth, but its attractiveness and beauty are felt by a *boniform* faculty, like the moral sense of later writers. Locke taught that moral good and evil signify conformity or disagreement with some law; and of laws there are divine law, the civil law, and the law of opinion. The divine law may be either promulgated by the light of nature or the voice of revelation; the civil law comprehends all those positive statutes that are framed by civil rulers; and the law of opinion is that unwritten and changing law which is commonly called public sentiment. Dr. Samuel Clarke resolved the notions of right and wrong into the eternal fitness of things; Wollaston, into the truth of things. Richard Price asserted that right and wrong are original conceptions or intuitions. The same doctrine is taught by the Scottish philosophers, Thomas Reid and Dugald Stewart, and by many writers in England and America. Most of these writers we have named confine their attention to the functions of the intellect in moral phenomena, and would seem to overlook more or less the emotional element in the same, conceiving of the moral nature as purely rational. Strikingly contrasted with this class of writers are those who explain these experiences by a special sensibility or capacity for peculiar emotions, called the moral sense. Among these are Henry More, already referred to; the earl of Shaftesbury, author of *The Characteristics;* Prof. Francis Hutcheson, who gave form and currency to the appellation "moral sense;" David Hume, some of whose special ethical doctrines are open to grave exception; and Thomas Brown and Jonathan Edwards. Hutcheson was foremost in asserting that all virtue is resolved into benevolence, in which he followed Cumberland, and is followed by Edwards, who defined true benevolence to be a love of being in general, which should be proportioned to the quantity of being, and thus provided for the obligation that God should love himself, and the creatures of God should love God with a supreme affection. Edwards still further distinguished virtuous love into the love of benevolence and the love of complacence. Bishop Butler rendered special service to ethical philosophy by insisting, with Shaftesbury and Hutcheson as against Hobbes and many of the English free-thinkers, that man is capable of benevolent or disinterested affection for his kind. He also contended against the licentious doctrines of his time that the true interpretation of the Stoic precept, "to live according to nature," requires man to recognize the natural supremacy of the moral over all other impulses. This doctrine of the natural supremacy of conscience has been often asserted to be original with Butler, but incorrectly. He emphasized it at a critical time, but the doctrine itself in its principle is as old as Plato. In respect to the nature of conscience he is not explicit, but asserts that it is probably neither exclusively rational nor emotional, but includes both these elements. In his sermons he agrees with Hutcheson that benevolence comprehends all human duties; in his *Essay on the Nature of Virtue* he takes exception to this doctrine, and contends that a separate and independent authority pertains to gratitude and veracity. Butler's contributions to moral science have exerted a powerful influence in England and America. A special application of this theory was made by Adam Smith in his *Theory of Moral Sentiments.* He derived our moral judgments and feelings from the principle of sympathy operating upon man in society. The original sources of our ethical judgments and feelings are the grateful and hostile feelings of our fellow-men. With these feelings we have so intimate and sensitive a sympathy that we insensibly and by ready association connect them with our actions, and these with our intentions and dispositions; and we do this so rapidly that they often seem to be independent in their origin and authority of the root from which they sprung. This theory must of course deny to man living out of society the capacity for either moral judgments or feelings. James Hartley, the originator, and Abraham Tucker, the expounder, of the associational psychology, resolved the moral phenomena into the operations of association, according to which the feelings of approbation and disapprobation become insensibly and inseparably united with certain actions and feelings. William Paley, in his *Treatise on Moral and Political Philosophy,* which for more than half a century was generally used as a textbook in England and America, resolved virtue into the arbitrary will of God, and the motives for the practice of virtue into a desire of future happiness. The moral nature, according to this theory, must necessarily be the creature of education and the product of circumstances. Jeremy Bentham was the reputed father of the utilitarian school of morals, which founded all virtue in the tendency of actions to promote happiness. The theory, as expounded by Bentham and Mill, the father and the son, was a theory of external conduct in social and public relations, rather than a theory of ethics proper. Its cardinal principle is identical with that of Cumberland, but its denial of human freedom as the ground of human responsibility, its neglect to recognize the permanent and internal springs of action, and its generally irreligious tendency have exposed it to the charge of being unscientific and superficial. The most favorable exposition and able defence of this so-called modern utilitarianism has been made by John Stuart Mill. John Austin, the author of the able treatise *The Province of Jurisprudence Determined,* writes from the same standpoint. Alexander Bain adopts the extremest views of those who derive the moral judgments from the influence of society under the laws of association. Herbert Spencer teaches the same theory, but modifies and fortifies it by his metaphysical doctrines of evolution and the law of differentiation. This, in turn, is blended with the physiological doctrine of heredity to which Charles Darwin and his followers have given extensive currency.

In America the earliest and perhaps the ablest writer upon ethics is Jonathan Edwards, whose opinions have already been stated. The theologians of his school have generally accepted his doctrines. Dr. Timothy Dwight has expounded a system more nearly like that of Bishop Cumberland, whom Dr. Nathanael W. Taylor has followed in the main. Both writers were far more exact than Cumberland in their analyses, and more scientific in their definitions. Dr. Francis Wayland and Dr. Joseph Haven published each a popular textbook upon ethics, in which they expound and defend the doctrine of Price and Dugald Stuart. Dr.

Laurens P. Hickok has written a textbook in which he makes spiritual worthiness the distinctive and fundamental characteristic of right moral feeling and action, exalting the relation itself to an intuition. Dr. Mark Hopkins has published two treatises, *Lectures on Moral Philosophy* and *Love as Law*, in which he develops the theory of moral distinctions from the idea of adaptation to the highest good. The views of President McCosh may be found in his *Intuitions of the Human Mind*, and his correspondence with Pres. Hopkins in the appendix to *Love and Law*, 3d ed. Dr. McCosh accepts the theory of Price. Pres. J. H. Fairchild, of Oberlin, O., has published a textbook which is founded on a theory similar to that of Hopkins. Rev. David Metcalf has published *An Inquiry into the Nature, Foundation, and Extent of Moral Obligation*, in which he expounds with great acuteness and tenacity the views of the New England theologians, and subjects the opposite views to minute criticism.

The Kantian ethics have had no little influence upon American and English writers within the last thirty years, originally through the school of Coleridge, and subsequently through an original study of German philosophy.

In Germany, Leibnitz gave the hints or germs of what would have been his ethical theory had it been complete, much in the vein of Cumberland. The theory of Kant has had great significance in modern speculation. After Kant, as the result of his criticism of the speculative reason, had limited its functions to phenomena, denying it the power to know *things in themselves*, and especially had tested and set aside its authority to accord anything more than regulative validity to the ideas of God, the soul, and the material universe, he resorts to the practical reason to furnish reality and validity first to ethical relations, and by means of these to that speculative truth which the speculative reason is unable to affirm. The practical reason commands the will by its categorical imperative to believe in duty. In order that duty may be disinterested, this must be enjoined and obeyed irrespective of any possible relations to the sensibility—*i. e.* to happiness—simply because it is right. But in order that duty may be performed, the will must be free; therefore it must be free in fact, and it should be believed to be free. Moreover, although duty should be performed at the simple command of the practical reason, yet it is fit and necessary that it should be rewarded; and in order that it may be rewarded there must needs be a moral ruler; therefore, the practical reason commands the speculative to believe there is a God. The moral law in its content must be a rule that is fit to be universal, because only a universal rule can be accepted by the reason. Hence, the fundamental axiom of morals is, Act in such a way as is fit and possible for you in all conceivable circumstances. The ethical system of Kant has been sharply criticised in Germany and elsewhere. In England, his doctrine of the categorical imperative, and his rejection of what he calls eudemonism, have been accepted by most of the adherents of the intuitional theory, from its supposed similarity to Butler's doctrine of the supremacy of conscience. F. P. Cobbe is the earnest and eloquent expounder of the Kantian doctrine in her *Intuitive Morals*. A few ingenious writers in England have of late endeavored to cut loose from the leadings of any received or prevalent system, as S. S. Laurie, *The Philosophy of Ethics, Notes Expository and Critical;* S. H. Hodgson, *The Theory of Practice;* H. Calderwood, *Handbook of Moral Philosophy;* Sidgwick, *The Method of Ethics;* W. Whewell, *Elements of Morality, including Polity*, and have demonstrated that the field of speculative and practical discussion is by no means exhausted.

Of the German philosophers since Kant, the ethical system of each is usually a subordinate appendage to his metaphysical theory. Schleiermacher has perhaps been the most significant next to Kant, especially for his threefold doctrine of duties, virtues, and goods. J. G. Fichte, Schelling, Hegel, Herbart, Trendelenburg, Rothe, Schopenhauer, Chalybæus, J. H. Fichte, Lotze, are all able writers upon ethics. In France, Th. Jouffroy is the most significant of modern writers, and follows the Scottish school, with some important deviations. The disciples of Cousin in general follow the Kantian and Scottish doctrine that the moral relations are intuitional. In Italy, as in Germany, the ethical and political philosophy of the leading writers is secondary to their speculative systems. Their contributions are of special interest at present for the applications which may be made of them to the political philosophy and the educational policy of the new kingdom of Italy.

Besides many special treatises not named, and general histories of philosophy, the following works may be consulted with advantage: Sir Alexander Grant, *The Ethics of Aristotle*, in 2 vols. (1st ed. London, 1857–58); John Stuart Blackie, *Four Phases of Morals* (Edinburgh, 1871; New York, 187–); A. Neander, *Ueber das Verhältniss der hellenischen Ethik zum Christenthum*, in *Wiss. Abhandl.* (Berlin, 1851); Sir James Mackintosh, *A General View of the Progress of Ethical Philosophy, chiefly during the Seventeenth and Eighteenth Centuries* (*Encyc. Brit.;* also London, 1830; Philadelphia, 1832); W. Whewell, *Lectures on the History of Moral Philosophy in England* (London, 1852; enlarged ed. 1862); *History of Moral Science*, by Robert Blakey, 2 vols. (2d ed. Edinburgh, 1836); S. S. Laurie, *Notes Expository and Critical on Certain British Theories of Morals* (London and Edinburgh, 1868); W. E. H. Lecky, *History of European Morals from Augustus to Charlemagne*, 2 vols. (2d ed. London, 1869); Alexander Bain, *Mental and Moral Science, a Compendium of Ethics; Sketch of Ethical Theories* (London, 1868); E. H. Gillett, *God in Human Thought, and the Moral System* (1874); I. H. Fichte, *System der Ethik;* F. E. D. Schleiermacher, *Grundlinien einer Kritik der bisherigen Sittenlehre*, in *Werke zur Philosophie* (1ter Band, Berlin, 1803); K. F. Staüdlin, *Geschichte der Moral-Philosophie* (1822; 3 Bde. (Bd. 1, historical and critical), Leipsic, 1850); Fr. Vorländer, *Geschichte der phil. Moral, Rechts- und Staats-Idee der Engländer und Franzosen* (3c. Marburg, 1855); Paul Janet, *Histoire de la Philosophie morale et politique, dans l'Antiquité et les Temps modernes*, tomes 2 (Paris, 1860); *De la morale* (Paris; translated, *The Theory of Morals*, New York, 1883); Rothe, *Theological Ethics* (3 vols.); Henry Sidgwick, *The Methods of Ethics* (London, 1874); Herbert Spencer, *The Duty of Ethics* (London and New York); Leslie Stephen, *A System of Ethics* (London and New York). N. Porter.

Moran′ (Benjamin), b. in Lancaster co., Pa., in 1820; became a printer in Philadelphia; went to Europe about 1850; travelled over England on foot, and published a volume, *The Footpath and the Highway* (1853); became clerk to the American legation in London and private secretary to Mr. James Buchanan, then minister (1854); received the appointment of secretary of legation Nov., 1855, and remained in that post for nearly twenty years, occasionally acting as chargé d'affaires. He became noted for his thorough knowledge of the archives of the legation and of the annals of American diplomacy; was popular with American visitors to England and with the English; became minister resident in Portugal in 1874.

Moran (M. Nimmo). See Appendix.

Moran (Thomas), b. in Bolton, England, Jan. 12, 1837; brought in childhood to Philadelphia; apprenticed to an engraver in 1853; commenced painting landscapes in 1856, and, though he had received no instruction in that branch of art, he soon developed an effective style. He visited Europe in 1861, and again in 1866, paying special attention to the paintings of Turner; achieved success as an illustrator of books and in the execution of landscapes, chiefly of great size; settled at Newark in 1871, and in the same year accompanied Prof. Hayden's expedition to the Yellowstone River. The result was his magnificent painting, *The Grand Cañon of the Yellowstone*. This and a companion picture, *The Chasm of the Colorado*, produced two years later, after a similar expedition to Utah and Arizona, were purchased by Congress for $20,000.—His brother, Peter, b. in Bolton, England, Mar. 4, 1842, is a distinguished painter of animals; and another brother, Edward, has devoted himself to marine subjects.

Mora′no Cala′bro [*Muranum*], town of Italy, province of Cosenza, situated not far from Castrovillari. Near it are the ruins of an old town and castle. Pop. 8910.

Morant′, town of Jamaica, in the West Indies, is situated on the southern coast of the island, at the mouth of a river of the same name. It was much injured by the rebellion of 1865, but is now rapidly recovering. Pop. 7000.

Morat′ [Ger. *Murten*], town of Switzerland, in the canton of Freiburg, on the Lake of Morat, famous for the victory which the Swiss won here (June 22, 1476) over Charles the Bold, duke of Burgundy.

Moratin′, de (Leandro Fernandez), son of Nicolas, b. at Madrid Mar. 10, 1760; carefully educated, and prepared himself for literary pursuits, though for some time he was engaged in the jewelry trade; received prizes from the Academy of Madrid in 1782 and 1785; visited Paris in 1787, where he made the acquaintance of Goldoni, and brought in 1770 his first and best comedy on the stage, *El Viejo y la Niña*. It was his object to reform the Spanish theatre, and he succeeded. Godoy gave him a pension; he travelled extensively in France, England, Holland, and Germany, and his following dramas, which were received with great applause, evince, besides a natural talent of considerable vigor, a highly developed taste. King Joseph made him his librarian, but after the restoration of Ferdinand VII. he left Spain, lived mostly in Paris, and d. there June 21, 1828. His excellent work, *Origines del*

Teatro Español, written in Paris, reaches only to Lopez de Vega.

Moratin, de (Nicolas Fernandez), b. at Madrid, Spain, July 20, 1737, belonged to an ancient Biscayan family; received a careful education; became a lawyer and professor of poetry in the Imperial College at Madrid; was the founder of the literary club which took its name from the coffee-house of San Sebastian, and with the countenance of the court and of the great nobles undertook, amidst great opposition, the reformation of the Spanish theatre by substituting for the religious dramas, or *autos sacramentales*, pieces more in accordance with modern taste, especially as represented by the French school. He had previously published a comedy, *La Petimetra* (1762), and a tragedy, *Lucrecia*, as specimens of the new dramatic school, but neither of them had been placed upon the stage. *Hormesinda*, represented in 1770, achieved success, and *Guzman el Bueno* (1777) was much admired for its classic verse. Moratin was also the author of *Diana*, a didactic poem (1763), and *Las Naves de Cortés destruidas* (1765), a narrative poem on the conquest of Mexico, considered by Ticknor to contain the noblest verse of its kind produced by any Spanish writer of the eighteenth century. All his pieces are characterized by purity and correctness of diction and harmony of versification. D. at Madrid May 11, 1780.

Mora'via [Ger. *Mähren*], province of Austria, bounded W. by Bohemia, N. by Silesia, E. by Hungary and Galicia, and S. by the duchy of Austria. Area, 8584 square miles. Pop. 2,153,496, of whom 600,000 are Slavonians and the rest Germans. It is almost entirely encircled by mountains—W. by the Moravian, N. by the Sudetic, and E. by the Carpathian—whose branches and spurs cover the whole country with exception of the southern part, which forms an elevated plain. Generally, the surface slopes towards the S., traversed by the Morava (or March, which see) and a number of minor streams, which all send their waters to the Danube. The more elevated portions of Moravia are not fertile: the mountains yield some coal, alum, saltpetre, and metals, especially copper and lead, but the valleys and the southern plains are very fertile, and produce not only grain, flax, hemp, hops, and excellent pastures, but also wine, chestnuts, and various kinds of fine fruits. Of the total area, 53 per cent. is arable land, 26 forest, 9 meadow, and 8 garden. Cattle, fine horses, geese, fowls, and bees are reared, and extensive manufactures of cloths, flannels, and other woollen fabrics are carried on. In 1880 the province possessed 122,858 horses, 677,807 cattle, 158,852 sheep, 205,976 swine, and 116,880 goats. The breeds of both sheep and horses are good and highly esteemed. The rearing of poultry is a considerable industry. In the twelfth century Moravia was made a margravate and declared a fief of the Bohemian crown, to be held by the younger sons; in 1526, on the death of Louis II. at the battle of Mohacs, it fell to Austria, together with Bohemia.

Moravia, Cayuga co., N. Y. (see map of New York, ref. 4-F, for location of county), 18 miles S. E. from Auburn, on the Southern Central R. R., is the centre of a large grain-growing and dairying district, and has good water-power, a union graded school, flouring-mills, a woollen factory and a spoke-factory, cheese-factories, a foundry, etc. Pop. in 1880, 1540.

Moravian Brethren. See Moravian Church, by Bishop Edmund de Schweinitz.

Moravian Church, The, is so called because in the fifteenth and sixteenth centuries Moravia constituted one of its principal seats, and because it was renewed in the eighteenth by refugees from that country. Its official name, however, is "The Church of the United Brethren," or the *Unitas Fratrum*, and it originated not only in Moravia, but also in Bohemia. The blood of the martyr John Huss (which see) was its seed. It was founded by some of his followers in 1457 on the barony of Lititz, in Bohemia. The basis of their union was the following three principles: The Bible is the only source of Christian doctrine; public worship is to be conducted in accordance with the teaching of the Scriptures and on the model of the apostolic Church; the Lord's Supper is to be received in faith, to be doctrinally defined in the language of the Bible, and every human explanation of that language is to be avoided. Lititz soon became the rallying-point for awakened persons throughout Bohemia and Moravia, so that the new Church rapidly increased. Its first ministers were priests of the Calixtine or national Church, from which the Brethren had seceded. In 1467, however, they introduced a ministry of their own, and secured the episcopacy from Bishop Stephen of the Austrian Waldenses. In spite of frequent persecutions at the hands both of the Roman Catholics and of the national Church, they increased in numbers and influence. At the beginning of Luther's Reformation (in 1517) they had about 200,000 members and over 400 parishes. In the course of time they established colleges and theological seminaries, set up several printing-presses, and translated the entire Bible from the original into the Bohemian tongue, which version has remained a standard to the present day. About 1547 they spread to Poland; and in 1557 the *Unitas Fratrum* was divided into three ecclesiastical provinces—the Bohemian, the Moravian, and the Polish—each governed by bishops of its own, but all united as one Church. Religious liberty having been proclaimed in Bohemia and Moravia in 1609, the Brethren became one of the legally acknowledged churches of these lands. In the early part of the Thirty Years' war, however, Ferdinand II. inaugurated the so-called Anti-Reformation, which crushed evangelical religion out of Bohemia and Moravia. Only a hidden seed of the Church of the Brethren remained. The majority of its members, together with the Lutherans and the Reformed, were driven into exile (1627). A new centre was now established at Lissa in Poland, and many parishes of refugees were formed. But Lissa was destroyed in 1656, in a war between Poland and Sweden, and the remaining parishes were gradually absorbed by other Protestant bodies. For more than half a century the *Unitas Fratrum* ceased to exist as a visible organization. Its hidden seed in Bohemia and Moravia, however, remained, and its illustrious bishop, Amos Comenius, filled with a prophetical anticipation of its renewal, republished its history, confession, and discipline, commended the future Church of the Brethren to the care of the Church of England, and took steps to perpetuate its episcopacy. Hence, for a period of fifty years, clergymen of the Reformed Church were consecrated bishops of the *Unitas Fratrum*, that the succession might not die out. On June 17, 1722, a few descendants of the Brethren, who had fled from their native land to Saxony, began to build the town of Herrnhut on an estate of Count Zinzendorf, where an asylum had been provided for them. This town soon became the rallying-place for the remnant of the Church, descendants of which, to the number of several hundred, immigrated thither from Bohemia and Moravia. They introduced their ancient discipline, handed down by Comenius, and in 1735 received their venerable episcopate at the hands of its two last survivors, Daniel Ernst Jablonsky and Christian Sitkovius. At the same time, however, many Christians from different parts of Germany joined them, so that the renewal of their Church involved a union of the German element of pietism with the Slavonic element which they represented. The result was a development different from that in Bohemia and Moravia. Count Zinzendorf himself became the leading bishop of the resuscitated Church, and he strove to build it up in such a way as not to interfere with the rights and privileges of the state Church, in the communion of which he had been born, and to which he was sincerely attached. In carrying out this principle he did not let the renewed *Unitas Fratrum* expand as other churches expand, but established on the continent of Europe, in Great Britain, and in America, exclusively Moravian settlements, from which the follies and temptations of the world were excluded, and in which was fostered the highest type of spiritual life. In doing this he carried out Spener's favorite idea of *ecclesiolæ in ecclesia*. Fifteen exclusive settlements still exist in Germany and four in Great Britain. In such towns, until recently, Moravians only were allowed to hold real estate, and the Church controlled not only religious but also municipal, and to some extent industrial, affairs. This fundamental principle is now undergoing a change which will gradually lead to the abolition of the entire system of exclusivism. In America it has been given up, the last vestige of it disappearing in 1856. The American Moravian Church now stands on the same footing as the other Protestant denominations of the land, and is pursuing the same polity of extension. In the last twenty years it has doubled its membership, and flourished in other respects. But even in the period in which exclusivism was fully developed throughout the *Unitas Fratrum*, it did not remain idle or stand aloof from work for the spread of the kingdom of God. On the contrary, while its peculiar system necessarily kept it small at home, it began a very extensive mission in heathen lands, a no less influential domestic mission on the continent of Europe, and a number of educational enterprises that have given it a name far and wide. In 1857 its constitution was remodelled. The *Unitas Fratrum* now consists of three *provinces*—the German, British, and American—which are independent in all provincial affairs, but form one organic whole in regard to the fundamental principles of doctrine, discipline, and ritual, as also in carrying on the foreign and the Bohemian missions. Hence, there is a provincial and a general government. Each province has a provincial synod, which elects from time to time a board of bishops and other clergymen, styled the "Provincial Elders' Conference," to administer the government in the interval between synods. To this board is committed the power of appointing the ministers to their several parishes. Every ten or twelve years a General Synod of the whole *Unitas Fratrum* is convened at Herrnhut in Saxony. It consists of delegates from each province and from the foreign missions, and elects a board of twelve bishops and other clergymen, styled the "Unity's Elders' Conference," which oversees the whole Church and superintends the foreign and Bohemian missions. The doctrine of the Church is set forth in its Catechism, its Easter Morning Litany, and in the statutes drawn up by the General Synod, and comprises all those points which are held by Trinitarian Christians as essential to salvation. The distinguishing feature of Moravian theology is the prominence given to the person and work of Christ, and a marked characteristic of the Church generally is its catholicity. The ministry consists of bishops, presbyters, and deacons. The episcopal office is not provincial and not diocesan, but represents the whole *Unitas Fratrum*. A ritual is used which comprises a litany for Sunday morning—free prayer being allowed at other times—forms for baptism, the Lord's Supper, confirmation, etc., services for the festivals of the ecclesiastical year, and a particular litany for Easter morning. Love-feasts are held, in imitation of the primitive *agapæ*, preparatory to the Lord's Supper and on other occasions. The use of the lot, which at one time was universal, is now greatly restricted, and in the American province resorted to only when a minister receiving an appointment requests its use. The enterprises of the Church are the following: (1) *Boarding schools* for young people not connected with it, 48—namely, 28 in the German province, 15 in the British, and 4 in the American, educating annually about 2500 pupils of both sexes. There are, besides, numerous parochial schools, a college, a missionary institute, and 3 theological seminaries. (2) *Foreign missions*, commenced in 1732, since which time 2212 missionaries, male and female, have been sent out, and comprising the following 16 "mission provinces"—namely, Greenland, Labrador, Indian country of North America, St. Thomas and St. John, St. Croix, Jamaica, Antigua, St. Kitts, Barbadoes, Tabago, Mosquito Coast, Surinam, South African western province, South African eastern province, Australia, and Thibet. (3) *Bohemian mission*, begun in 1870 in the early seats of the *Unitas Fratrum*, and numbering four stations. (4) *Domestic mission* on the continent of Europe, called the *Diaspora*, having for its object the evangelization of the European state churches, without depriving them of their members, who are organized into "societies" within the Church, and carried on in Germany, Switzerland, Denmark, Norway, Sweden, Poland, Livonia, Esthonia, and other parts of Russia. The whole number of souls in the three provinces of the *Unitas Fratrum* is 31,306, of whom 16,822 belong to the American province; the whole number of converts in the foreign missions is 79,021; the number of foreign missionaries, 325; and the entire membership, 110,327. Besides these there are about 80,000 souls connected with the Diaspora mission. (For further particulars see *Moravian Manual*, Bethlehem.) EDMUND DE SCHWEINITZ.

REVISED BY EDMUND ALEXANDER SCHWEINITZ.

Mo'ra-Wood, the timber of *Mora excelsa*, or *Dimorphandra Mora*, a noble forest tree of Guiana. It is of the order Leguminosæ. The wood resembles the best oak in quality, but is dark, like mahogany.

Mo'ray Frith, an inlet of the German Ocean, on the N. E. coast of Scotland, 16 miles wide at the entrance, and stretching inland for about 31 miles, to Inverness.

Morazan' (Gen. FRANCISCO), b. in Honduras, Central America, in 1799; was secretary-general of Honduras in 1824; was soon afterwards elected governor; distinguished himself as a soldier in frequent contests with the conservative or "reactionary" party, which he drove from the city of Guatemala in 1829, on which occasion the national congress decreed him the title of "savior of the republic," and by virtue of his extraordinary powers as commander-in-chief he effected a radical reform in ecclesiastical affairs, suppressing the convents, expelling the rebellious priests, and confiscating the Church property to educational and other public uses. In 1832, after suppressing another formidable insurrection, Morazan was chosen president, but was opposed with unrelenting hatred by the conservatives, and after several years of disturbances the republic was disorganized and broken into five independent states. Morazan took refuge in Chili in 1840; settled in Costa Rica in 1842, where he was spontaneously chosen president of the state with a view to afford him a basis for national reorganization, but after a short time a counter-revolution broke out, to which Morazan fell a prisoner, and was executed Sept. 15, 1842.

Morbihan', department of France, a part of the old province of Bretagne, bordering S. on the Atlantic. Area, 2667 square miles. Pop. 521,614. The northern part is hilly, but the rest, especially the land along the sea, is low and level, forming large plains, in some places very fertile, in others occupied by heath or marshes. The islands along the coast are especially remarkable for their fertility. Horses, cattle, sheep, and bees are extensively reared; corn, hemp, flax, and apples are raised; cider, butter, and honey are the principal products. The fisheries are very important. Principal towns, Lorient and Vannes.

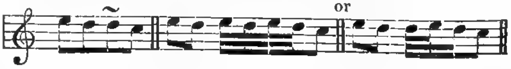
Morco'ne, town of Italy, province of Benevento. This town, of ancient origin, is supposed by some to be the *Morgantia* of the Samnites. Pop. 6914.

Mor'dants [Fr., from Lat. *mordeo*, to "bite;" Ger. *beizen*], substances used in dyeing and calico-printing to fix colors which have no affinity for the tissues; in gilding, any viscous or sticky matter employed in making gold-leaf adhere. Mordants are indispensable to the dyer; they serve as a bond of union between the fibre and the color, and many of them modify the tint of the color, thus enabling the dyer to produce many shades of color with the same dye. Animal fibres, as silk and wool, generally attract coloring-matters; for them, therefore, mordants are less important, though they are often used, either to make the color more durable or to brighten or otherwise modify the tint. Few colors can, however, be made to adhere to vegetable fibres, cotton or linen, without the aid of a mordant. Colors which require mordants are called adjective; those which do not, substantive. Safflower is a substantive dye for cotton and linen; most other dyes are adjective for these fibres. The mordant has a positive affinity for both color and fibre, and binds the two together. The most important mordants are alumina, oxide of iron, and oxide of tin. They are generally applied in the form of soluble salts. If cotton is immersed in a solution of acetate of alumina, a basic acetate of alumina will be fixed on the fibres so firmly as to resist removal by washing; if the cotton be now treated with water and ground madder, the red coloring-matters of the madder, alizarine and purpurine, will unite with the alumina, and thus each fibre will become covered with the red madder lakes, or salts of alizarine and purpurine, with alumina. If an iron salt be substituted for the acetate of alumina, as acetate of iron, a similar result would follow the treatment with madder, except that, as the iron compounds with alizarine and purpurine are purple, the cotton would be dyed of this color. Sometimes the mordant and color are applied simultaneously. Astringents, such as sumac, nutgalls, etc., are employed as mordants, and act by virtue of the tannic acid they contain. When mordants are printed on cotton cloth in stripes and figures, and the cloth thus mordanted is subjected to the action of the dyestuff, the color is fixed in similar stripes and figures, leaving the other portions of cloth white; this is calico. Sometimes the color is mixed with a salt of the mordant, and the two are printed together ("topical printing"). On subjecting the cloth to the action of steam, the acid of the mordant, generally acetic, is expelled, and the base and color become fixed on the cloth.

The term *mordant* is sometimes applied to agents which act merely mechanically and cement the color to the fibre, as albumen, caseine, etc., which are used for pigment colors, such as ultramarine, oxide of chromium, etc., and for aniline colors. The term is also applied to salts which furnish a part of the matter of which the color actually consists, as the iron salt in producing prussian blue or the lead salt in forming chrome yellow. In these colors there is no proper mordant, as the insoluble color is merely produced in the fibre by the combination of its component parts. This difference is more apparent than real, as the same is actually true when alumina or iron is used with madder or with astringents. (See articles on CALICO-PRINTING and DYEING.) C. F. CHANDLER.

Mor'decai (ALFRED), b. in North Carolina about 1800; graduated at West Point, and was appointed second lieutenant of engineers July, 1823, remaining at the Military Academy as professor of philosophy and engineering till 1825; transferred to the ordnance corps with the rank of captain 1832, and in 1855 sent by the government as member of the military commission to the Crimea, etc., his report being published by Congress in 1860; resigned May 5, 1861. Author of various professional works, including the *Ordnance Manual*. In 1863 he became assistant engineer of the Mexico and Pacific R. R.

Morden'te, or **Mordante** [It.], in music, a species of short trill or shake formerly much in use. It was commonly written and played as in the example following:



More (Hannah), b. at Stapleton, Gloucestershire, England, Feb. 2, 1745; was educated at a seminary kept by her two elder sisters at Bristol, in which she afterwards became a teacher; began writing poems, pastorals, romantic tales, and tragedies at an early age; made the acquaintance of Garrick, by whom her tragedies of *Percy* (1778) and *The Fatal Falsehood* were successfully produced at Covent Garden; obtained the warm friendship and admiration of Dr. Johnson, Burke, and the literary circle swayed by them; abandoned writing for the stage from religious scruples while in the height of success, and devoted her pen to the advancement of religion and education; settled at Wrington 1786; produced *Sacred Dramas* (1782), *Florio* (1786), *Thoughts on the Manners of the Great* (1788), and *Religion of the Fashionable World* (1791); established at Bath the *Cheap Repository* (1795), a monthly periodical which attained an immense circulation, in which she published a series of short moral tales, including the celebrated *Shepherd of Salisbury Plain;* acquired a competence by her writings and the management of her seminary; removed to Barley Wood, near Cheddart (1802), where she founded several charitable schools; published *Strictures on the Modern System of Female Education* (1799), which led to her being invited to draw up a programme for the education of Charlotte, the princess of Wales; wrote in 1809 *Cœlebs in Search of a Wife*, her most popular book, followed by *Practical Piety* (1811), and numerous other works; settled at Clifton 1828, and d. there Sept. 7, 1833, leaving a fortune of £30,000, one-third of which was bequeathed for charitable purposes. A pleasing incident in her later career was her affectionate interest in the boy Thomas Babington Macaulay, who resided a considerable time with her, and doubtless owed something of his extraordinary literary career to her watchful care. Her complete *Works* were published in 11 vols. (1830), and several of them are still frequently reprinted. (See her *Memoirs*, by William Roberts (4 vols., 1834), and the *Correspondence of Hannah More with Zachary Macaulay* (1860).)

More (Henry), D. D., F. R. S., b. in Grantham, Leicestershire, Eng., Oct. 12, 1614; was bred a Puritan; studied at Eton and Christ College, Cambridge, where he took a fellowship. In 1675 he became prebendary of Gloucester; d. at Cambridge, Sept. 1, 1687. He is remembered as a mystical philosopher and admirer of Plato and the Cabbalists; author of *Conjectura Cabalistica*, *Philosophical Poems* (1647), *The Mystery of Iniquity* (1664), *Enchiridion Ethicum* (1669), *Enchiridion Metaphysicum* (1671), and of a number of other works characterized by acuteness, great learning, and a thoroughly devout spirit.

More (Sir Thomas), b. in London, England, in 1480, son of Sir John More, judge of the king's bench; studied Latin under Nicholas Hart; became at the age of fifteen a member of the family of Cardinal John Morton, archbishop of Canterbury, for whom he probably acted as secretary or amanuensis in preparing *The Historie of the Pittiful Life and Unfortunate Death of King Edward V. and the Duke of York, his Brother, with the Troublesome and Tyrannical Government of the Usurpation of Richard III., and his Miserable End*, which has been called the first specimen of classical English prose; entered Canterbury College (now Christ Church), Oxford, 1497, where he learned Greek under William Grocyn, the first professor of that language in England; became an intimate friend of Erasmus; studied law at New Inn and Lincoln's Inn; lectured on jurisprudence at Furnival's Inn, and on St. Augustine's *De Civitate Dei* at St. Lawrence's church; resided for some years in a Grey Friars monastery, partaking of the manual labors and spiritual exercises of the monks while pursuing classical studies and learning French and music; married Miss Jane Colt 1505; engaged in the practice of law; soon rose to great eminence; was elected to a magistracy of criminal causes and a member of Parliament for Middlesex; opposed the exactions of Henry VII. both before the courts and in Parliament, thereby incurring the wrath of that monarch, visited upon his father in the form of malicious prosecution, fine, and imprisonment. Soon after the accession of Henry VIII. Cardinal Wolsey was charged to secure for the Crown the services of the brilliant young advocate, which he effected, not without difficulty, and More was successively made master of requests and confidential envoy to the Netherlands (1514 and 1515) to negotiate for the enlargement of commercial privileges. About this time he composed in Latin his most famous work, the *Utopia*, or account of an imaginary commonwealth in a distant island of the Atlantic, of which the manners, laws, and state of society were depicted as a model worthy of English imitation. This work, printed at Louvain, Antwerp, and Paris in 1516, and at Bâle in 1518, was quickly translated into English, Dutch, French, and Italian, and excited universal admiration. More was made privy councillor and treasurer of the exchequer; was knighted 1521; repeatedly sent by Wolsey on special commissions to France; became a favorite of the king through the wit and wisdom of his conversation; was chosen Speaker of the House of Commons 1523; made chancellor of the duchy of Lancaster 1525; accompanied Wolsey on his famous embassy to France 1527, and became lord chancellor 1529. The Reformation had then recently begun; Luther had violently assailed not only his cherished friend Erasmus, but his monarch, and More entered zealously into the lists, attacking the new doctrines upon their weakest points with inimitable learning and wit, as well as causticity. More was by nature conservative; his religious convictions were of the strongest kind; his tendencies to asceticism were now reviving; it is not, therefore, surprising that he regarded the repression of heresy as a duty of paramount obligation, but the accusations of cruelty in the persecution of Protestants seem unfounded. However ready the chancellor might be to aid Henry VIII. as "defender of the faith," he could not be expected to acquiesce in the royal vagaries in dealing with the rights of Queen Catharine of Aragon, and his refusal to countenance the proceedings for divorce led to his retirement from the chancellorship in May, 1532. He thenceforth lived in seclusion at Chelsea; was one of the believers in the divine mission of Elizabeth Barton, the nun of Kent, and in Apr., 1534, was committed to the Tower for refusing to swear allegiance to the "act of succession," which excluded the daughter of Queen Catharine from the throne in favor of the offspring of Anne Boleyn; remained in prison above a year in free communication with relatives and friends; refused to take the oath of submission to the king in his newly-assumed character of head of the Church, and all efforts by the council to change his resolution having proved fruitless, he was brought to trial before the high commission for constructive treason, condemned to death, and executed within the Tower July 6, 1535. By the unanimous consent of historians, Sir Thomas More was one of the greatest minds and purest characters on record. One of More's chief characteristics was his unconquerable pleasantry—a quality which did not desert him even upon the scaffold. His collected *Works*, Latin and English, were published at Louvain 1556–57; the best known, the *Utopia* and the Latin *Epigrams*, have often appeared separately. (See biographies by his son-in-law, Roper, his great-grandson, Cresacre More, Cayley, Sir James Mackintosh, and Lord Campbell.) Porter C. Bliss.

More'a, the ancient *Peloponnesus* [island of Pelops], is the large southern peninsula of Greece, separated from the mainland by the Gulfs of Patras, Corinth, and Egina, and connected with it by the narrow isthmus of Corinth. Area, estimated at 8800 square miles. Pop. 600,000. It is an elevated table-land encircled with high mountains, often arid and unproductive on account of lack of water, but in many places intersected by very fertile valleys. The etymology of the name *Morea*, which in the early Middle Ages superseded the old name, Peloponnesus, is uncertain. Some derive it from *morus*, "mulberry," because the outline of the country is like that of the leaf of the mulberry; others derive it from *more*, a Slavic word, signifying "sea," meaning by it the more maritime part of Greece. The latter seems the more probable, as the land was invaded in the eighth century by Slavic tribes, which settled and remained here, and gave many rivers and places new names of Slavic origin.

Moreau (Hegésippe), b. in Paris Apr. 9, 1810, in very humble circumstances, was educated in the refuge of the destitutes and apprenticed to a printer, worked at his trade in Paris and Provins, led a life of dissipation and destitution, and d. in misery Dec. 10, 1838. Shortly before his death he published a volume of poems which made quite a sensation, and which certainly contains some pieces of exquisite beauty.

Moreau (Jean Victor), b. at Morlaix, in Bretagne, Aug. 11, 1763; studied first law, but joined in 1792 the army of the north as commander of a battalion of volunteers from Rennes, and evinced under Pichegru such a military talent that in 1794 he was made a general of division. In 1796 he commanded the army of the Rhine and Moselle, and penetrated into the centre of Bavaria, driving the Austrians under Archduke Charles before him; but after Jourdan's defeat at Würzburg (Sept. 3), he was compelled to retreat in order not to be cut off from France, and this retreat along the valley of the Danube and through the Black Forest, accomplished in perfect order and without loss, while fighting a superior and victorious army, established his fame as one of the greatest living generals. Incidentally implicated in the conspiracy of Pichegru, he became suspected and received no command for nearly two years; but in 1799 he commanded in Italy, first under Scherer and then under Joubert, and distinguished himself again. By those who wished to overthrow the Directory the dictatorship was offered him, but feeling himself unable to govern a state, he declined the offer and gave his services to Napoleon. Next year (Apr. 25, 1800) he crossed the Rhine at the head of an army of 100,000 men, and now followed the campaign through Bavaria and Austria to the walls of Vienna, ending with the decisive victory at Hohenlinden (Dec. 3), which resulted in the Peace of Lunéville (Feb. 9, 1801)—a campaign as brilliant as that Napoleon made at the same time through Northern Italy. But from this moment a rivalry sprang up between the two great generals. Moreau's wife succeeded in embittering his heart against the First Consul, and Napoleon was determined to seize the first opportunity to crush him. He was arrested (Feb. 15, 1804) as an accomplice of the conspiracy of Pichegru and Cadoudal against the life of the First Consul, and although the proofs were very insufficient, he was declared guilty (June 10) and banished. He went to North America, and settled at Morrisville, Pa., but on the invitation of Alexander I. of Russia he returned to Europe in 1813, and was present at the emperor's side in the battle of Dresden (Aug. 27, 1813), when a cannon-ball fractured both his legs. He d. Sept. 2, at Laun, in Bohemia, and his body was brought to St. Petersburg, where it was buried with great solemnity.

More'head, on R. R., cap. of Rowan co., Ky. (see map of Kentucky, ref. 3–I, for location of county), 35 miles W. by S. of Grayson. Pop. in 1880, 163.

Morehead, or **Morehead City,** seaport of Carteret co., N. C. (see map of North Carolina, ref. 4–J, for location of county), the S. E. terminus of the Atlantic and North Carolina R. R., 36 miles S. E. of New Berne. It is on Old Topsail Inlet, and has a steam-ferry to Beaufort and a line of steamships to New York. Pop. in 1870, 267; in 1880, 520.

Morehead (Charles S.), b. in 1802 in Nelson co., Ky.; was educated at Transylvania University; became a lawyer; was often in the legislature, of which he was three times chosen Speaker; attorney-general of Kentucky 1832–37; M. C. 1847–51; governor of Kentucky 1855–59; was a Clay Whig, but became a strong secessionist, and was confined in Fort Lafayette, near New York, for sedition for a long time in the war of 1861–65. D. near Greenville, Miss., Dec. 23, 1868.

Morehead (James T.), b. at Covington, Ky., May 24, 1797; was educated at Transylvania University and the University of North Carolina, and studied law with J. J. Crittenden; practised law at Bowling Green, Frankfort, and Covington, Ky.; was often in the legislature; lieutenant-governor 1832; governor 1834–36; president of the board of internal improvements 1838–41; U. S. Senator from Kentucky 1841–47; author of a work on *Practice and Proceedings at Law* (1846), etc. D. at Covington, Ky., Dec. 28, 1854.

Morehead (John M.), b. about 1796 in North Carolina; graduated in 1817 at the University of North Carolina; was an able lawyer; president of the Whig national convention 1848; governor of North Carolina 1841–45. D. at Rockbridge, Va., Aug. 28, 1866.

Mor'el [Fr. *morille*], the name given to the members of the genus *Morchella,* belonging to the ascomycetous group of Fungi, and best known for their esculent qualities, being among those fungi which were first used as articles of food. The most widely known species of the genus is *Morchella esculenta,* Pers., which inhabits woody and bushy places, growing chiefly in the spring. The common morel is found in the U. S., as well as in most parts of Europe, but those in commerce come mostly from Germany. From the fact that this fungus prefers to grow on soil over which a fire has recently passed, the German peasants ignited the forests to such an alarming extent that rigid laws were enacted against such depredations.

More'lia, capital of the state of Michoacan, Mexico, and seat of an archiepiscopal see, established in 1863. Founded by the Spaniards as early as 1541, it was called Valladolid until 1828, when the present name was given in memory of the revolutionary chief Jose Maria Morelos, who, as well as Iturbide, was born there. The city is solidly built, with well-paved, regularly laid-out streets embellished by a number of handsome ecclesiastical and other public structures, including, notably, the stately cathedral, with two lofty, graceful towers, erected in 1745. Water is supplied by a costly arched aqueduct, built in 1788 at the expense of the bishop, Fray Antonio de San Miguel, to give employment to the poor during a famine. The present population exceeds 30,000.

Morell' (George), b. at Lenox, Mass., Mar. 22, 1786; graduated in 1807 at Williams College; called to the bar in 1811; removed to Cooperstown, N. Y.; was first judge of the Otsego county court 1827 and 1832; a U. S. judge in Michigan 1832–36; a judge of the Michigan supreme court 1836–43; its chief-justice 1843–45. D. at Detroit Mar. 8, 1845.

Morell (George W.). See Appendix.

More'lla, town of Spain, province of Castellon, is surrounded with walls and defended by a strong citadel which has played a conspicuous part in many Spanish wars. Pop. 7190.

More'los, or **Montemorelos,** formerly *San Mateo del Pilon,* town of Mexico, in the state of Nuevo Leon, 2000 feet above the sea, has manufactures of sugar, rum, hardware, hats, etc., and 9000 inhabitants.

More'los y Pa'von (Jose Maria), b. at Valladolid (now named Morelia in his honor), state of Michoacan, Mexico, Sept. 30, 1765; shot in the city of Mexico Dec. 22, 1815. Of humble parentage, he earned as a muleteer the means of education, and entering the priesthood, for which he felt a strong aspiration, became curate of Carácuaro and Nucupetaro. A pupil of the curate Hidalgo, he joined in the revolt made by the latter against the Spaniards in 1810, and was entrusted with the duty of extending the movement on the S. W. coast, where he soon was at the head of 3000 men, officered by some of the wealthiest and most influential young men of that region. He manifested decided military capacity, with the tact relating to discipline as well as handling his forces. On Feb. 19, 1812, he fought and defeated a Spanish army at Cuautla Amilpas, where he was subsequently besieged by other Spanish forces, but effected his escape to win repeated victories from the Spaniards in other quarters of Mexico, at one time holding Orizaba on the E. coast, then Oaxaca in the S., and yet again Acapulco, which he took in Aug., 1813. In an expedition against Valladolid in Dec., 1813, he was disastrously beaten by Iturbide, after which the tide of fortune ran constantly against him, until he was taken prisoner Nov. 15, 1815, carried in triumph to Mexico, there tried, and shot. In his death the revolt was deprived of its ablest leader. Thomas Jordan.

Moren'ci, on R. R., Lenawee co., Mich. (see map of Michigan, ref. 8–J, for location of county), has a union school, a woollen and a flouring mill. Principal employment, farming and dairying. Pop. in 1880, 1209.

More'to y Caba'ña (Agustin), b. in Spain about 1600; was a fertile and successful dramatist, a friend and imitator of Lope de Vega and Calderon; became an ecclesiastic towards the close of his life, after writing more than 200 plays, of which the most admired was *Desden con el Desden* ("Disdain met with Disdain"), reckoned one of the four most perfect productions of the Spanish drama. D. at Toledo Oct. 28, 1669. An incomplete edition was commenced during his lifetime, and terminated in 1681 in 3 vols. Brunet regards Moreto as the creator in Spain of a true comedy, to which Lope de Vega and Calderon had merely approximated.

Mor'fit (Campbell), M. D., b. at Herculaneum, Mo., 1820; was educated at Columbian College, D. C.; studied chemistry with J. C. Booth, with whom he was associated as editor of the *Encyclopædia of Chemistry* (1850); became a manufacturer of chemicals; professor of chemistry in the University of Maryland 1854–58, when he removed to New York. Author of a work on the manufacture of soap and candles (1847), *Chemical and Pharmaceutical Manipulations* (1848), *Tanning and Currying,* from the French, with additions (1852), *Perfumery* (1855); with Professor Booth prepared the Smithsonian report (1851) on the progress of the chemical arts; also author and editor of other works, chiefly chemical, besides numerous scientific papers.

Morga'gni (Giovanni Battista), b. at Forli, in the Papal States, Feb. 25, 1682; studied medicine at Bologna; practised in his native town and at Venice, and was appointed in 1711 professor of anatomy at Padua, where he d. Nov. 5, 1771. His *De Sedibus et Causis Morborum per Anatomen indagatis* (2 vols., 1761), *Adversaria Anatomica* (3 vols., 1706–19), and *Epistolæ Anatomicæ XVIII.,* form the foundation of pathological anatomy.

Morgan, cap. of Calhoun co., Ga. (see map of Georgia, ref. 6–F, for location of county), 25 miles E. of Fort Gaines. Pop. in 1870, 126; in 1880, 111.

Morgan, cap. of Morgan co., Ut. (see map of Utah, ref. 2–G, for location of county), on the Union Pacific R. R. (Weber Station) and on both sides of Weber River, 25 miles S. E. of Ogden. Pop. in 1880, 433.

Morgan (Charles H.), b. at Manlius, N. Y., Nov. 6, 1834; graduated at West Point, and entered the army as brevet second lieutenant of artillery July, 1857; served with the Army of the Potomac during the civil war as chief of artillery of 2d corps Oct., 1862, to May, 1863, and inspector-general and chief of staff of same corps (with rank of lieutenant-colonel) Jan., 1863, to Mar., 1865, receiving the successive brevets from that of major to that of brigadier-general for gallant services in the field. Appointed brigadier-general of volunteers in May, 1865, he commanded the White River district in the department of Arkansas until mustered out Jan., 1866. Was afterward major 4th U. S. Artillery. D. Dec. 20, 1875.

Morgan (Com. Charles W.), nephew of Gen. Daniel, b. in Virginia in 1790; entered the navy as midshipman 1808; was lieutenant on the Constitution during the cruise in which the celebrated engagements with the Guerrière and the Java occurred, 1812; received from the Virginia legislature a sword for his services on those occasions; became captain 1831; was in command of the Mediterranean squadron 1841–43. D. at Washington, D. C., Jan. 5, 1853.

Morgan (Daniel), b. in Hunterdon co., N. J., 1736; removed to Virginia in early life, and in 1755 joined Braddock's expedition as a wagoner; received 500 lashes in 1756 for an alleged insult to a British officer. On the outbreak of the war for independence he raised a company of riflemen, with which he marched to Boston, and accompanied Arnold's expedition against Quebec, where, after a brave resistance, he was forced to surrender himself a prisoner; upon being exchanged he was appointed (Nov., 1776) colonel of a Virginia rifle regiment, which he commanded with great ability, and was conspicuous at Saratoga; promoted to be brigadier-general in 1780, he was attached to the Southern army, and Jan. 17, 1781, won the victory of Cowpens over Tarleton, successfully avoiding Cornwallis's subsequent pursuit and rejoining Gen. Greene. For this service Congress voted him a gold medal. In 1794 he was again actively employed in suppressing the "whisky insurrection" in Pennsylvania; was a member of Congress 1795–99. D. July 6, 1802.

Morgan (Edwin Dennison), LL.D., b. at Washington, Mass., Feb. 8, 1811; became in 1828 a clerk, and in 1831 a partner, in a wholesale grocery business in Hartford, Conn., and in 1836 established a very successful mercantile business in New York City; was State senator of New York 1843–53; governor of New York 1859–62, performing the duties of his office at that trying time with great efficiency; ranked as maj.-gen. of U. S. volunteers 1861–62 (without pay); U. S. Senator 1863–69; declined the secretaryship of U. S. treasury Feb., 1865, and 1881. He was a munificent patron of Union Theological Seminary, whose library took his name. D. Feb. 14, 1883.

Morgan (George Washington), b. in Washington co., Pa., Sept. 20, 1820; abandoned his studies in 1836 to join the Texan army for independence, attaining the rank of captain: appointed cadet at the U. S. Military Academy in 1841, but without graduating settled in Mount Vernon, O. (1843), and became a lawyer; the war with Mexico again commanded his services, and as colonel of the 2d Ohio Vols. he served a year under Gen. Taylor, and on the increase of the army was appointed colonel 15th U. S. Infantry Mar., 1847, which under Scott he led with ability, receiving the brevet of brigadier-general for Contreras and Churubusco, where he was severely wounded; U. S. consul at Marseilles 1855–58, in which latter year he was appointed minister to Portugal. In the civil war as brigadier-general of volunteers he commanded a division of the Army of the Ohio; of the Army of the Tennessee in the assault on Chickasaw Bluffs, Dec., 1862, and subsequent capture of Arkansas Post. Compelled by reason of ill-health to resign in June, 1863, he was the unsuccessful Democratic candidate for governor of Ohio in 1865; M. C. 1871–75.

Morgan (Sir Henry John), the most celebrated of the early English *flibustiers* or buccaneers, b. in Wales about 1637, was the son of a wealthy farmer; ran away from home in boyhood; shipped as a sailor to Barbadoes; went thence to Jamaica; soon joined a band of buccaneers, of which he ultimately became the leader; increased his numbers by admitting adventurers of all nationalities, and ultimately became possessed of a formidable fleet, with which he repeatedly captured important seaports and ravaged whole districts of the "Spanish Main." Morgan's earliest exploits were on the coasts of Campêche, where he made many prizes. He then combined his forces with those of an older corsair named Manswelt or Mansfield, taking the title of vice-admiral, and the two adventurers, after capturing the island of Santa Catalina upon the coast of Costa Rica, advanced upon Cartagena, which they would have taken had not a quarrel between the English and French buccaneers broken out, in consequence of which they returned to Santa Catalina. Upon Mansfield's death, Morgan became his heir and successor, and thenceforth meditated bolder enterprises. With a well-equipped fleet of twelve vessels he ravaged Los Cayos and the S. coast of Cuba; marched inland; took and ravaged Puerto Principe after a formal battle; took Puerto Bello in New Granada 1668, carrying by assault its three fortresses, putting to the sword the garrisons, and torturing the wealthy inhabitants to produce their hidden wealth. The city was evacuated only on payment of a heavy ransom by the governor of Panamá. Reinforced by a body of French buccaneers under Pierre le Picard, Morgan, with 960 men, attacked and took Maracaybo, a city of 22,000 inhabitants, which was freed from plunder by the payment of a ransom 1669; engaged and captured a formidable Spanish squadron, and returned to Jamaica with an immense booty. In the following year he assembled all the "brothers of the coast" (*hermanos de la costa*) for a raid upon Panamá; made rendezvous at Cape Tiburon, Santo Domingo, Dec. 16, 1670, with thirty-seven vessels and 2200 men; appointed as second in command a Frenchman named Bradelet; took La Rancheria near Cartagena; captured the island of Santa Catalina a second time, obtaining stores of powder and guides, and took and destroyed the fort of San Lorenzo at the mouth of the Chagres River, killing over 300 of the garrison. The buccaneers then ascended the Chagres River in canoes with 1300 men, had to fight with concealed Indians, and suffered much from hunger, but succeeded in crossing the Isthmus, and appeared before Panamá Jan. 26, 1671. The city was defended by four regiments of the line, besides 2800 armed citizens and 2000 savage Indians, but this considerable force was totally routed and the city taken, sacked, and burned. After a residence of a month at Panamá the buccaneers returned to Jamaica with a booty of over $2,000,000. Morgan then returned to civilized life, married the daughter of one of the royal officers at Jamaica, was knighted by Charles II., became commissary of the admiralty, published at London his *Voyage to Panamá* (1683), and spent the last twenty years of his life in opulence in Jamaica, where he d. in 1690. (See Esquemeling (or Œxmelin), *Buccaneers of America* (London, 1684), and Van Tenac, *Histoire Générale de la Marine.*) Porter C. Bliss.

Morgan (Gen. James D.), b. at Boston, Mass., Nov. 19, 1810; went to sea in boyhood in the ship Beverley, which was burned by the mutinous crew; escaped to the coast of South America, and experienced great hardships before returning to Boston; settled at Quincy, Ill., in 1834; engaged in mercantile pursuits; served as captain in the Mexican war; entered the Federal military service in 1861 as lieutenant-colonel of 7th Illinois Vols.; was made brigadier-general for meritorious services at New Madrid and Corinth July, 1862; took part in the campaigns of the Army of the Tennessee, and commanded a division of the 14th corps of Sherman's army during the Atlanta and Georgia campaigns.

Morgan (John), M. D., F. R. S., b. in Philadelphia in 1735; graduated at Philadelphia College 1757; M. D. at Edinburgh 1764, having previously studied under William Hunter and on the Continent; became in 1765 professor of theory and practice in the Philadelphia College, and the principal founder of the medical school; was 1775–77 director-general and physician-in-chief of the army general hospital at Philadelphia. D. in Philadelphia Oct. 15, 1789.

Morgan (Gen. John H.), b. at Huntsville, Ala., June 1, 1826; served in a cavalry regiment in the Mexican war; became a manufacturer of bagging at Lexington, Ky., where in Sept., 1861, he organized the Lexington Rifles, with whom he joined Gen. Buckner in the Confederate service; commanded a squadron of cavalry at Shiloh, and soon afterwards began a series of raids through the portions of Kentucky held by the Union forces, destroying railroads, bridges, and supplies, gaining a wide celebrity. In 1863 he crossed the Ohio River upon a bold raid, but was captured with most of his command, and was confined in the Ohio penitentiary. He succeeded in escaping, and again undertook a raid in Tennessee, but was surprised during the night by Federal cavalry at a farmhouse near Greenville, and killed while attempting to escape, Sept. 4, 1864.

Morgan (Lewis Henry), b. near Aurora, N. Y., Nov. 21, 1818; graduated at Union College in 1840; practised law in Rochester 1844–64; in 1861 he was a member of the New York assembly, in 1868 of the State senate; in 1851 published *League of the Iroquois;* in 1868, *The American Beaver and his Works;* in 1870, *Systems of Consanguinity and Affinity of the Human Family* (*Smithsonian Contributions of Knowledge*, vol. xvii.). His works are authoritative in the U. S. and in other countries on the subjects treated in them. D. Dec. 17, 1881.

Morgan (Sydney **Owenson**), Lady, b. in Dublin, Ireland, about 1780, was the daughter of an actor at the Royal Theatre who anglicized his name from McOwen, and was said to possess some literary ability. She published in 1797 a volume of poems, and afterwards wrote two novels, which met with little success. In 1806 her novel, the *Wild Irish Girl, a National Tale*, gained her a sudden popularity in spite of obvious defects of grammar and the violation of all rules of literary composition. This work introduced her into aristocratic English circles, and in 1812 she married Sir Thomas Charles Morgan, a distinguished physician. She continued for many years to write novels, songs, comic operas, biographies, and works of travel, which were savagely condemned by Gifford and other reviewers, but found favor with a large portion of the reading public, and were pecuniarily profitable. One of her most carefully prepared books was *France* (1817), a critical review of the state of society as observed by her during a residence in Paris, accompanied by appendices "on the state of law, finance, medicine, and political opinion in France," written by her husband. A similar work upon *Italy* appeared in 1821. Among her more popular novels were *Florence Macarthy* (1816), *The O'Briens and the O'Flahertys* (1827), and *The Princess* (1835). In other departments her most celebrated works were probably the *Life and Times of Salvator Rosa* (1823) and *Woman and her Master* (1840). Lady Morgan was long a leader in London literary society, where she gained warm friends and had no lack of bitter enemies. In the last year of her life she published *Passages from my Autobiography* (1858). D. in London Apr. 13, 1859. A collective edition of her works was edited by herself in 1855–56. She is said to have gained £25,000 by her writings, in addition to a pension of £300 conferred upon her by the ministry of Lord Grey. (See *Lady Morgan, her Career, Literary and Personal, with a Glimpse of her Friends and a Word to her Calumniators* (1860), by W. J. Fitzpatrick.)

Morgan (Sir Thomas Charles), M. D., b. in London about 1780; educated at Eton and at St. Peter's, Cambridge; practised medicine for some time in London; resided more than twenty years in Ireland, where he was knighted in 1811; was a commissioner of Irish fisheries and a zealous advocate of Catholic emancipation; wrote much for the *New Monthly Magazine* and other periodicals; resided for several years in France and Italy, aided his wife, the celebrated Lady Morgan, in the preparation of some of her works, and published *Sketches of the Philosophy of Life* (1818) and *Sketches of the Philosophy of Morals* (1822). D. in London Aug. 28, 1843.

Morgan (William). See Anti-Masonry and Freemasonry.

Morgan (William F.), S. T. D., b. Dec. 21, 1818, at Hartford, Conn.; educated at Union College, N. Y., and at the General Theological Seminary in New York City; has published *Sermons*, and has been rector of St. Thomas's P. E. church, New York City, for about twenty-five years.

Morganat'ic Mar'riage [perhaps from the Gothic *morgian*, to "limit," because the wife's rights are "limited;" or perhaps from the German *Morgengabe, donum matitunale*, which constitutes the wife's right to the property of the husband], or **Left-handed Marriage,** in Germany, Austria, and Denmark the marriage of a prince, nobleman, or, in some regions, of any gentleman of rank, with a woman of inferior position, or *vice versâ*. Inequality of rank and social condition is not, however, necessary to a marriage of this kind. A morganatic marriage may be made between persons of perfectly equal condition—in order, for instance, not to prejudice the children of a first marriage by allowing full right to the offspring of a second. Such marriages do not necessarily prevent the contract of perfect marriage with a lady of full rank. Morganatic or inferior wives do not share the rank, titles, or estate of the husband, and the children, if not really illegitimate, are not regarded as of the rank of children of a full marriage, neither can they succeed to the property or the dignity of the father. Under the royal marriage act of England a marriage of this kind has no matrimonial effect whatever, and can obtain none.

Morgan City, St. Mary's parish, La. (see map of Louisiana, ref. 11–D, for location of parish), on R. R. and the Atchafalaya River, 80 miles W. by S. of New Orleans. It is a port of entry, has a good harbor, and is connected with Texan, Havana, and Mexican ports by steamers. It was captured from Union forces by Gen. Richard Taylor in 1863. Pop. in 1870, 776; in 1880, 2015.

Mor'ganfield, cap. of Union co., Ky. (see map of Kentucky, ref. 3–D, for location of county), about 125 miles W. of Louisville, has a college. Pop. in 1870, 300; in 1880, 744.

Mor'ganton, cap. of Fannin co., Ga. (see map of Georgia, ref. 1–G, for location of county), 45 miles E. by N. of Dalton. Pop. in 1880, 143.

Morganton, cap. of Burke co., N. C. (see map of North Carolina, ref. 3–D, for location of county), on Catawba River, and on the Western North Carolina R. R. Pop. in 1870, 554; in 1880, 861.

Morgantown, cap. of Butler co., Ky. (see map of Kentucky, ref. 4–F, for location of county), on the navigable Green River. Pop. in 1870, 125; in 1880, 204.

Morgantown, cap. of Monongalia co., West Va. (see map of West Virginia, ref. 3–E, for location of county), has the State University, also a female seminary and graded school. Pop. in 1870, 797; in 1880, 745.

Morgar'ten, a mountain-pass in the canton of Zug, Switzerland, between Morgarten Hills and Lake Egeri. On Dec. 6, 1315, the Swiss won here their first victory over the Austrians, though numbering only 1400, while the Austrian army consisted of nearly 15,000 men. Services are performed on the anniversary of the battle in a chapel erected at the foot of the hill.

Mor'ghen (Raphael Sanzio), b. in Florence, Italy, June 19, 1758; d. there in 1833. His father, an engraver, gave him early instruction in his art, and, recognizing his extraordinary talent as displayed in seven engravings from the masks of the Carnival in 1778, sent him to the school of Volpato in Rome. Volpato gave him his daughter in marriage, took him into partnership, and shared with him the labor of executing the plate of Raphael's *Parnassus* in the Stanze of the Vatican. In 1790, Morghen visited Naples, but declined tempting overtures to stay there, preferring the offer of the grand duke of Tuscany, a salary of 400 scudi, and free apartments in the city of Florence, with the liberty of engraving such works as he pleased and the right of property in his own plates. The duty imposed was the superintendence of a public school. At this period the reputation of Morghen stood very high. The dedication of the plate of Raphael's *Transfiguration* to Napoleon in 1812 obtained for him honors and preferment. From Louis XVIII. he received the decoration of the Legion of Honor and the cordon of St. Michael. The entire work of Morghen is estimated to comprise 254 pieces, 18 of which are from Raphael; 73 are portraits. The most celebrated plates are *The Last Supper*, his masterpiece, the *Madonna del Sacco*, the *Madonna della Seggiola*, *The Transfiguration*, the *Aurora*, *St. John in the Wilderness*, the *Repose in Egypt*, *Magdalene Penitent*, the *Sleeping Virgin with the Infant Jesus*, the *Holy Family Reposing*, *Diana and her Nymphs*, *The Seasons Dancing before Time*. Among his portraits are those of Dante, Boccaccio, Petrarch, Ariosto, Tasso, Leonardo da Vinci, Raphael, Francesco Moncada, the family of Earl Spencer. Palmerini, the pupil of Morghen, published in 1824 a *Life* and portrait of his master, with a catalogue of his works. Proof impressions of Morghen's masterpieces are rare and command high prices. O. B. Frothingham.

Morgue, The [originally an outer court or entry of a prison], a building (*La Morgue*), on the Quai de Marché Neuf in Paris, where the bodies and clothing of unknown persons found dead are exposed for identification. The name is also applied to similar institutions in other cities.

Mori'ah [the feminine of *Moreh*], a district in Palestine, on one of whose mountains Abraham attempted the sacrifice of Isaac (Gen. xxii. 2) and Solomon afterwards built the temple (2 Chron. iii. 1). This identity has been denied by Dean Stanley and others, but was affirmed by Josephus (*Antiq.*, i. 13. 2), and is accepted by a majority of the best scholars. (See also Jerusalem.) R. D. Hitchcock.

Mori Arinori, b. in the province of Satsuma, Japan, about the year 1846; was among the first students sent to England to be educated; and, after remaining in London two years, returned to Japan. He took part in public affairs after the late rebellion in his country, and was the one who proposed to have abolished the custom of wearing two swords by one of the privileged classes. He was the first to receive a diplomatic mission from his government, and in 1871 was accredited to the U. S. as chargé d'affaires. During his residence in America he devoted special attention to educational matters, and interested himself in preparing two small books in the English language for the instruction of his countrymen. In 1873 he returned to Japan, and in 1875 was appointed first assistant minister of foreign affairs.

Mo'rier (James), b. in England in 1780, was a grandson of William Waldegrave, Lord Radstock; early entered the diplomatic service; was private secretary of Lord Elgin in his embassy to Constantinople; accompanied the grand vizier in the campaign in Egypt against the French, with orders to take part in the anticipated negotiations for the evacuation of the country by the latter; was taken prisoner by the French, to whom his mission was known, and set at liberty with a threat to treat him as a spy should he return to Egypt. Having acquired an intimate knowledge of several Oriental languages, he spent many years as secretary of legation or as chargé d'affaires in Persia; returning in 1816, published *A Journey through Persia, Armenia, and Asia Minor to Constantinople in the years 1808 and 1809* (London, 4to, 1812), *A Second Journey through Persia, etc. between the years 1810 and 1816, with a Journal of the Voyage by the Brazils and Bombay to the Persian Gulf* (1818), and attained great celebrity through his novel descriptive of Persian manners and customs—*The Adventures of Hajji-Baba of Ispahan* (5 vols., 1824–28), which was followed by three others upon the same theme—*Zohrab the Hostage* (3 vols., 1832), *Ayesha, the Maid of Kars* (3 vols., 1834), and *Mirza* (3 vols., 1841). D. at Brighton Mar. 30, 1849.

Mö′rike (Eduard), b. at Ludwigsburg, Würtemberg, Sept. 8, 1804; studied theology at Tübingen, and was for some time active as a minister, but retired on account of ill-health, and lived afterwards in Stuttgart as a teacher. His novels, *Maler Nolten* (1832), *Vier Erzählungen* (1856), etc., as well as his poems, *Gedichte* (1838) and *Idylle vom Bodensee* (1846), made a great impression. He also translated Anacreon and Theocritus. D. June 4, 1875.

Mori′llo (Gen. Pablo), count of Cartagena and marquis of Fuentes, b. at Fuentes de Malsa, Spain, in 1777; entered the Spanish navy 1793; was sergeant of artillery at the battle of Trafalgar, where he plunged into the sea and rescued the flag of his vessel, which had been shot away; served in the land-forces against the French invasion 1808–13, and rose to be field-marshal 1813 and lieutenant-general in 1814 by courage and perseverance; was sent in 1814 with 10,000 men to reconquer the insurgent provinces of Venezuela and New Granada, and after many alternations of fortune was forced by Bolivar to sign the truce of Truxillo 1820; was recalled at his own request; was ennobled, made commander of Madrid 1820, espoused the cause of Ferdinand VII. in the contest with the Cortes 1820–21; then went over to the constitutional cause and obtained command of an army corps, and, once more changing sides, submitted to the French intervention. The restored king, however, refused to pardon his former treason, and Morillo not only suffered the confiscation of his property, but spent most of his remaining days in exile, dying at Rochefort, France, July 27, 1838.

Morin′ (Arthur Jules), b. in Paris, France, Oct. 17, 1795; studied at the École Polytechnique and at the École d'Application, Metz, 1813–19; entered the foot artillery, and in 1855 became a general of division; attained numerous distinctions—the grand cross of the Legion of Honor, membership in the Institute and the Academy, a directorship in the Conservatoire des Arts et Métiers, the presidency of the imperial commission for the Exposition of 1855, the presidency of the Society of Civil Engineers; is widely known as a master of experimental and practical mechanics and dynamics. Among his many important works are a *Mémoire sur la Pénétration des Projectiles, etc.* (1835), *Mémoire sur les Pendules balistiques* (1839), *Mémoire sur les Roues hydrauliques* (1835–39), *Mémoire sur Divers Appareils chronométriques et dynamiques* (1837), *Leçons de Mécanique pratique*, *L'Aide Mémoire de Mécanique pratique, Salubrité des Habitations*, etc. D. Feb. 7, 1880.

Morindine, a yellow crystalline coloring-matter contained in the root of *Morinda citrifolia*, called *soranjee* in the East Indies. (See Soranjee.)

Morindone. See Soranjee.

Mor′ison (John Hopkins), b. in Peterborough, N. H., July 25, 1808; was educated at Exeter Academy and Harvard College, which latter gave him the degree of A. B. in 1835 and of D. D. in 1858; was first settled over the Unitarian society in New Bedford, Mass., and afterwards (1846) in Milton, where he still preaches. Is the author of a *Life of Jeremiah Smith* (1845) and of a *Disquisition and Notes on the Gospel of Matthew* (1859); has been editor of the *Monthly Religious Magazine*, and a frequent contributor to the *Christian Examiner* and other denominational journals. O. B. Frothingham.

Morisonianism. See Evangelical Union.

Morlaix′, town of France, department of Finisterre, at the confluence of the Jarleau and Kerlent, 7 miles distant from the sea. Its harbor, which has 13 feet of water at ordinary and 23 feet at spring tides, is defended by an old castle built in 1542 on a rock in the sea. The railway from Paris to Brest is here carried across the river on a viaduct 934 feet long and 207 feet high. Morlaix has some manufactures of tobacco and paper, and considerable trade in corn, butter, oil-seed, pork, tallow, candles, honey, and wax. Pop. 15,346.

Mor′laks [*Morlacci* or *Primortzi*, "maritime people"], a rude S. Slavic race found in Dalmatia and the Austrian coast-lands. They are mostly sailors and devout Roman Catholics. The Morlaks of the interior make the best soldiers among the Dalmatian troops.

Morley (Henry), b. in London Sept. 15, 1822; educated at King's College, London; practised medicine 1844–48; was for two years a successful instructor; became in 1851 a London journalist, and afterwards edited the *Examiner;* lecturer on English literature at King's College, London, 1857–65, and in 1865 became professor of English language and literature at University College, London. Author of *How to Make Home Unhealthy* (1850), *Defence of Ignorance* (1851), *Lives* of Palissy, Cardan, Cornelius Agrippa, Marot, etc.; *English Writers before Chaucer* (2 vols., 1864–67), and other works.

Morley (John), b. at Blackburn, Lancashire, England, Dec. 24, 1838; educated at Cheltenham and Lincoln College, Oxford, graduating in 1859; is a liberal in politics; editor since 1867 of the *Fortnightly Review;* author of *Edmund Burke* (1867), *Critical Miscellanies* (1871), *Voltaire* (1872), *Rousseau* (1874).

Morley (Thomas), b. in England about 1545; was a musical pupil of William Birde; studied at Oxford; imitated the Italian style; was a skilful performer and a prolific composer of anthems, church services, ballets, canzonets, and madrigals. He published four books of *Madrigals* (1594–1601), a *Plaine and Easie Introduction to Practicall Musicke* (1597), and *The Triumphs of Oriana* (1601), an extraordinary performance, being a collection of twenty-four madrigals in honor of Queen Elizabeth (Oriana) by as many English verse-writers, set to music by "Thomas Morley, Bach. of Musicke and Gentleman of Her Majesty's honorable Chapell." One of the verse-writers was John Milton, father of the celebrated poet. Morley d. at London in 1604.

Morman′no, town of Southern Italy, province of Cosenza, situated on a hill about 15 miles from Castrovillari. Pop. 5890.

Mormon, Book of. See Mormons and Smith (Joseph).

Mormon Migration. See Mormons.

Mor′mons, or, as they call themselves, **The Church of Jesus Christ of Latter-Day Saints,** a religious sect founded in 1830 by Joseph Smith at Manchester, N. Y., settled since 1847 in the Territory of Utah under the presidency of Brigham Young, and comprising about 200,000 members, including about 50,000 living in other countries. The distinguishing peculiarities of the sect are, in religious respects, the belief in a continual divine revelation through the inspired medium of the prophet at the head of the Church; in moral respects, the practice of polygamy; and in social respects, a complete hierarchical organization. The government of the Mormons is a pure theocracy; its officers form a complete priesthood. The supreme power, spiritual and temporal, rests with the first presidency, elected by the whole body of the Church, and first filled by Brigham Young, Heber C. Kimball, and Daniel C. Wells. Then follows the office of the patriarch, first held by the nephew of Joseph Smith; then the council of the twelve apostles and of the seventy disciples; then the orders of high priests, bishops, elders, priests, teachers, and deacons. But of the first presidency two members are only coadjutors; one alone is the real head of the whole organization—the prophet, the seer—and he alone has the "right" of working miracles and receiving revelations. This belief in a continual divine revelation through the medium of the prophet—a belief which enjoins absolute obedience to the commands of the revelation on the part of all persons who accept it—is the cornerstone of the social building of Mormonism, the only vital agency in its history, the whole secret of its success; and the day it dies out, Mormonism is nothing but a heap of nonsense. The Mormons accept both the Bible and the *Book of Mormon* as divine revelations, but they hold them both subject to the explanations and corrections of the prophet. Thus, polygamy was originally condemned by the Book of Mormon, but in 1843 Joseph Smith received a revelation according to which it was not only permitted, but recommended. Joseph Smith, who was a man of gross sensuality and utterly unable to control his passions, found it impossible to lead a life of personal profligacy and yet carry out the rôle of a divinely-chosen organ for the foundation of a new religion. There was nothing to do under such circumstances but to reverse the generally accepted ideas of sin and holiness; and since the emigration to Utah the Mormons have openly avowed and preached the doctrine of polygamy, the number of a man's wives and children being considered of the greatest consequence to his perfection in the future state. The Book of Mormon was the legitimation by which Joseph Smith first introduced himself to the world—the guaranty he gave for the divine character of his mission. An angel from heaven appeared before him and told him where this book, the Bible of the Western continent, the supplement to the New Testament, the fulness of the divine revelation, was hidden. On the spot designated by the angel Mr. Smith found in a stone box a volume six inches thick and composed of thin gold plates, eight inches by seven, held together by three gold rings. These plates were covered with writing in the "reformed Egyptian" tongue—whatever that may be—but besides the volume Mr. Smith found the "Urim and Thummim," a sort of supernatural spectacles—for the puerilities of children's stories are not wanting—which enabled him to read and understand the characters. Sitting behind a curtain drawn across the room, he then dictated a translation—for he could not write himself—to his secretary, Oliver Cowdery, and this translation was printed in 1830, accompanied by testimonials from eleven persons who had seen the golden plates before they unfortunately disappeared. It was soon proved beyond doubt that the Book of Mormon was simply a sort of historical romance written in 1812 by one Solomon Spalding, who indulged in that kind of authorship, though he never succeeded in getting his productions published, and that the manuscript had become lost in a printing-office in Pittsburg under the hands of an apprentice, Sidney Rigdon, who in 1829 became an associate of Joseph Smith. But all argument on this point proved utterly useless, as those who were able to accept evidences needed none, while those who needed them were incapable of accepting them. The book pretends to give the history of America up to the fifth century of our era; the first settlement of the country after the destruction of the tower of Babel and the dispersion of the nations; the second settlement in the sixth century B. C. by Lehi and his sons, arriving directly from Jerusalem; the origin of the American Indians from the unfaithful Jews, who were condemned to have "dark skins:" the arrival and preaching of Christ in America; the final destruction of the faithful; and the command from God to the prophet Mormon to write down an abridgment of all these events and hide the volume—the whole being interspersed with clumsy remarks relating to Calvinism, Methodism, Universalism, and Millenarianism. With this book as a basis for his teaching, and guided by divine revelations whenever such were needed, Joseph Smith began to preach, and in Jan., 1831, he led the first Mormon congregation, consisting of thirty members, from Manchester, N. Y., to Kirtland, O., which place became the head-quarters of the sect for the following seven years. Its growth was rapid, though not remarkably so. The breaking up of the one universal Christian Church into a number of more or less individual conceptions of Christianity, which has been the characteristic of Christian progress and development, especially in this last century, has caused, at least for the time being, in the lower strata of the Christian population a looseness of ideas and a confusion of feeling which make it very easy for any one to make converts among them if he be only sufficiently positive. Under such circumstances it is rather singular that the Mormons have worked for nearly half a century and have not now more than about 200,000 adherents, for they were exceedingly positive. But in Joseph Smith a certain visionary fanaticism, which made him well suited to the business he had chosen, was connected with so much licentiousness and fraud that internal discrepancies and external conflicts soon arose, and the whole enterprise would no doubt have burst but for Brigham Young, who joined the sect in 1832. He was a man of indomitable will, gifted with a most impressive eloquence, in possession of a decided talent for organization, and of great business shrewdness; and he was ambitious. Power was his ruling passion, and the passion of power is very seldom entirely destitute of moral elevation. The whole success of the sect and all the elements of respectability which it contains are due to him, while all its miseries and all its excesses had their roots in Joseph Smith's character. All his business transactions in Kirtland were more than doubtful. The bank of which he had made himself president failed in 1838, and he had to flee in order to avoid being arrested for fraud. Meanwhile, the great body of the sect had emigrated into Missouri, and settled chiefly in and around Far West. But their conduct had now become so offensive to their neighbors that they lived in a state of actual warfare, and at the close of 1838 they were driven out of the State. Crossing the Mississippi, they retired into Illinois, and settled in the vicinity of Commerce, where they founded the city of Nauvoo, and lived there for seven years. Great advantages were given them there. A charter was granted to the city which nearly made it independent of the State government, and the Mormons had everything their own way. Thus, the city prospered well, though not better than many other new towns of America; and when speaking of the Mormons it must always be remembered that one part of their success is due to the abundance of rich soil which they have had for nothing, and another to the previously accumulated capital which flowed freely into their society, for it was their practice to leave their old and poor converts behind and carry away the young and rich. That part of their success which is due to their peculiar religious, moral, and social organization is singularly small. At Nauvoo the whole association came near its dissolution. The dissipation of Joseph Smith provoked even his intimate friends, and the divine revelation concerning polygamy, with which his sins were to be covered, excited at first general indignation. A newspaper published by one of his former friends began to expose his outrages and crimes, and when, at the head of his personal party among the Mormons, he razed the printing-office to the ground and expelled the publisher from the city, a warrant for his arrest was obtained by this man and served upon him. He refused to obey; the militia was called in to enforce the warrant. The Mormons armed at Nauvoo to resist it; and civil war was on the eve of breaking out when the governor succeeded in persuading the prophet to surrender and take his trial. He was brought to the jail at Carthage, and on the evening of his arrival (June 27, 1844) he was shot there by a mob. In the following year the legislature of Illinois repealed the charter of Nauvoo, and the situation of the Mormons in the State had now become so precarious that a new emigration was deemed necessary. Preparations were immediately commenced under the leadership of Brigham Young, who was elected prophet after the death of Joseph Smith, and with admirable firmness and circumspection he led a host of about 16,000 persons across the prairie deserts to Salt Lake Valley—a movement which it took about two years to perform. (For the further history of the Mormons see the articles UTAH and BRIGHAM YOUNG; for details concerning the origin of Mormonism see the article on JOSEPH SMITH. (See also *Book of Mormon*, 1879; *Book of Doctrine and Covenants*, 1876; Elder John Jaques, *Catechism for Children*, 1877, and N. W. Green, *Mormonism*, 1870: T. B. H. Stenhouse, *Rocky Mountain Saints*, 1873; John W. Gunnison, *Mormons or Latter-Day Saints*, 1852; Hepworth Dixon, *Spiritual Wives*, 1868; J. H. Beadle, *Life in Utah*, 1870.)

CLEMENS PETERSEN.

Mormop′idæ [from *Mormops*, one of the genera], a family of insectivorous bats with rudimentary nasal appendages; the ears are moderate and each has a distinct tragus; the intermaxillaries are well developed; the molars ($\frac{5}{6} -- 1 \times 2$) have W-shaped ridges; the incisors ($\frac{2}{2} \times 2$) are small; the stomach is sacciform, and has the two extremities approximated. They feed upon insects. The family—or, according to Dr. Peters, sub-family—has three genera—viz. *Mormops*, *Chilonycteris*, and *Pteronotus*. Their known species are West Indian animals. The family needs confirmation. THEO. GILL.

Mormyr′idæ [from *Mormyrus*, the ancient name of a sea-fish applied erroneously to the typical genus], a family of fishes of the order SCYPHOPHORI (which see), of which the body is more or less oblong; the scales cycloid and with sculptured reticulated exposed areas; the head covered with a naked skin; eyes more or less lateral; the opercular apparatus with the interoperculum atrophied; the mouth subterminal or inferior, with the cleft narrow and transverse; the margin of the upper jaw formed in the middle by the intermaxillaries, which are united into a single bone, and on the sides by the supramaxillaries; teeth variable; branchial apertures restricted to narrow lateral slits; branchiostegal rays are six, two external stout and four internal slender; the fins well developed, the dorsal and anal variable in actual and relative proportions; each with a series of pores at the base; the caudal always well developed and distinct; ventrals always present and abdominal; the air-bladder is simple; the stomach sub-globular, with two pyloric cæca; on each side of the tail are linear or band-like gelatinous bodies, which have been regarded, but erroneously, as electric organs. The family is peculiar to the fresh waters of Africa; about thirty species are known, which have been distributed in a number of genera—viz. *Mormyrus*, *Mormyrodes*, *Gnathonemus*, *Mormyrops*, *Marcusenius*, *Petrocephalus*, *Hyperopisus*, and *Isichthys*. Several of these are found in the Nile, especially in its upper parts, and engravings of them have been perpetuated on the monuments of Egypt.

THEO. GILL.

Morning Glory. See CONVOLVULUS.

Morny′, de (CHARLES AUGUSTE LOUIS JOSEPH), DUKE, b. in Paris Oct. 23, 1811, was a son of Queen Hortense of Holland and Count de Flahault, and consequently a half brother of Napoleon III. But his birth was kept a secret. He was adopted by a count De Morny, a resident of Mauritius, and educated by his paternal grandmother, Madame de Souza. He entered the army, fought with distinction in Algeria, and was made a chevalier of the Legion of Honor. But, Queen Hortense having died in 1837 and left him an annuity of 40,000 francs, he abandoned his military career, returned to Paris, and divided his time and energy equally between dissipation and financial speculation. But the most brilliant part of his life falls after 1850. As minister of the interior he was the executor, and probably also the instigator, of the *coup d'état;* and, though he soon retired from the cabinet and contented himself with the chair of president of the *corps legislatif,* he continued to exercise a considerable influence on the emperor. He was, indeed, next to the empress Eugenie, the most characteristic figure of the second empire. D. of sheer exhaustion, Mar. 10, 1865.

Moroc'co, sultanate of North-western Africa, situated between lat. 27° and 36° N., lon. 4° 30′ E. and 11° 50′ W., bounded by Algeria, the Mediterranean, the Strait of Gibraltar, the Atlantic, and Sahara. The area of the sultanate is estimated at about 305,000 square miles. The coast along the Atlantic is generally low, flat, sandy, very dangerous to navigate, and affording only a few harbors—El-Harish, Rabat, Casablanca, Mazagan, Saffee, and Mogadore; of which the best and most important are Mazagan and Casablanca. The coast from the Strait of Gibraltar eastward along the Mediterranean is high, bold, and rocky. The principal harbors here are Tangier, on the Strait of Gibraltar, and Tetuan. Spain owns Ceuta and several other points on this coast. A beautiful and very fertile plain, containing all the large cities, Morocco, Fez, etc., extends between the coast-range and the Atlas Mountains, which in several parallel lines traverse the country from N. E. to S. W. None of the peaks of the Atlas reach the line of perpetual snow; Miltzin, the highest point, situated 30 miles S. E. of the city of Morocco, rises 11,500 feet, but is often entirely free from snow. A number of rivers originate in the Atlas—the Draa, Nun, and Sus flowing to the Atlantic, the Muluia to the Mediterranean—but none of them are navigable. They are generally rapid and even turbulent in the spring, but often disappear altogether during the summer. The climate in the plain is delicious, tempered by cool breezes from the Atlas, which keep off the scorching winds from Sahara; in the wet season, from November to March, showers are frequent. In the mountains and on the southern slope extreme heat and cold alternate, and the changes are often very sudden. Excellent marbles of different kinds are found; gold, silver, copper, tin, nickel, rock-salt, and sulphur; iron is abundant and of good quality, and traces of ancient mines, probably worked by the Carthaginians, are met with in several places. The luxuriant forests which clothe the mountains contain oak, cedar of Lebanon, pine, and many kinds of valuable timber-trees. In the valleys and the plain all the cereals, fruits, and vegetables of the warm and temperate zones can be cultivated—wheat, maize, rice, sugar, cotton, tobacco, grapes, oranges, figs, almonds, dates, beans, peas, saffron, etc. But agriculture is generally in a very backward state, and the country sometimes does not produce sufficient wheat for its own demand. Large herds of cattle, horses of a small but spirited breed, goats whose skins furnish the famous morocco leather, and camels, are reared, but exportation is forbidden. The lion and panther are frequent in the forests, the hyæna, jackal, and wild-boar in the plain, the gazelle and the ostrich in the regions bordering on Sahara; numerous serpents, scorpions, lizards, and insects. Manufactures of fine woollens and silks are carried on at Fez, of bricks and silver ware in other places; but the only branch of industry carried to perfection and extensively developed is that of leather. The commerce is inconsiderable; the traffic with the southern and eastern countries is carried on by caravans. The inhabitants, estimated, but probably too highly, at 6,400,000, are Berbers (generally agriculturists), Arabs (nomads), Moors (often employed in offices), Jews (merchants), and negroes (often slaves). The languages spoken are dialects more or less corrupted of the Berber, Arabic, Spanish, and negro tongues from the interior of Africa. The reigning religion is Islam. In ancient times the country formed part of MAURITANIA (which see); in the seventh century it was conquered by the Arabs, whose religion and customs the Moors adopted. In 787 the kingdom of Fez was founded; in 1058 that of Morocco. In 1648 the present dynasty ascended the throne. In 1814 slavery of Christians was prohibited, and in 1817 piracy was suppressed. CLEMENS PETERSEN.

Morocco, one of the capitals of the sultanate of Morocco, situated in lat. 31° 38′ N., lon. 7° 36′ W., in a plain at the foot of the Atlas, 1500 feet above the level of the sea, is surrounded by a wall 23 feet high, 7½ miles in circuit, pierced by seven gates, and flanked with numerous towers, but now generally in a dilapidated condition. The city was founded in 1072, and was in the thirteenth and fourteenth centuries a famous seat of learning, to which the Moors of Spain sent their children to be educated, and said to have had 500,000 inhabitants. It contains still many large mosques and a magnificent palace, but otherwise its splendor has decayed. Of its manufactures, that of red and yellow morocco is famous; its commerce is chiefly carried on by the Jews, who number about 6000, but live in an abject condition. Pop. estimated at 50,000.

Morocco Leather is the name given originally to leather made from goat skins tanned with sumach, but is now applied also to the inferior sort (roan) made from sheep skins. The name appears to be derived from the superior excellence of the leather formerly obtained from Morocco. The goat skins are steeped in water to remove the hair, and are then scraped clean and smooth on the fleshy side, and placed in milk of lime. From the lime-pits they are drawn out from time to time, laid to drain, and then steeped afresh. When the hair has become thoroughly loose, it is scraped off with a double-handled steel knife. After a few more days' steeping it is scraped on the flesh side until it is smooth and even. The skins are then placed in a liquid made from the dung of pigeons and hens. This done, they are sewn up in a bag shape, the grain being outside. A small orifice is left, and in this a funnel is inserted and a strong infusion of sumach is poured in. A number of the skins thus filled are rolled about in a large tub containing a weaker solution of sumach. The object of this motion is to accelerate the action of the liquid contained in the skins, as well as to subject all portions of them to the equal action of the bath. They are then heaped upon a wooden rack, and pressure brought to bear until the sumach penetrates the pores and brings the tannin into the closest relationship with the fibres. The tanning is completed by a repetition of the process described, which can all be accomplished in one day. The bags are unsewn, scraped, and hung up in the drying-loft. When again wetted and smoothed with a rubbing instrument they are ready for dyeing, being sewn together at the edges, as only one side has to be colored. The mordant used is a solution of tin or alum-water. The dye used is chiefly cochineal; boiled with alum, it forms a red liquid which is filtered through linen into a cask. The skins undergo immersions in this dye. They are then rinsed and tanned with sumach, and afterwards fulled with beetles, polished, and dried. Variations in color are obtained by the use of other dyestuffs. The final operation is that of currying. The process varies according to the purpose for which the skins are intended. (See LEATHER.)

Enamel oilcloth, made to look like morocco leather, is now extensively used. Real morocco leather is considered to be the best material for bookbinding, and the estimation in which it is held has led to extensive counterfeiting, inferior sheep skins being dressed and dyed to resemble it as much as possible. The preparation of imitation morocco from sheep skins does not vary greatly from that used for the genuine article. The color of the leather is not always given by dyeing, as almost any hue can be obtained by topical application. Aniline dyes have been used, but are said not to be durable. W. E. A. AXON.

Moron', town of Spain, province of Seville, on the Guadeira. Its castle, built by the Moors, was formerly one of the strongest fortresses of Spain, but was blown up by the French in 1812. Pop. 14,879.

Mor'pheus, in Roman mythology, the god of dreams, the son of sleep (from Gr. μορφεύς, the "moulder," the former of dreams), is generally represented as an old man with huge wings and a horn exhaling a somniferous odor.

Morphia. See OPIUM.

Morphol'ogy [Gr. μορφή, "form," and λόγος, "discourse"], **Animal,** is that branch of zoology, in its widest sense, which treats of the general form (not outline) and organization of animals, and the principles involved, as well as the correspondence in the various forms of the several members and parts, so far as they are comparable in any structural characters, but entirely independently of the uses of the parts and organs. It thus contrasts with animal physiology, which treats of the organization in whole, so far as respects adaptation to surroundings, as well as the various parts and organs, so far as their uses and functions are concerned. To discover the unity of organization in diverse forms of the animal kingdom, and the essential similarity in their mode of evolution, are the principal problems within the province of morphology.

Characteristics and Method.—The science thus distinguished is of comparatively late development, inasmuch as the tendency of the human mind (as is exhibited in the phraseology used in daily life as well as in the history of science) is to determine organs and parts from the consideration of their uses, rather than their intimate structure. This is exemplified, for instance, in the terms applied to the members; thus, the fore as well as hind limbs of quadrupeds when adapted for walking are all called legs; when, however, the fore limbs are specialized for certain other purposes, as grasping, etc., they are called arms; when for flying, they are designated as wings; and when modified for swimming, they are re-named fins. On the other hand, the appendages for walking in the insects are called by the same name as the analogous limbs of vertebrates—*i. e. legs*—although developed in a very different manner; the flying appendages of insects are called *wings*, as are those of bats and birds, although the former are the result of an outgrowth of the integument, while the wings of the vertebrates are developed from the fore limbs; the common name *gills* has also been given to the organs of respiration, through the medium of water, of fishes, as well as of mollusks, worms, etc.; and that of *lungs* has been applied to organs for respiration, through the medium of air, in the air-breathing vertebrates, as well as in the air-breathing mollusks, although the organs thus designated in the several cases have nothing in common except their functions, and are developed from entirely different elements of the organism. In like manner have the words *mouth, jaws, teeth*, and in fact the names of all parts of the organization, been applied from a consideration of the real or supposed functions, and not with reference to their anatomical correspondence in the different types of the animal kingdom. So far, too, has this predisposition been carried to view objects with reference rather to their relations to the surrounding media than with reference to structure that even the cetacean and sirenian mammals, though agreeing in all structural points with the quadruped mammals, were formerly universally associated with fishes, and are still regarded as such even by some in other respects well-educated persons. Thus, the progress of science in the direction of morphology has been in direct opposition to our prepossessions, and has slowly but steadily advanced in proportion as our knowledge of the structure of animals has. This growth has been so gradual that it is difficult to assign the proper meed of praise to those who have contributed to the progress. Without going into details, it is sufficient to indicate that Cuvier's recognition of the four branches of the animal kingdom limited the search for homologies to a great extent within the limits of the respective sub-kingdoms for the various constituents thereof, and in an anatomical direction. Von Baer at nearly the same time recognized still more distinctly the principles of morphology and the limitations of homologies. The transcendental philosophy of Geoffroy Saint-Hilaire, Goethe, Oken, and others, however barren in results elsewise, and although even misleading to a great extent, was at least of some use in the limitation of the identification of parts from physiological considerations, and in the diffusion of morphological ideas, but erred in excessive generalization. Morphology and physiology were, however, in spite of the growth of science, long confused together, and the latter employed at the expense of the former in morphological questions; even Cuvier himself was, to a considerable extent, imbued with this error.

As has already been indicated, a principal object of morphology is the discovery and correct appreciation of the fundamental nature and correspondence of the respective regions and organs in different animals. Comparative anatomy (*i. e.* the structure of the adult animal), comparative embryology in its utmost details (*i. e.* the anatomy of the fœtus or young in its several stages of youth), and histology, are all invoked for the solution of the questions involved in this search. And so far is physiology from being a guide in such investigations that the student must be ever on his guard against being influenced by apparent similarity of functions, or superficial similarities of parts which are subservient to a common purpose. The natural prepossessions with which all must to a greater or less degree start in the consideration of natural history must be also kept in check. Thus, if any structure might be considered unchangeable as a whole, and therefore permitting exact homological comparison throughout a series, it might be supposed that it would be the intestinal tract in its whole extent. Such, however, is far from being the case, and in many forms that which is the principal cavity in the embryo, and evidently represents the oral cavity of the lower forms of animals—*e. g.* polyps and acalephs—becomes closed, or developed as the anus, and a secondary perforation of the body-wall becomes connected with the intestinal cavity and developed as a mouth. In short, the modifications and deviations are so innumerable, and parts that are insignificant in some become of such overshadowing importance in others, and *vice versâ*, that extreme caution is necessary in making comparisons and deciding on the correspondence or homologies of parts. Comparisons, too, are, to a very limited extent, capable of being extended with precision to the representatives of different branches or sub-kingdoms.

Subdivisions and Definitions.—Morphological problems admit of being grouped according to the aim in view by the investigator, and the various problems which fall within this domain have been classified primarily under (1) anatomy (which again has been divided into tectology and promorphology), and (2) morphogeny (including ontogeny or embryology and phylogeny, which is based chiefly on palæontology). Such are the divisions advocated by Haeckel in an extensive work on morphology (*Generelle Morphologie der Organismen*), who defines them as follows: *Anatomy* is morphology in the narrowest sense, and treats of the entire structure of the organism. *Tectology* (or the doctrine of structure) is that science which treats of the composition of the organism from organic elements or entities of different degrees. *Promorphology* (or the doctrine of fundamental form—*Grundformenlehre*) is that science which treats of the superficial form of organic individuals, or their stereometric fundamental form. *Morphogeny*, or developmental history, is the general science of the developing form of the organism. *Ontogeny* (or embryology) is the developmental history of the organic individuals (*onta*). *Phylogeny* (or palæontology) is the developmental history of organic stems or genealogical stocks (*phyla*).

The necessity for exact expression has also given rise to a number of terms of which only those most generally used need be referred to. *Homological* parts are those which agree in structural relations, however much they may differ in functions, and are presumably modified from corresponding primitive elements. Thus, the arms of man, the fore limbs of quadrupeds, the wings of birds, and the pectoral fins of fishes (as of whales) are homologues of each other; so are also the lungs of the air-breathing vertebrates and the swim-bladders of fishes. *Analogous* parts are those which agree in function, however much they may differ in structure, and may be (but not necessarily) modified from entirely different primitive elements. Thus, the wings of birds and of insects are analogues (but not homologues) of each other. Of course, however, those organs which are homologous in detail, such as the wings of different flying birds, are also analogous. *Metameric* or *serially homological* parts are those which agree in general characters and relations, and are developed in an analogous manner, but not from the identically corresponding elements. Thus, the fore and hind limbs are the serial homologues of each other, as are also the different vertebræ in the same individual.

Radiate and Bilateral Symmetry.—Very few general propositions can be enunciated for the entire animal kingdom. It may, however, in general terms, be affirmed (passing by the lowest types, which are amorphous or destitute of form) that there is a tendency to the manifestation of either a radiate or bilateral symmetry in all animals. The radiate symmetry is exhibited in most polyps (sea-anemones, etc.) and acalephs (jelly-fishes, etc.), as well as in the echinoderms (star-fishes, etc.). In these forms the axis may be said to be vertical, and from it the parts radiate outward; these ideally radiating parts (comparable to the separable slices of an orange) are called spheromeres. It is suggestive that this radiate symmetry, which is so characteristic of flowers, is only exhibited in the lowest (next to the protozoans) representatives of the animal kingdom. The radiated form is, however, often more superficial than real, and in the echinoderms especially there is a decided tendency to bilateral symmetry, and the viscera are often irregularly packed. It is notable that the most prevalent number of spheromeres in the radiate types is five, but there are, however, innumerable exceptions. In all of the higher forms of the animal kingdom the disposition is more or less towards bilateral symmetry. This bilaterality is exemplified in the most perfect manner in the articulates, and, although superficially as great in the vertebrates generally, is not so all-pervading, inasmuch as the viscera, as is well known, are always stowed in a more or less irregular manner; in the mammals, *e. g.*, the heart being on one side and the stomach at more or less of an angle with the axis. In these types, also, we find many exceptions to this rule of bilateral symmetry. Even the beetles with large cephalic appendages have those appendages diversely developed on the respective sides. The hermit crabs still more decidedly exhibit asymmetry in their claws as well as in their abdomen. Even in the vertebrates we find striking exceptions to bilateral symmetry; thus, a large group, with many species, of fishes (Heterosomata, including the flat-fishes, etc.) have their eyes on one side, the head being twisted accordingly; and one side is dark, and the other generally whitish. In the toothed whales, also, we find great asymmetry displayed in the olfactory region, the nasal bone of one side being much larger than the other. In the shell-bearing gasteropod mollusks, bilateral asymmetry is much more apparent (rather because it is superficial than because much exceeding that in others) than in articulates and vertebrates, and is the result of the hernia-like protrusion of the intestines, and the development around them of a shell which is extended generally sufficiently to include the entire body. These examples suffice to prove that there is no absolute law of development of symmetry for animals, and indicate that the varieties of forms are rather the results of dynamical coefficients and for adaptation to different conditions of life.

Metamerology, or Vegetative Repetition of Parts.—In many diverse forms corresponding parts are repeated, and sometimes almost *ad infinitum*, in the same individual, and the relation of these forms to more generalized ones indicates that this tendency is not the result of genetic affiliation. This character is best exemplified in certain helminths, as well as in some true worms; in some of the former, especially, it is carried to such an extreme that we find each segment provided with generative organs, and readily separable from the contiguous ones, and capable of producing a head and tail and of attaining complete individuality. The very numerous group of arthropod (footed) articulates is also characterized by a less perfect but still well-marked repetition of segments; and to this repetition, indeed, it owes its name—*articulatus*, "jointed." In the course of specialization from the low to the high, however, differentiation supervenes between the several regions, and the anterior segments become developed disproportionately to the posterior. In the branch of vertebrates the vegetative repetition is exemplified in the segmentation of the dorsal column into vertebræ, and it is contended by many that the skull is the result of the combination of several vertebræ differentiated from the others, and specifically modified for the inclusion of the brain and the several functions connected with alimentation and the senses. (See SKELETON.) This vegetative repetition is also exemplified in the numerous legs which are developed in the myriapod articulates, the six of insects, and the four of most vertebrates. In the vertebrates it is to be noted that the anterior and posterior members of those forms which are chiefly adapted for walking or swimming are very similar, corresponding segments being reproduced for each, and the combinations being much alike in form and otherwise. This similarity is indeed so great and general that we are compelled to recognize the operation of some dynamic law, under which, and for similar purposes, like instruments are evolved; but that this similarity is not due to a simple predetermined plan, and is not the consequence of conformity with any pattern, is evident on further investigation, inasmuch as it is found that in certain forms the respective members are developed for entirely different purposes, and one or the other, or both, may be absent, in whole or in part, or with parts diversely combined. Excessive differentiation of the fore and hind members is manifested in the birds and bats. The fore limbs are wanting in representatives of every class except the mammals—*e. g.* in the extinct Dinornithidæ among the birds, in serpents and some lizards among the reptiles, in cæcelians among the amphibians, and in many fishes. The hinder limbs are also lost in many forms—*e. g.* the sirenian and cetacean mammals, most serpents and some lizards, a few amphibians, and many fishes. The direct relation which exists in all these cases between structure and habits, and the great want of coincidence between the variations noted and modifications of the other parts, bring into strong relief the unimportance of teleology and the significance of morphology; the want of coincidence is only explicable on the assumption of the parts being as they are because of development and retention consequent on adaptability for the specific conditions under which they exist—in other words, natural selection.

Antitropy, or Antero-posterior Symmetry.—It has been maintained by some comparative anatomists that there is an antagonism of the opposite extremes of the body, and that fundamentally those extremes or poles are alike, but modified for adaptation to different ends. It has even been urged that the homotypes of the mouth, tongue, salivary glands, and other organs are represented by parts peculiar to the posterior extreme, and that the posterior limbs are to be compared inversely with the anterior ones. In other words, if we should venture to give expression to this ideal conception in unsophisticated language, the typical animal would be composed of two halves—an anterior and posterior—which would be alike, but face in opposite directions. The view under a metaphorical phraseology has been advocated with much zeal by men of learning and industry; but there seems to be little in nature to verify the conception. If we look at the lowest vertebrate form (*Branchiostoma*), we are very far from finding any realization of the conception, save in superficial aspect; and if we look at man, who is the highest, we equally fail to appreciate the relevancy of the conception. If, going beyond the vertebrates, we examine the tunicates (adult as well as embryonic), from which the vertebrates are supposed to have originated through forms resembling *Branchiostoma*, we find an equally decided contradiction of the hypothesis. In view of these facts, it is not obvious what advantage is gained by the adoption of any hypothesis like that of antero-posterior symmetry. The archetypical animal, as expressed in the most generalized and lowest known form, and the most specialized and highest, almost equally fail to exhibit actual antero-posterior symmetry. It is true that there is an inversion especially manifested in the higher vertebrates in the direction of the several segments of the different members, the humerus being flexed backward and the femur forward; but it is apparently a less violent assumption that these relations are the consequents of mechanical forces, resulting in rotation in different directions and destined for the sustentation of the body, than of either a primitive or prospective tendency or plan with reference to antero-posterior symmetry. The limbs are, in fact, nearly parallel in fishes, but little inverted with reference to each other in amphibians, and most antiverted in the birds and mammals. If there is a tendency to antitropy, it should therefore apparently be most manifest in the highest form. Whether there actually is such antitropy in man is a matter for ordinary observation. The fact, too, that annelids and helminths in fission develop the heads of the segmented individuals from the end nearest the original head is also opposed to the hypothesis in question.

Examples.—The branch of vertebrates being that whose representatives are best understood, as well as most familiar to the educated generally, the application of morphological principles will be best illustrated in their case. This may be done by first taking two extremes, and then endeavoring to ascertain the meaning and relations of the members by the intercalation of intermediate types.

On the one hand, as the highest expression of the animal kingdom, we have man. In brief, he is a vertebrate, erect in stature, with two limbs developed as legs and two as arms; breathing air through the medium of lungs; with a highly-developed brain divided into cerebrum and cerebellum, and with a definite number of nerves connecting with certain organs and parts; a bony skeleton divided into well-marked regions—*e. g.* the skull (in which are to be distinguished the brain-case, the lower jaw directly articulated with the former, several small ear-bones, and the hyoid apparatus), the limbs, etc. On an examination of the abdomino-thoracic cavity we find, besides an intestinal canal, a pair of lungs connecting directly with the oral cavity; a quadrilocular heart; a distinctly differentiated liver; kidneys for the secretion of urine; and highly-specialized organs of generation (in the female, in connection with the ovaries, a uterus, in which the young are for some time borne, and in the male, in connection with the testicles, certain complicated parts).

On the other hand, by far the lowest of the vertebrates, stands the *Branchiostoma lanceolata*. Although a vertebrate, inasmuch as it has a nervous chord encased in a sheath and separated by a vertebral axis from the abdominal cavity, it is without a distinct head, and has rather the aspect of a worm than of a vertebrate; the body is horizontal, and pointed at both ends; entirely destitute of limbs, as well as scapular and pelvic arches; breathes air through the medium of water; has no distinctly differentiated brain (the several regions in the higher forms not being represented as distinct elements), and the skeleton is represented by a simple notochord or persistent cartilaginous axis, which ends in a point forward, no skull being developed; the viscera are also few in number; the intestinal canal has a large perforated pharynx, and thence runs straight and without lateral curvature backward; there are no lungs or air-bladder; the heart is tubular, and not divided into partitions; the liver is a diverticulum of the intestinal canal; the kidneys are extremely rudimentary, and the organs of generation very simple, and scarcely differing superficially in the two sexes.

Such are the extremes exhibited by the members of a universally accepted branch. If we compare these two extremes together, it is at first impossible to perceive any resemblance in whole, or even to recognize the similar or homologous parts in each. The statement so often made in popular works that all the representatives of a single branch or sub-kingdom are built upon the same pattern, and that the corresponding parts are reproduced in all, is most evidently falsified by a comparative examination of the animals in question. It would be indeed absolutely impossible to obtain an adequate conception of the correspondence of these two forms were it not that numerous intermediate types exist which enable us, by successive intercalations, to trace the development of the various organs and parts. The examination of these intermediate forms in their adult as well as in their embryonic condition shows us that not even the rudiments of several parts exist as such in the inferior type. It becomes evident in the course of our examination that the limbs are the development of buds which spring from the side, and these are first developed in selachians (sharks, rays, etc.). The brain becomes gradually developed and differentiated into regions, which finally become subordinate to a central mass (the cerebrum) as we ascend the animal scale, and in the lowest form the nerves alone are present to remind us of the relations of the simple brain—if so it may be called—to the specialized organ of the higher forms. The notochord in *Branchiostoma* does not even represent potentially the skeleton of the higher vertebrates, inasmuch as in them it is the result not only of chrondrification and ossification of that notochord, but also of the union therewith of elements which have originated independently of the axial skeleton: *e. g.* the skull in the higher forms is composed of cartilage bones (bones formed in the cartilage), as well as membrane bones, and, in part at least, the latter are the homologues of dermal plates in the sturgeon and some other fishes. The lungs in the higher forms can be readily connected by regular gradations with the single air-bladder of fishes; and the relations which that has in the generalized or lower fishes, as well as its absence in the selachians, marsipobranchiates, and *Branchiostoma* shows that it was primitively a simple diverticulum of the alimentary canal, and consequently only potentially represented by the undifferentiated surface of the intestinal canal in *Branchiostoma*. In that form, likewise, the liver, so distinct in the higher forms, is represented by merely a diverticulum of the intestinal canal, but already specialized, so as to be actually comparable with the liver.

Causes of Morphological Correspondence.—The "reason why" of the coincidences thus indicated will naturally be called for. The older naturalists were wont to explain that they were in accordance with a "plan" instituted by the Creator in the beginning, and that the representatives of the several great branches or sub-kingdoms of the animal kingdom were constructed after an ideal pattern common and peculiar to the various members of each branch. This, however, was only another way of expressing the fact that the animals of the respective groups did agree in structure, and failed to give the wherefore, as well as in still another point. If a "plan" had been predetermined upon, and "patterns" selected for the construction of animals, any deviation therefrom would indicate subjection to a higher power and failure in ability to carry into execution the original plan. If, therefore, the plan would be evidence of prescience, the failure of execution would prove impotence in ratio to the failure. Now, as already pointed out, every type is deviated from, and innumerable exceptions interfere with every extensive generalization respecting community of structure. The idea of plan, therefore, not only fails to give any explanation for morphological correspondences, but in its actual application and failures is really in antagonism to the conception of divine creative power. The consideration of morphological problems has finally culminated in a general adoption of the theory that the correspondences in question are the results of genetic development from the most generalized common stocks; and this theory is the only one yet broached that is consistent with the deviations from, as well as conformity between, the characters common to groups, and with the subordination of teleological or physiological characters to morphological or structural ones. (See further BIOLOGY, COMPARATIVE ANATOMY, SKELETON, ZOOLOGY, etc.) THEODORE GILL.

Morphology in botany, was somewhat earlier developed than in zoology, as its foundations are perhaps more obvious. In all the higher grade of plants the structure in the vegetation is such as readily to suggest the idea of successive repetition of similar yet sometimes variant parts; and in the blossom the identity of the more prominent parts with leaves is popularly recognized in calling them the leaves of the flower. The step does not seem a long one to take which resulted finally in the morphological view now held; namely, that the upwardly growing parts of a plant—all, indeed, but the roots and mere superficial growths, such as hairs and prickles—consist of joints of stem, developed one from another, each joint bearing at its summit one, two, or more leaves, or what answer to leaves. This idea is fully exemplified in the article BOTANY, and is again referred to in the article LEAVES. A brief historical notice may here be added.

These ideas essentially began with Linnæus, who in 1750 briefly announced that flowers and leaves, flower-buds and leaf-buds, are identical in nature and origin, and that a flower-cup consists of rudimentary leaves united. Several years afterward, in a paper entitled *Prolepsis Plantarum*, he gave these conceptions a somewhat fanciful development, in which the point was lost or obscured; and he also misled his followers by an independent and incongruous speculation, suggesting that the calyx answered to the outer bark of the stem, the corolla to the inner bark, the stamens to the wood, and the pistil to the pith. His earlier and just ideas being thus overlaid, it is not surprising that they bore no fruit. In 1766, Caspar Frederic Wolf, in a second edition of his thesis of 1751, redeveloped and extended these earlier views. His thesis was a theory of generation, and was mainly devoted to animal physiology. But he clearly conceived the plant to be made up of two elements, stem and leaf, in continued succession, and regarded all the organs of the flower as modified leaves. He added an hypothesis to explain how these parts come to be developed as floral organs instead of foliage-leaves: the hypothesis was, that by a diminution of vegetative force leaves degenerate into bud-scales and the like, as in woody plants at the end of the season's growth, to be renewed in full vigor in the vegetation of the ensuing spring; and, similarly, that they degenerate into bracts, sepals, petals, stamens, and pistil, and finally seed, from which the renewed vigorous development in turn proceeds. This thesis was overlooked and forgotten. At least it was unknown to Goethe when, in 1790, he published his better-known paper on the *Metamorphosis* of plants, thus bringing in a name which has long been current, but is now little used. Without entering into details, it is sufficient to state that Goethe clearly indicated by scientific evidence the passage of leaves, or what could or might have been leaves, into bracts, sepals, and petals, and these into stamens, and showed that by retrograde metamorphosis pistils, and indeed all the other parts of the blossom, might revert to leaves. He thus established the leaf as the type from which by "metamorphosis"—or rather by development under other forms, subservient to other uses—all the organs of the flower originated. Goethe also had a gratuitous hypothesis to account for the changes; which was, that vegetable life and growth consisted of a series of successive expansions and contractions—that the plant expanded in vegetation and contracted in inflorescence, and so on—an hypothesis remarkably like that of degeneration and reinvigoration as taught by Wolf, considering that the one was unknown to the other. Goethe's ideas, if not so completely forgotten, produced for fully a quarter of a century no more fruit than those of his predecessor, Wolf. That they had taken no hold out of Germany, and but little there, appears from the fact that they were wholly unknown to De Candolle until several years after he had published the first edition of his *Théorie Élémentaire*. In this work similar notions of morphology were developed, but from a different point of view; viz. from that of a symmetrical plan in the flower—a symmetry which is seldom completely exemplified, at least to superficial inspection, owing to abortions, coalescence, union of heterogeneous parts, or other disguises, but which the instructed botanist readily discerns and interprets. By the time that De Candolle had become aware of Goethe's publication the minds of botanists were ready for morphology, and ever since it has been turned to practical account. The principal steps in its subsequent development, essentially as now received, were soon taken by Robert Brown, Dupetit-Thouars, De Candolle, Roeper, etc., and systematic as well as structural botany was placed upon a morphological foundation.

De Candolle's *Théorie Élémentaire* was the needful counterpart of the theory of *metamorphosis* of Goethe. For, preoccupied with the idea of symmetry, the former nowhere brought out the idea that the parts of the flower answer to leaves. If this idea, which Goethe put forward, had been in De Candolle's mind, he would not have failed to ask the question why flowers are symmetrical in plan, nor to have found the answer to that question already suggested, in a measure, by his father's friend, the pastor Bonnet, in his *Memoir on Leaves*, although it was completely furnished, only much later, by Schimper, Braun, and other investigators of phyllotaxy, beginning about the year 1829. The symmetry of the blossom is an obvious corollary from the symmetrical arrangement of leaves; and the test of almost every morphological interpretation of structure in a flower is its agreement or just analogy with what is true of the leaves. ASA GRAY.

Mor′phy (PAUL CHARLES), b. at New Orleans, La., June 22, 1837; exhibited from childhood surprising skill in chess, and at the age of twelve had defeated the best players of his native city; graduated at St. Joseph's College; studied law, and was admitted to the bar in 1857; at the chess congress in New York in 1857 was the victor, thereby becoming the champion player of the U. S.; in 1858 visited Europe; gained a victory over Löwenthal and others in London; defeated the best French and German players, and gave exhibitions of his ability to play eight games simultaneously without seeing the chess-boards.

After winning the highest honors, however, he suddenly abandoned chess-playing, and gradually conceived such an abhorrence therefor that it almost drove him into a frenzy to have the subject mentioned. Early in 1883, Prof. W. Steignitz of London, who is regarded as the present chess-champion of the world, went to New Orleans purposely to see Morphy, but the latter would not receive him. After his return from Europe he tried to resume his profession as a lawyer, but his mercurial disposition and his erratic habits prevented him from building up a business. He was seized by a melancholia which almost verged upon madness, and d. July 10, 1884.

Mor'rell (William), an English clergyman who accompanied Capt. Robert Gorges to Massachusetts in 1623; resided for a year at Plymouth; returned to England, and published in 1625 a poem in Latin and English heroic verse entitled *Nova Anglia*, interesting as one of the first literary monuments of New England colonization, and containing some elegant and harmonious lines; a copy of it is in the British Museum. The work was reprinted in *Mass. Hist. Coll.*, 1st series, i.

Morrill (Anson P.), b. at Belgrade, Me., June 10, 1803; became a manufacturer and merchant; was governor of Maine 1855–57, and M. C. 1861–63.

Morrill (Rev. David Lawrence), M. D., LL.D., b. at Epping, N. H., June 10, 1772; became a physician of Epsom, N. H., in 1793; pastor of the Congregational church Goffstown, N. H., 1802–11; a practitioner of medicine 1807–30; was many years in the New Hampshire legislature, and in 1816 was its Speaker; U. S. Senator 1817–23; president of the State senate 1823; governor of New Hampshire 1824–27, and afterwards editor of the New Hampshire *Observer*. D. at Concord, N. H., Jan. 28, 1849.

Morrill (Justin S.), b. at Strafford, Vt., Apr. 14, 1810; engaged in mercantile business, and in 1848 became a successful agriculturist; M. C. from Vermont 1855–67; chairman of committee of ways and means and author of the Morrill tariff of 1861; U. S. Senator 1867–73, re-elected in 1873, 1879, and 1885.

Morrill (Lot M.), LL.D., b. at Belgrade, Me., May 3, 1813; educated at Waterville College; became a lawyer in 1839; entered the legislature in 1854; pres. of State senate 1856; gov. of Maine 1858–60; U. S. Senator 1861–76; and was sec. of the treasury June 21, 1876–Mar., 1877; afterward collector of Portland, Me., till his death, Jan. 10, 1883.

Morrilton, Ark. See Appendix.

Mor'ris, or **Nine Men's Morris,** a game played on a board or other material upon which three squares are drawn, one within the other, and having round spots at the corners and at the middle of every side of each square, the adjoining spots being connected together by straight lines. The game is conducted by two persons, with nine pieces for each player, of similar form, and white and black, as in draughts. Each player places the pieces alternately on the spots, endeavoring to prevent his opponent from having three in a row, and the pieces being moved along the lines from spot to spot as occasion requires. When three pieces of a color are in a row, the player takes up one of his opponent's pieces, and he who succeeds in taking off all the other's pieces wins the game.

Morris, city, cap. of Grundy co., Ill. (see map of Illinois, ref. 3–F, for location of county), on the Chicago Rock Island and Pacific R. R. and the Illinois and Michigan Canal, is one of the largest grain-markets of the West, having many warehouses; contains a classical institute, school-furniture, plough, and cultivator factories, extensive mines of bituminous coal, numerous carriage and repair shops, etc. Pop. in 1870, 3138; in 1880, 3486.

Morris, R. R. junction, cap. of Stevens co., Minn. (see map of Minnesota, ref. 8–B, for location of county), 159 miles N. W. of St. Paul. Pop. in 1880, 743; in 1885, 1230.

Morris (Charles), b. at Woodstock, Conn., July 26, 1784; entered the navy July 1, 1799, and served during the war with Tripoli; promoted to be lieutenant in 1807, and was distinguished in the war of 1812 as first lieutenant of the frigate Constitution, being severely wounded in the engagement of that ship with the British frigate Guerrière, Aug. 19. Received a captain's commission and took command of the Adams, in which he made a very successful cruise, but which he was compelled to destroy in 1814, while lying in the Penobscot River in a disabled condition, to prevent her falling into the possession of an expedition sent to capture her. Subsequently in command of the Brandywine, he conveyed La Fayette back to France in 1825, and later attained the rank of commodore and commanded a squadron. For many years he was in charge of various bureaus in the navy department, being chief of the bureau of hydrography at the time of his death, which occurred at Washington Jan. 27, 1856.

Morris (Clara), b. at Cleveland, O., in 1850, received the first elements of dramatic education as a member of the ballet corps at the academy of music of her native city. In 1869 she played young lady's parts at Wood's theatre in Cincinnati, and in 1870 at the Fifth Avenue theatre in New York. In the next season she made a great hit by her impersonation of Annie Sylvester in *Man and Wife*. Her success was still greater in *Divorce, Article 47, The Geneva Cross*, etc. Her forte is the emotional rather than the passionate, and among the emotions more especially those of sorrow, grief, and suffering. But in parts of that description she has at her disposal a vividness and presence of imagination, a truthfulness and correctness of expression, and a sympathetic power which absolutely sway the audience. She was married to F. C. Harriott of New York in 1874.

Morris (Edward Joy), b. in Philadelphia July 16, 1815; graduated at Harvard 1836; in the State legislature 1841–43; in Congress 1843–45 and 1857–61; *chargé d'affaires* at Naples 1850–54; U. S. minister to Turkey 1861–70; author of a book of travels in the Levant (1842) and of several valuable translations from the German. D. Dec. 31, 1881.

Morris (Francis Orpen), b. at Beverley, Yorkshire, Mar. 25, 1810; graduated at Oxford 1833; took orders in the Church of England; became incumbent of Nunburnholme, Yorkshire, and was chaplain to the late duke of Cleveland. He has published a *History of British Birds* (1851–57), *Bible Natural History* (1852), *Records of Animal Sagacity and Character* (1861), *Natural History of British Moths* (1859–71), *An Essay on the Eternal Duration of the Earth* (1870), *Difficulties of Darwinism* (1870), *Dogs and their Doings* (1871), several monographs on the nests of British birds, on butterflies, etc., and various other works on scientific, antiquarian, social, and religious topics.

Morris (George P.), b. at Philadelphia Oct. 10, 1802; removed in early life to New York, where he soon began to write for the press; published the New York *Mirror*, in connection with Samuel Woodworth, 1823–42; was the associate of N. P. Willis in publishing the *New Mirror* (1843), the *Evening Mirror*, assisted by N. P. Willis and Hiram Fuller (1844), the *National Press* (1845–46), and the *Home Journal* (1846–64); in the latter he was assisted by N. P. Willis. Mr. Morris was one of the best song-writers. Among his most popular songs were *Woodman, Spare that Tree, My Mother's Bible, We were Boys Together, The Miniature, Where Hudson's Wave*; author of several volumes of prose and verse. D. in New York July 6, 1864.

Morris (George Sylvester), A. M., b. at Norwich, Vt., Nov. 15, 1840; graduated with highest honors at Dartmouth College 1861; served in the army; was tutor at Dartmouth 1863–64; studied theology, and spent several years in Germany, chiefly in philosophical studies; translated Ueberweg's *History of Philosophy*, with additions (1871), and became professor of modern languages and literature in the University of Michigan 1870; resigned this position in Feb., 1880, and in the following year was appointed professor of logic, ethics, and the history of philosophy in the same institution; from 1878 to 1885 lecturer on ethics and the history of philosophy in the Johns Hopkins University, Baltimore, Md. He has written on philosophical topics in various reviews and in the *Transactions* of the Victoria Institute, London, and is the author of the following works: *British Thought and Thinkers* (Chicago, 1880), *Kant's Critique of Pure Reason: A Critical Exposition* (Chicago, 1882), and *Philosophy and Christianity*, being the "Ely Lectures" for 1883 (New York, 1883).

Morris (George U.), U. S. N., b. June 3, 1830, in Massachusetts; entered the navy in 1846, rose to commander in 1866, and was retired in 1874. Distinguished himself by his gallant defence of the Cumberland when attacked by the Merrimack, Mar. 8, 1862. In his report for 1862 the secretary of the navy says: "Passing by the Congress, the Merrimack dashed upon the Cumberland, and was received by her with a heavy, well-directed, and vigorous fire, which, like that of the Congress, produced but little effect. A contest so unequal could not be of long continuance, and it was closed when the Merrimack, availing herself of her power as a steam-ram, ran furiously against the Cumberland, laying open her wooden hull and causing her almost immediately to sink. As her guns approached the water's edge her young commander, Lieut. Morris, and the gallant crew stood firm at their posts, and delivered a parting fire, and the good ship went down heroically with her colors flying." D. Aug., 1875. Foxhall A. Parker.

Morris (Gouverneur), b. at Morrisania, N. Y. (now in New York City), Jan. 31, 1752, was of a wealthy family which produced many distinguished public men of New York; graduated at King's College, N. Y., 1768; was admitted to the bar in 1771; was in the provincial congress of New York 1775; assisted in drafting the State constitution 1776; was in the Continental Congress 1777–80; lost a leg in 1780 in consequence of an accident; became in 1781 assistant superintendent of finance, and afterwards was Robert Morris's partner in mercantile business; was one of the committee which drafted the Federal Constitution 1787; was engaged in business in France 1788–91; U. S. agent in London 1791; minister to France 1792–94; was U. S. Senator 1800–03, displaying remarkable ability and eloquence; was one of the fathers of the New York canal system, and president of the canal commission 1810–16; author of numerous essays, etc. D. at Morrisania, N. Y., Nov. 6, 1816; was a man of aristocratic tastes and great hospitality, and in politics was a Federalist.

Morris (Com. Henry W.), grandson of Gouverneur, b. in New York City in 1806; entered the U. S. navy as midshipman 1819; became lieutenant 1828, commander 1849, and captain 1856; commanded vessels on the home rendezvous and the African and Brazilian squadrons 1845–55; was fleet-captain to Com. Stringham in the Mediterranean squadron 1855–56; superintended the construction of the steam sloop-of-war Pensacola at the Washington navy-yard 1861; passed in that vessel the Confederate batteries on the Potomac Jan., 1862; joined the Gulf blockading squadron; took a brilliant part in the attacks upon Forts Jackson and St. Philip and the Chalmette batteries, which preceded the capture of New Orleans; was placed in command of the naval forces guarding that city; lost his health by arduous duty, and d. at New York Aug. 14, 1863.

Morris (John G.), D. D., LL.D., b. at York, Pa., Nov. 14, 1803; graduated at Dickinson College 1823, and in theology at Princeton 1825; was pastor of the First Lutheran church in Baltimore 1826–59, and of another church in the same city six years; was the first librarian of the Peabody Institute at Baltimore, for which he drew up a catalogue containing the titles of 50,000 volumes; published a *Popular Exposition of the Gospels* (1840), translated from the German *The Life of John Arndt* (1853), *The Blind Girl of Wittenberg* (1856), Leonhard's *Geology;* wrote *Quaint Sayings and Doings concerning Luther*, *Life of Catharine de Bora* (wife of Luther), a *Catalogue* and a *Synopsis* of the described Lepidoptera of the U. S., both published by the Smithsonian Institution; *Contributions to the Entomology of the U. S.*, in *Silliman's Journal;* papers on Martin Behaim (1855) and on the Lords Baltimore, printed by the Maryland Historical Society; has written sketches of foreign travel, numerous scientific, religious, and literary essays. He was the first editor of the *Lutheran Observer* (1831–32), and co-editor of the *Year-Book of the Reformation* (1844). He founded the village of Lutherville near Baltimore, and the flourishing female seminary at that place; was one of the founders of the *Record* of the Linnæan Society, published at Gettysburg; delivered several courses of scientific lectures at Pennsylvania College, Gettysburg, and an annual course on *The Connection between Science and Revelation* in the Lutheran seminary at the same place. He has been president or vice-president of numerous scientific, literary, and religious bodies, and is an active member of the American Association for the Advancement of Science.

Morris (John Thomas), S. J., b. at Utakamund, Madras presidency, India, July 4, 1826; became a Catholic while studying at the University of Cambridge; proceeded to Rome and completed his education at the English College; took orders; served in the diocese of Northampton, becoming canon; was for three years vice-principal of the English College, Rome, after which he was appointed secretary to Cardinal Wiseman. In 1867 he entered the Society of Jesus. Father Morris has published a *Life of St. Thomas of Canterbury*, *Condition of Catholics under James I.*, *The Letter-Books of Sir Amias Poulet, Keeper of Mary Queen of Scots* (1874), and a very remarkable work, *The Troubles of our Catholic Forefathers* (2 series, 1874), in which he casts a vivid light upon the forgotten annals of the persecution of Catholics by Queen Elizabeth.

Morris (Lewis), b. at Morrisania, N. Y., in 1671; became a judge of the superior court of New Jersey in 1692, and was prominent in public affairs; was for years chief-justice of New York and New Jersey, and acting governor in 1731; was active in the separation of New York and New Jersey 1738; governor of New Jersey 1738–46; d. at Kingsbury, N. J., May 21, 1746.

Morris (Lewis), one of the signers of the Declaration of Independence, was the eldest brother of Gouverneur Morris, b. in 1726 at Morrisania, N. Y.; graduated at Yale 1746; was in 1775 active in detaching the Indians from the service of Great Britain; was in the Continental Congress 1775–77, and afterwards a major-general of militia. D. at Morrisania Jan. 22, 1798.

Morris (L. N.), b. in New York 1800, grandson of Lewis, signer of the Declaration of Independence; graduated at West Point 1820; after twenty-five years of garrison and frontier life the war with Mexico offered an opportunity for more active duty, and at Palo Alto and Resaca de la Palma Morris nobly performed his duty, and at Monterey, on the first day of the fight, was killed while leading an assault, Sept. 21, 1846. At the time of his death he was a captain of the 3d Infantry and brevet major.

Morris (Lewis O.), b. at New York, son of the above; in 1847 entered the army as second lieutenant, and in the war with Mexico participated in the siege of Vera Cruz and subsequent operations. On the outbreak of civil war in 1861 he was in command (rank of captain) of his battery in Texas, which he refused to surrender. Appointed colonel 113th New York Vols. in 1862, his command was stationed in the defences of Washington, where it was converted into a heavy artillery regiment, and as such attained a high degree of proficiency. In May, 1864, his regiment was joined to the Army of the Potomac, and engaged in all the battles of that memorable campaign, Morris being most of the time in command of a brigade up to the battle of Cold Harbor, June 3, 1864, where, like his father, he met his death at the head of his command.

Morris (Richard), LL.D., b. at Bermondsey, Southwark, England, Sept. 8, 1833; was educated at St. John's College, Battersea; appointed lecturer on the English language and literature in King's College School in Apr., 1869, and was ordained curate of Christ Church, Camberwell, 1871. Dr. Morris has been for many years one of the most efficient members of the Chaucer, the Early English Text, and the Philological societies, and was chosen president of the latter in 1874—a high honor for so young a man, especially since he is not a graduate of either of the great universities. He has published *The Etymology of Local Names* (1857), *Specimens of Early English* (1867), *Historical Outlines of English Accidence* (1872), *Elementary Lessons in Historical English Grammar* (1874), and *Primer of English Grammar* (1875). He has admirably edited for the publishing societies numerous early texts, among which are *Early English Alliterative Poems* (1865), *Old English Homilies* (1867–73), *Legends of the Holy Rood* (1871), *Chaucer's Poetical Works* (1866), *Spenser's Works* (1869), *Selections from Chaucer's Canterbury Tales* (1867), and *Cursor Mundi* (1874–75).

Morris (Robert), b. Jan. 20, 1734. A native of England, he came with his father to America in 1747, and after serving in the counting-house of Mr. Charles Willing in Philadelphia until 1754, formed a partnership with that gentleman's son, which continued with great success until 1793. Morris strongly opposed the Stamp Act, and against his business interests signed the non-importation agreement of 1765. In 1776 he was a delegate to the Continental Congress, and, though once voting against the Declaration of Independence, signed that paper on its adoption, and was twice (1777–78) re-elected to Congress. Throughout the war the services of Mr. Morris in aiding the government during its financial difficulties were of incalculable value; he freely pledged his personal credit for supplies for the army, at one time to the amount of $1,400,000, without which the campaign of 1781 would have been almost impossible; he also established the Bank of North America, and in 1781 was appointed superintendent of finance, which post he held until 1784, continuing to employ his personal credit to facilitate the needs of his department. He was subsequently a member of the Pennsylvania legislature, of the convention which framed the Federal Constitution, and from 1786 to 1795 was U. S. Senator, declining in the mean time the proffered post of secretary of the treasury, and suggesting the name of Alexander Hamilton for that office. After engaging in the China trade, he in his later years became involved in land speculations which resulted ruinously, and the remaining days of this noble patriot were passed in confinement for debt. D. at Philadelphia May 8, 1806.

Morris (Robert Hunter), a son of Governor Lewis Morris of New Jersey; was a lawyer; for twenty-six years a councillor of New Jersey, and for twenty years its chief-justice, 1737–57; was deputy governor of Pennsylvania 1754–56. D. in New Jersey Feb. 20, 1764.

Morris (Gen. Staats Long), grandson of Gov. Lewis (1671–1746), and brother of Gouverneur, b. at Morrisania, N. Y., Aug. 27, 1728; entered the British army; became captain 1756; soon afterwards lieutenant-colonel of the 89th Highlanders; served at the siege of the French colony of Pondicherry, India, 1761; became brigadier-general 1763; married the duchess of Gordon, who d. 1770; sat in Parliament; became major-general 1777 and full general 1786; was appointed governor of Quebec 1797, and d. in 1800.

Morris (Thomas), b. in Virginia Jan. 3, 1776; passed his early youth in Western Virginia; removed in 1795 to Columbia, and in 1800 to Clermont co., O., where he studied law while employed as a farm-laborer; was admitted to the bar 1804; elected to the legislature 1806; was continuously a member of either the upper or the lower house for twenty-four years; became eminent as a lawyer; was elected in 1809 a judge of the supreme court of the State, and in 1832 was elected U. S. Senator as a Democrat. He distinguished himself at Washington as an opponent of slavery and a defender of freedom of the press, free speech, and the right of petition. He was consequently not re-elected, but was in 1844 the candidate of the "Liberty party" for the Vice-Presidency on the ticket with James G. Birney. D. near Bethel, O., Dec. 7, 1844, one month after the Presidential election. His *Life, Speeches, and Writings* were published in 1855 by his son, Rev. B. F. Morris.—Two other sons, Isaac N. (b. Jan. 22, 1812) and Jonathan D., are distinguished lawyers, have figured in public life, and have been members of Congress, the former for Illinois (1857–61), the latter for Ohio (1849–51).

Morris (Thomas A.), D. D., b. in Kanawha co., West Va., April 28, 1794; joined the Ohio Methodist Episcopal Conference in 1816; labored as an itinerant preacher in the North-west down to 1834, when he was appointed the first editor of the *Western Christian Advocate*, the organ of his denomination in Cincinnati; in 1836 was elected bishop. He was distinguished for his prudence in counsel, the terseness and directness of his discourses, and his ability as a presiding officer. He was author of a volume of sermons and biographical sketches of his Western fellow-laborers in the ministry. D. at Springfield, O., Sept. 2, 1874.
Abel Stevens.

Morris (Thomas A.), b. in Nicholas co., Ky., Dec. 26, 1811; graduated at West Point June, 1834, and appointed second lieutenant of artillery; resigned from the army in 1836 to follow the profession of civil engineer, being appointed in that year resident engineer of canals and railroads in the service of the State of Indiana; was chief engineer of the Terre Haute and Richmond R. R. and of the Indianapolis Indiana and Bellefontaine R. R. 1847–52; of the Indianapolis and Cincinnati R. R. 1852–54, and president of the latter road 1854–57; president of the Indianapolis Pittsburg and Cleveland R. R. 1859–61. On the outbreak of the civil war he was appointed brigadier-general of Indiana State volunteers, and served in the West Virginia campaign of 1861 at Philippi, Laurel Hill, and Carrick's Ford. Declining the appointment of brigadier-general and major-general of volunteers, he resumed the chief engineership of the Indianapolis and Cincinnati R. R. in 1862; was president of the Indianapolis and St. Louis R. R. 1867–70; receiver of the Indianapolis Cincinnati and Lafayette R. R. 1870–73.

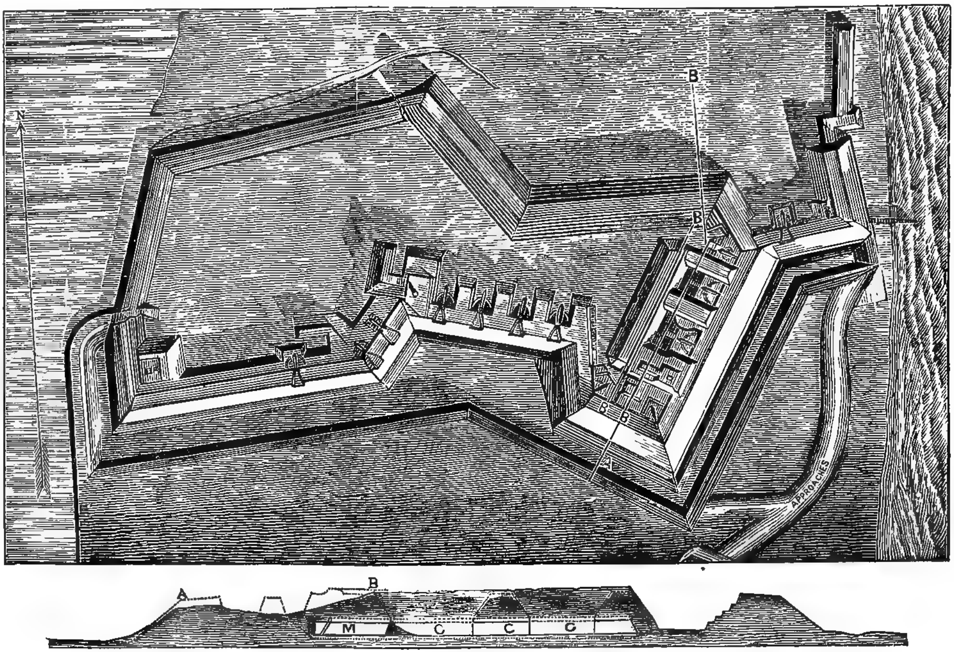
Morris (William), b. in England in 1834, eldest son of a merchant who died in 1844, leaving him considerable property; educated at the Forest School, Walthamstow, at Marlborough and at Exeter colleges, Oxford; studied painting, but in 1863 devoted himself to the designing and manufacture of artistic household furniture and decorations, from which circumstance he has often been improperly called an upholsterer, his own occupation being that of a designer. In 1858 he published a small volume entitled *The Defence of Guinevere and other Poems*, and in 1867 *The Life and Death of Jason*, a narrative poem. His principal work, *The Earthly Paradise*, consisting of legendary and romantic tales in verse, appeared in 4 parts in 1868–71, since which time he has published *Love is Enough; or, The Freeing of Pharamond*, a morality (1873). His later publications are *The Æneid of Virgil*, translated into English verse (1876), and *The Story of Sigurd the Volsung and the Fall of the Niblungs*, a poem (1877). By a peculiar facility of form these poetical productions attracted considerable attention, though the conception of the true, informing character of the subjects, whether Greek or Scandinavian, was utterly shallow. In collaboration with Erick Magnusson he has translated from the Icelandic *The Story of Grettir the Strong* (1869), *The Story of the Volsungs and the Niblungs* (1870), and *Three Northern Love Stories* (1875). In 1882 he published *Hopes and Fears for Art*, five lectures delivered during the five preceding years in London, Birmingham, and Nottingham.

Morris (Gen. William Walton), b. at Ballston Springs, N. Y., Aug. 31, 1801; graduated at West Point 1820; served against the Arickaree Indians 1823; was major of mounted Creek volunteers in the Seminole war 1836–37; was engaged in the battles of Wahoo Swamp, Okeechobee, Hatcheeluskee Creek, and many others, gaining two brevets for gallant conduct, and during nine years' garrison duty (1837–46) gained a brilliant reputation as a military lawyer; was attached to the judge-advocate's department of Gen. Taylor's army on the Rio Grande 1846; was actively engaged in the battles of Palo Alto and Resaca de la Palma; was made military governor of Tampico on the occupation of that port, military governor of Puebla 1847–48; was commandant at Fort Kearney, Neb., 1853–60, and at Fort McHenry, Baltimore, 1860–61, where he promptly brought his guns to bear on the rioters in the memorable affray of Apr. 19, 1861. He was promoted to a lieutenant-colonelcy May 14, 1861, and shortly afterwards refused to answer a writ of *habeas corpus* granted by a Maryland judge, on the ground that it had become invalid by the outbreak of hostilities. He was made full colonel of the 2d Artillery Nov. 1 of the same year, brevet brigadier-general in the regular army June 9, 1862, "for meritorious services," and brevet major-general Dec. 10, 1865. He remained in command of Fort McHenry throughout the war, and d. there Dec. 11, 1865, the day following his last promotion.

Mor'risburg, port of entry of Dundas co., Ont., Canada, on the St. Lawrence, at the foot of the Rapide du Plat Canal and on the Grand Trunk Railway, 92 miles above Montreal and opposite the village of Waddington, N. Y. It has a fine water-power, well improved, and does a large shipping business. Pop. in 1881, 1719.

Mor'ris Dance [probably *Moorish* dance], a rude dance common in England in the Middle Ages, and even now occasionally performed in the rural districts. The dragon or hobby-horse, Robin Hood, Maid Marian, and other fantastic characters often bore a part in it. It was generally performed by young men gaudily decorated with colored ribbons and using bells, castanets, swords, etc.

Mor'ris Island, a low narrow sand-island on the S. side of the entrance into Charleston harbor, S. C., a little more than 3½ miles long, lying broadside to the ocean. A Confederate battery on Cummings Point, at the extreme N. end of the island, aided in the capture of Fort Sumter from the Union forces, Apr. 12 and 13, 1861. After this the Confederates erected Fort Wagner and other batteries on Morris Island as part of the exterior line of defences for Charleston. The S. end of the island was captured by an assault made from small boats by the Union forces, July 10, 1863, and two unsuccessful assaults upon Fort Wagner, located near the N. end of the island, followed July 11 and 18, the object being to get within effective breaching distance of Fort Sumter, occupying an interior line about 2700 yards distant from Fort Wagner. After the assault of the 18th, it was determined to reduce Fort Wagner by a regular siege, and the first parallel, 1330 yards from the work, was opened on the 19th; on the night of July 23 the second parallel, at an average distance of 600 yards in advance of the first, was established and made strongly defensive. The creek on the left was spanned with booms to keep off boat-attacks, and on the right the parallel was extended into the surf by a defensive barricade. Ground for the third parallel was occupied on the night of Aug. 9, 500 yards from Fort Wagner. In the mean time, breaching batteries against Fort Sumter had been placed in position in the second and first parallels, and upon ground to the left and rear of the latter. From Aug. 18 to 21, during the bombardment of Fort Sumter, approaches were pushed forward from the third parallel by the full sap, and the fourth parallel was established Aug. 21 at an average of 300 yards from Fort Wagner. On the 26th a sand-ridge about 100 yards in advance of the fourth parallel and 200 yards from Fort Wagner was carried by assault, and the fifth parallel established thereon. Between this parallel and the fort the island narrowed to about 30 yards in width and 2 feet in depth above high water. In rough weather the sea passed entirely across this low neck of beach to the marsh on the left, while the front of Fort Wagner, which was 260 yards in length, kept up a converging fire of artillery and sharpshooters upon the shallow, shifting, and frequently submerged trenches of the besiegers. The navy occupied the main channel abreast the island, and rendered most valuable co-operation in keeping down the fire from the fort. In this emergency, when all further progress seemed impossible, the besiegers carried all their light mortars to the front to operate over the heads of the sappers and miners; enlarged the capacity of the fifth parallel and the advanced trenches for sharpshooters; trained upon Wagner the heavy rifled guns that had been used in breaching Fort Sumter, and placed calcium lights in front to aid their night-work and blind the enemy. The co-operation of the New Ironsides man-of-war during daylight was also secured. The final operations against the work were actively inaugurated on the morning of Sept. 5, and are described as follows in the report of the commanding general: "For forty-two con-



Plan of Fort Wagner, on Morris Island, as constructed by the Confederates. The lower engraving is a vertical section on the line A B B in the upper engraving; M, magazine; C C C, bombproof shelter.

secutive hours the spectacle presented was one of surpassing sublimity and grandeur. Seventeen siege and Coehorn mortars unceasingly dropped their shells into the work over the heads of our sappers and the guards of the advanced trenches; thirteen of our heavy Parrott rifles—100, 200, and 300 pounders—pounded away at short though regular intervals at the south-west angle of the bombproof, while during the daytime the New Ironsides, with remarkable regularity and precision, kept an almost incessant stream of eleven-inch shells from her eight-gun broadside ricocheting over the water against the sloping parapet of Wagner, whence, deflecting upward with a low remaining velocity, they dropped nearly vertically, exploding within or over the work, and rigorously searching every part of it except the subterranean shelters. The calcium lights turned night into day, and while throwing around our own men an impenetrable obscurity, they brilliantly illuminated every object in front, and brought the minutest details of the fort into sharp relief. In a few hours the fort became practically silent, exhibiting but little sign of life, and none of activity. Occasional straggling shots continued to be delivered at the New Ironsides, and one or more sharpshooters opened from time to time a hasty and ineffectual fire upon the head of the sap. The garrison had sought safety in the bombproof shelter." Under this fire the trenches were pushed forward by the evening of Sept. 6 to the outer edge of the ditch on the side next the sea, completely masking the enemy's guns, and orders were given to carry the place by assault on the following morning. During the night the enemy evacuated the fort, and the whole of Morris Island came into possession of the Union forces. Long-range guns were subsequently placed upon the N. end of the island, and used against Charleston, 4 miles distant, and also against Fort Sumter to prevent the erection of batteries upon its ruins. One of the guns used against Charleston was a 30-pounder Parrott rifle (4.2-inch calibre). It was fired 4606 times before it burst, and some of its projectiles attained a range of 5½ statute miles. The "Swamp Angel," so named by the soldiers, but officially called the Marsh Battery, was a battery of one 8-inch Parrott rifle constructed during the siege of Fort Wagner upon the marsh W. of Morris Island, where the soft alluvial mud was about 18 feet deep. It was distant 7000 yards from the lower end of Charleston City. On Aug. 21 a demand was made on the Confederate commander for the evacuation of Morris Island and Fort Sumter, accompanied by the assurance that the city of Charleston would be bombarded in case of refusal. No reply having been received within the specified time, a few shots were fired on the city during the night of the 21st, and resumed on the following. The gun burst at the thirty-sixth discharge, and was never replaced. In the bombardment of Fort Wagner the attempt to breach its bombproof shelter failed. In the accompanying vertical section the depression from A to B was the result of firing 54½ gross tons of metal at the end of the bombproof shelter. (See Gillmore's *Report on Engineer and Artillery Operations against Charleston;* see also article Bombardment, by Gen. J. G. Barnard.)

Q. A. Gillmore.

Morrison, city, cap. of Whiteside co., Ill. (see map of Illinois, ref. 2-D, for location of county), 127 miles W. of Chicago, on the Chicago and North-western R. R., has 7 churches, 1 national bank, 2 weekly newspapers, 3 hotels, several manufactories and mills, and stores. Pop. in 1880, 1981.

Morrison (John Irwin), b. near Chambersburg, Pa., in 1806, of Scotch-Irish descent, was an earnest student in boyhood under private instruction; became a teacher at the age of fifteen; removed with his parents to Salem, Ind., in 1824, and next year was at the head of the Salem grammar-school. He graduated in one year at Miami University, at Oxford, O., in 1828. He returned after graduation to Salem school as teacher, and for most of his after-life was a leading educator in Southern Indiana. He was afterward a professor of mathematics and of Latin and Greek in the State university, filled several offices of honor as senator of the State, member of the constitutional convention of 1850, treasurer of the State in 1864, and finished his ripe and useful life honored by all who knew him as a Christian patriot and scholar. D. in his home at Knightstown, Ind., in 1882. B. C. Hobbs.

Morrison (Robert), D. D., F. R. S., first Protestant missionary to China, b. at Morpeth, Northumberland, Eng., of Scottish parentage, Jan. 5, 1782, had but a scanty elementary education, and began early to work in his father's shop as a lastmaker's apprentice. But his inclination for studies, especially philological and theological, was very strong, and in 1803 he succeeded in gaining admittance to the Independent academy at Hoxton. In the following year he offered his services to the London Missionary Society and entered the mission college of Gosport, where he studied Chinese under the tuition of a native teacher. In 1807 he proceeded to Canton, and in 1808 he was appointed translator to the East India Company's factory there. While in that position he published a Chinese grammar and translated the Bible into Chinese, the New Testament appearing in 1814 and the Old, executed with the collaboration of Mr. Milne, in 1818. He next founded, at Malacca, an Anglo-Chinese college, which, however, never succeeded very well, and in 1845 it was removed to Hong-Kong. In 1823-26 he visited England, where he created a great interest for the Protestant mission in China. Immediately after his return to Canton, in 1827, he entered upon new literary undertakings in behalf of the mission, preparing a Chinese commentary on the Bible and various translations from the storehouses of Christian literature. His greatest literary work, however, is his Chinese dictionary (5 vols.), printed at the expense of the East Indian Company in Macao (1815-23), a work of great industry and scholarship, though now superseded by later works of the same kind. He d. in Canton Aug. 1, 1834. His *Memoirs*, compiled by his widow and accompanied with critical notices of his Chinese works by Samuel Kidd, appeared in London (1839, 2 vols.). (See his *Life* in S. Wells Williams's *Lives of the Leaders of the Church*, Philadelphia, 1879, pp. 819–837.)

Morrison (William), b. at Montreal, Canada, in 1785; was apprenticed in the service of the New York Fur Company at Fond du Lac 1802; soon became a partner; made extensive explorations in the N. W. territories 1803–15; was in charge of John Jacob Astor's fur-business 1816–26, after which he retired to Berthier, Canada; was the first white man who discovered the sources of the Mississippi River. D. Aug. 7, 1866.

Morrissey (John), b. at Templemore, Ireland, Feb. 12, 1831; came to the U. S. with his parents in 1834; grew up at Troy under the humblest circumstances; taught himself reading and writing when eighteen years old; went to California 1850; returned in 1853; lived as a prize-fighter, saloon-keeper, Wall street speculator; entered politics in 1864; was elected to Congress in 1866, and to the State senate 1875; was, as a member of Tammany Hall, always opposed to the "Ring," and contributed much to breaking it up. D. at Saratoga, N. Y., May 1, 1878.

Morristown, cap. of Morris co., N. J. (see map of New Jersey, ref. 2–D, for location of county), 31 miles from New York, on Morris and Essex division of Delaware Lackawanna and Western R. R., has good educational advantages, a public park and the Speedwell Ironworks, etc. The town is supplied with pure spring water from an aqueduct. The State lunatic asylum, with accommodations for 1000 patients, is located on Whatnong Mountain, about 2 miles distant. Morristown is the residence of gentlemen doing business in New York, and forms an attractive place in the summer months for tourists. It was twice the headquarters of the American army during the Revolutionary war. Gen. Washington's headquarters (1780), in the suburbs, has been purchased by the Washington Association, aided by the State of New Jersey. Morristown has a large mercantile and mechanical trade. Pop. in 1880, 5418: in 1885, 8760.

Morristown, St. Lawrence co., N. Y. (see map of New York, ref. 1–H, for location of county), on R. R. and St. Lawrence River, opposite Brockville, Canada, with which it is connected by steam-ferry. Pop. in 1870, 1954; in 1880, 2186.

Morristown, R. R. junction, cap. of Hamblin co., Tenn. (see map of Tennessee, ref. 6–J, for location of county), has 2 colleges, and extensive quarries of variegated marble. The section is rich in mineral deposits. Pop. in 1880, 1350.

Mor'risville, on R. R., cap. of Madison co., N. Y. (see map of New York, ref. 5–G, for location of county), 30 miles S. W. of Utica, has a union school and a fine public hall. Principal business, dairying, hop-growing, and farming. Pop. in 1870, 570; in 1880, 711.

Morroval'le [*Morro di Vaglia*], town of Italy, province of Macerata, pleasantly situated on a hill at the foot of which flows the Chienti. This town is believed to have been founded by Charlemagne, and was formerly much more populous than at present. Pop. 5675.

Morrow (Jeremiah), b. at Gettysburg, Pa., Oct. 6, 1771; removed in 1795 to the North-west Territory, and became one of the most prominent citizens of Ohio: was its first member of Congress 1803–13, and again 1841–43; U. S. Senator 1813–19; governor of Ohio 1822–26; often held State offices of responsibility, and was for some years president of the Little Miami R. R. D. in Warren co., O., Mar. 22, 1852.

Mor'row (Thomas Vaughn), M. D., b. in 1804 in Kentucky; founded a reformed medical school at Worthington, O., under the auspices of Bishop Chase, and on the close of that institution in 1845 he established the American Eclectic School of Medicine at Cincinnati, O., which became the nucleus of the American Eclectic system of medical reform. D. July 16, 1850. Robert S. Newton.

Morse (Abner), b. at Medway, Mass., Sept. 5, 1793; graduated at Brown University 1816 and at Andover Seminary 1819; became Congregational pastor at Nantucket 1819–22, and afterward at Boundbrook, N. J., and in Indiana, where he procured the charter of a college and became a professor; delivered several courses of lectures on geology, and was author of several genealogical volumes—*Memorial of the Morses* (1850), *Descendants of Lawrence Litchfield* (1855), *Capt. John Grout* (1857), *Genealogical Register of Sherborn and Holliston*, and *Genealogy of Several Ancient Puritans* (3 vols., 1857–60). D. at Sharon, Mass., May 16, 1865.

Morse (Edward Sylvester), Ph. D., b. at Portland, Me., June 18, 1838; educated at Lawrence Scientific School, Cambridge, Mass.; was professor of comparative anatomy and zoology in Bowdoin College, Me., for several years, and lecturer on zoology at Harvard University; wrote several memoirs on the Pulmonifera of Maine, *The Tarsus and Carpus of Birds*, *Embryology of Lower Marine Forms*, and several papers on the relations of the Brachiopoda. He is a popular lecturer on scientific subjects, and resides at Salem, Mass.

Morse (Freeman H.), b. in Bath, Me., Feb. 18, 1807; served in the legislature 1840–43; was a member of Congress 1843–45; mayor of Bath three terms; again sat in Congress 1857–61; was conspicuous as a Republican; a member of the special committee of thirty-three on the rebellious States, and of the "Peace Congress" of 1861, and was consul at London during Pres. Lincoln's administration.

Morse (Isaac Edwards), b. at Attakapas, La., May 22, 1809; educated at Middletown, Conn., and at the Military Academy at Norwich, Vt.; entered the senior class at Harvard, graduating 1829; studied law at New Orleans and in Pennsylvania; travelled in Europe; served as a member of the State senate; was commissioner to New Granada under Pres. Tyler 1841–43; sat in Congress 1843–51; was subsequently attorney-general of Louisiana, and d. at New Orleans Feb. 11, 1866.

Morse (Jedidiah), D. D., b. in Woodstock, Conn., Aug. 23, 1761; graduated at Yale in 1783; was a tutor there in 1786; minister of the First Congregational church, Charlestown, Mass., 1789–1820; editor of the *Panoplist* 1806–11; one of the founders of the Andover Theological Seminary; a prominent defender by pen and voice of the Trinitarian doctrine; is chiefly remembered as the author of a series of geographies and gazetteers (beginning in 1784) which had a wide popularity; also author of a *History of New England* (1804), *Annals of the American Revolution* (1824), etc. D. at New Haven, Conn., June 9, 1826. (See his *Life*, by William B. Sprague, 1874.)

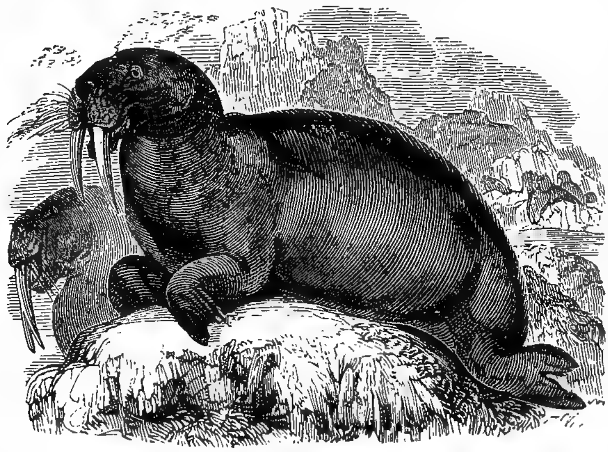
Morse (Richard Cary), son of Dr. Jedidiah, b. at Charlestown, Mass., June 18, 1795; studied at Phillips Academy, Andover; graduated at Yale College 1812; became amanuensis of Pres. Dwight and a member of his family; graduated at Andover Theological Seminary, and was licensed to preach 1817; aided his father in the preparation of one of his geographical works; joined his brother Sidney in establishing the New York *Observer* 1823; was for thirty-five years associate editor and proprietor of that paper, for which he executed many translations from the French and German; retired from active life in 1858; resided for some years at New Haven, Conn., and d. at Kissingen, Germany, Sept. 22, 1868.

Morse (Samuel Finley Breese), LL.D., b. in Charlestown, Mass., Apr. 27, 1791. He was the son of the great American divine and geographer, Jedidiah Morse, D. D., and was educated at Yale College, taking his bachelor's degree in 1810. Having a great love for art, he decided on becoming a painter, and with a view to the prosecution of his profession he went to London in 1811 with Washington Allston, to study in the Royal Academy under Benjamin West. In 1813 he received the gold medal for his first effort in sculpture, *The Dying Hercules*. Returning to America in 1815, he followed his profession, at the same time prosecuting his scientific studies, for which he had great fondness. He founded the National Academy of Design in New York, and was its annually elected president for many years. In 1829 he again visited Europe for further study in the schools of the Continent, and resided in Rome, Florence, Venice, and Paris for three years. On his voyage home in 1832, on the packet-ship Sully, he conceived and made drawings of the recording telegraph which bears his name. From this time till his death he was occupied with this invention, passing through vicissitudes of fortune, some of them of most painful experience. He was one of the first professors of the University of the City of New York, filling the chair of fine arts. In 1835, in his rooms in the university, he set up his rude telegraphic apparatus, but it was not till 1844 that he was enabled to bring his invention fully before the world. After repeated discouragements that would altogether have disheartened most men, by the aid of the American government he established a telegraphic line between Washington and Baltimore, a distance of 40 miles. Over this line, on May 24, 1844, Prof. Morse put to the test the great experiment on which his mind had been laboring for many anxious, weary years. From the rooms of the U. S. Supreme Court this message was sent to Baltimore, instantaneously received, and immediately returned: "What hath God wrought!" From this moment the triumph of Prof. Morse was complete. He passed at once into honors and riches. In his frequent visits abroad his progress was like that of a prince in the attentions he received, rather than that of a plain American citizen. Kings delighted to do him honor, while at home every one was proud of his successes. In 1846 the degree of doctor of laws was conferred upon him by his alma mater. He became a member of many learned societies in Europe and America, and the recipient of the most flattering foreign distinctions, wearing the decorations and titles of numerous orders. But the most distinguished mark of public gratitude for his invention was that conferred upon him by a congress of representatives of ten of the governments of Europe, specially convened for the purpose in Paris in 1858, at the suggestion of the emperor Napoleon, when it was unanimously decided that the sum of 400,000 francs should be presented to him.

Prof. Morse was a man of great simplicity and energy of character, large-hearted and generous in disposition, firm in his friendships, and persistent and exhaustive in all his researches. He held the pen of a ready writer, and his genius, learning, and taste were illustrated by many and large contributions to the press, all of them evincing graceful rhetoric and elaborate argument. On the 10th of June, 1871, a bronze statue of Prof. Morse was unveiled with imposing ceremonies in Central Park, N. Y., Prof. Morse himself being present. The last time he appeared in public was at the inauguration of the statue of Benjamin Franklin in Printing-house Square in front of the City Hall, N. Y., Jan. 17, 1872; on which occasion he made the inauguration speech and unveiled the statue. D. in New York City Apr. 2, 1872. (See his *Life*, by Samuel Irenæus Prime.) FRANCIS B. WHEELER.

Morse (SIDNEY EDWARDS), son of Dr. Jedidiah and brother of S. F. B. Morse, b. at Charlestown, Mass., Feb. 7, 1794; graduated at Yale College 1811; wrote for the *Columbian Sentinel* 1812–13; studied law in Judge Reeves's school at Litchfield, Conn.; established in 1815 the *Boston Recorder*, the first religious newspaper in the country; was associated with his brother in inventing and patenting the flexible piston pump 1817; published a school geography 1820, and a larger geographical treatise 1822; founded in May, 1823, with his younger brother, Richard C. Morse, the New York *Observer*, the first religious newspaper, and now (1876) the oldest weekly newspaper, in New York; invented with Henry A. Munson the cerographic method of printing maps 1839; brought out the *North American Atlas*, the *Universal Atlas*, and a new school geography, of which 100,000 copies were sold; remained senior editor of the *Observer* until 1858, when he sold his interest to Rev. Dr. S. Irenæus Prime, his associate since 1840; spent his later years in inventing and improving a "bathometer" for deep-sea soundings, and d. at New York Dec. 23, 1871.

Morse, Sea-horse, or **Walrus** [Russ. *morss;* Lapp. *morsk;* Norse, *hval-ros,* "whale-horse;" old writers state absurdly that *morse* is from the Lat. *Mors,* "death," from its fierce character], two species of *Rosmarus* (for the generic name *Trichecus* properly belongs to the manatee, a sirenian, and not a seal), large seals of the arctic regions, differing, however, from the other seals (Pinnipedia) in being chiefly molluscivorous. They form the family Rosmaridæ. The walruses are hunted for the coarse flesh (eaten by the northern peoples), for the excellent white ivory furnished by the great tusks (canine teeth of the upper jaw), for the rather scanty but excellent oil, which is superior to that of the sperm whale, and latterly for the hide, of which the Finns and Russians make superior cables, and the English and Americans make thick leather for buff-wheels and for heavy machine-belts. The females are very fond of their young, and both fight desperately when at bay. The largest males far exceed the ox in size. (See also PINNIPEDIA and ROSMARIDÆ.)



The Walrus.

Morshansk', town of European Russia, in the government of Tambov, on the Tzna. It has manufactures of soap and tallow, and an important trade in corn and cattle. Pop. 20,000.

Mortality. See LIFE ASSURANCE, by PROF. J. H. VAN AMRINGE, A. M.

Mortar. See ARTILLERY, BOMBARDMENT, and APPENDIX.

Mortar. See CEMENTS, by GEN. Q. A. GILLMORE, U. S. A.

Morta'ra [*Mortis-ara—Martijara*—"altar of death"], town of Italy, province of Pavia, about 40 miles N. W. from the city of Pavia. This town, situated in a very fertile district, was the scene of a bloody battle between Charlemagne and the Lombards in 774, was a place of great strength during the Middle Ages, and has suffered cruelly from military operations even as late as 1849–59. Its massive walls and fortifications have now given place to pleasant gardens. The network of railways and provincial roads centring at Mortara gives the town considerable commercial importance. Pop. 7408.

Mortara (EDGAR), son of a Jewish cloth-merchant in Bologna, who on June 23, 1858, was taken with force from his parents by the papal police, on orders from Padre Felletti, inquisitor-in-chief at Bologna, for the reason that he had been surreptitiously baptized into Christianity by a Roman Catholic maid-servant, and the Church considered itself under the obligation of protecting him against his parents. The boy and the parents were in despair, but addressed themselves in vain to the papal authorities. The Evangelical Alliance in London presented a protest against this outrage to the English government, but with no effect. When, in 1860, Bologna was incorporated in the kingdom of Italy, Felletti was arrested, but the boy was not returned.

Mor'tar-Vessels, in the navy, are of various kinds. The bomb-ketch was of this class, but is now disused. Sometimes steam vessels are employed. In the late civil war a class of wide, light-draught schooners, carrying each a 15-inch mortar and a 32-pound rifle gun, were used upon the lower Mississippi River. Against Island No. 10 mortar-vessels of another class were used.

Mort'gage [Fr. *mort,* "dead," and *gage,* "pledge"], in law. This topic will be considered under two principal divisions: I. Mortgages of land; II. Mortgages of chattels.

I. A mortgage of land is, when regular in its form, a conveyance of land for the purpose of securing the payment of a debt or the performance of an act at a specified time, with a condition (see CONDITION) that if the payment is made or the act performed at the time and in the mode prescribed, the conveyance shall be void. On the other hand, if payment, etc. is not made, the conveyance, strictly speaking, becomes absolute in the creditor or mortgagee, or "dead" (*mort*) in point of law to the debtor or mortgagor. There was a distinction taken from early times between a "living gage" or pledge (*vivum vadium*) and a "dead pledge (*mortuum vadium*). In the first case the debt was to be paid from the profits of the land, and the title did not pass to the creditor; in the case of the mortgage there was a conveyance of a defeasible nature, but which became absolute in the mortgagee if punctual performance was not made. By the rules of the common law the enforcement of the condition was rigorous if redemption was not made on the stipulated day, no matter how insignificant the debt might be, or how great might be the value of the mortgaged estate. It was not until the courts of equity gained a strong foothold that any modification of the severity of this doctrine took place. This result has been regarded by a competent judge as the most splendid triumph achieved by that system of jurisprudence over the harsh and forbidding theories of the early common law. The right of redemption has now become positively settled, and is regarded to be inherent in the very nature of a mortgage. The present theory in a court of equity is, that a mortgage is a mere security for a debt, and that, accordingly, any attempt on the part of the creditor to obtain more than his debt and interest from the land is in the nature of a penalty (see PENALTY), against the effect of which this court almost uniformly relieves on payment of the amount actually due. On this theory, the debt is the principal thing, and the land accessory. When the debt is transferred the security upon the land goes with it, even without special mention; so when the debt is paid the mortgage is really extinguished, though it may in form continue. A mortgage as thus explained, and being regular in point of form, has all the requisites of a deed or conveyance of land. It is signed, sealed, and delivered. There is a clause of defeasance in the deed, or if separate it is executed with due formality. The effect of the "defeasance clause" is to declare that if the debt is punctually paid or the act performed the deed is void. There may, however, be transactions of a less formal character which will be construed as in substance mortgages. The deed may be irregular or defective in some respects. There may, for instance, be no seal, or there may be a seal on the deed and none on the "defeasance" when separate. Perhaps there is no writing at all, and the intent to mortgage is implied from the nature of the acts transpiring between the parties; or, again, a debtor may have made an executory agreement to give a mortgage. Mortgages are thus capable of division into two great classes; one is formal, regular, and complete; the other is informal and defective. Those which are executed in due form are called "legal;" those which are wanting in this respect are termed "equitable." The leading instances of equitable mortgages are (*a*) the mere deposit of title-deeds to secure a loan; (*b*) the lien of a vendor for unpaid purchase-money; (*c*) agreement to mortgage; (*d*) deeds absolute in form, but intended as mortgages; (*e*) instruments of a defective and informal nature—*e. g.* such as are without seal either upon the deed or defeasance; (*f*) cases where the property mortgaged is of an equitable nature, such as contracts to purchase land. The main importance of distinguishing between the two sorts of mortgages is in respect to their effect considered as an incumbrance upon the land. It is a cardinal rule, when two regular mortgages compete with each other for priority, that the one first in order of time is superior in point of right. This remark is made without reference to statutes of registration of mortgages, which may establish a different rule. On the other hand, an informal, defective, or "equitable" mortgage will give way to a later regular or "legal" mortgage under certain circumstances. These are when the later mortgage is taken for a valuable consideration, and without notice of the existence of the informal transaction. For example, if a person should create a mortgage lien upon his land without writing, and by the mere deposit of his title-deeds as a security for a loan, it would be valid as between him and the lender. It would, in case of his death, bind his heirs or devisees. It would charge all purchasers with notice. But if any person should by a later legal mortgage acquire the title in good faith and for a valuable consideration, he would be preferred. Similar rules would be applied in favor of a subsequent purchaser by an absolute conveyance as well as by a mortgage. Reference should be made to the mode of establishing the fact that a deed absolute on its face was intended as a mortgage. This is allowable in courts of equity on the general ground that the omission of the clause of defeasance is imputable to fraud, accident, or mistake. The law of some States—*e. g.* New York—proceeds on a still more comprehensive theory, and permits parol or oral evidence to be offered for this purpose, without reference to any element of fraud, etc., and simply on the ground that the transaction was in fact the security of a debt.

There usually accompanies a legal mortgage a bond or promissory note or other promise to pay the debt. This is advantageous to the creditor, since, if the land does not yield enough to pay the debt, he has a further remedy upon the bond or note for the deficiency. Where there is no such promise the mortgagee is usually confined in his remedies to the mortgage. It is not material which form the contract assumes. Where no negotiable note is given, the mortgage, both in the hands of the mortgagee and assignee, is subject to all the defences which are applicable to the debt, so that if the debt cannot be collected by reason of fraud or duress or want of consideration, the mortgage cannot be enforced. On the other hand, if it accompanies a negotiable note which is not yet due, it is held to be the rule in a number of the States that a transfer before maturity which would preclude a defence to the note will have a like effect upon the mortgage. It is a cardinal rule that no agreement between the parties can take away or restrict the right of redemption. Such an agreement is regarded as a "penalty," and is accordingly inoperative. This rule does not preclude an agreement that on default of payment of interest for a specified time the entire mortgage, though not yet mature, shall become due. Such a stipulation enters into the contract, and does not curtail the right of redemption. So an agreement made after the execution of the mortgage for a new and sufficient consideration that the mortgagor shall convey his interest to the mortgagee is valid, if not under the special circumstances of the case unfair and oppressive. It is necessary to carefully take a distinction between a mortgage and a conditional sale. In the one there is an inherent right to redeem; in the other there is not. By a conditional sale is meant a transfer of land upon a condition (see CONDITION) that on the happening of a specified event the vendor shall have the right of repurchase. There is no relation of debtor and creditor in this case, and the former owner must comply strictly with the contract.

It is quite common to insert in a mortgage a power of sale enabling the mortgagee to sell in case of default of payment, and thus obtain the amount of his claim. This is deemed to be a valid power. It does not resemble an ordinary power of attorney, which is revocable in its nature. This power is irrevocable, being in legal phrase "coupled with an interest"—that is, the mortgagee, having an interest in the property, has the power conceded to him as connected with his interest in order to make it more completely available. (See POWER.) Should he transfer or assign his mortgage, the power would accompany it. When the mortgage is paid the power is extinguished. A mortgagee, though having such a power of sale, is not obliged to resort to it. He may "foreclose" in the manner hereafter explained, so that the remedies become cumulative. If on the sale a surplus is received, it belongs to the mortgagor, or if he is then dead, it passes to his heirs as the proceeds of real estate. This power is of an important nature, and liable to abuse. To guard against oppression it is regulated in a number of the States by statute prescribing the mode of giving notice of the foreclosure to the mortgagor and to incumbrancers, as well as of conducting the sale and giving title to a purchaser. It is not necessary that a mortgage should be given directly to a creditor. It may be executed to some person in trust for him. This is a very common case in mortgages of railroad property. A single mortgage is given to a trustee to secure a number of bonds. The mortgagee is thus a trustee, and the bondholders are *cestui que trustent* (see CESTUI QUE TRUST) or beneficiaries. On foreclosure the trustee will hold any property acquired by him in trust for the bondholders. As between the trustee and the debtor all the ordinary relations of mortgagor and mortgagee would attach.

Reference will now be made to the rights acquired by a mortgagee. In a common-law court he is deemed to be an owner of the land by a defeasible title until the mortgage is due. After it has matured his title is absolute, subject of course to the interference of a court of equity. Confining the attention for the moment to the courts of law, it may be affirmed that, as a strict legal rule, the mortgagee may exercise the ordinary rights of ownership. He may, in the absence of statutes to the contrary, by means of an appropriate action after the debt is due eject the mortgagor and take possession of the estate. He may notify lessees whose estate has been acquired before his own to pay rent to him. So he may convey his interest to another termed an assignee, who will stand in his position and possess his rights.

A court of equity, however, will fasten a trust upon the mortgagee while thus exercising his legal right. For example, if he should be in possession of the land, then called a "mortgagee in possession," he will be declared by that court as acting not merely for himself, but as a trustee for the mortgagor and subsequent incumbrancers. He could not, as an absolute owner might do, wilfully allow the property to lie idle. He would be required to act with ordinary diligence and prudence. Should he collect any rent, it would be applied on the mortgage. After his entire claim, including interest, is paid he is a mere trustee for the mortgagor and others interested in the land.

The theory on which the court of equity in framing its rules proceeds is, that the relation of debtor and creditor exists, and that the claim upon the land is a mere security. The mortgage partakes of the nature of that which it is given to secure. When the opposing views in the two courts come in conflict, the equity doctrine *modifies* that which prevails in law.

From what has been said, it may readily be inferred that the rules concerning mortgages are complex and difficult of comprehension in all their branches to any but professional men. The decisions of the courts on a cursory examination seem strangely conflicting when they may in fact be harmonized by considering that the subject is being regarded either from the law or equity point of view. Thus, it will be found to be stated on the one hand that the mortgage is a conveyance; that the title has passed to the mortgagee, and on his death descends to his heirs; and that he can only assign it by an instrument in the nature of a conveyance. On the other hand, it is affirmed with equal positiveness in another set of decisions (equity) that the mortgage is a mere attendant upon the debt; that the assignment of it carries the mortgage with it, even without special mention, as an incident; that the debt and mortgage both belong, in case of the mortgagee's death, not to the heirs, but to the personal representatives (executors or administrators). To reconcile these views it has only to be supposed that the equity theory fastens a *trust* upon him who would be deemed owner in a court of law. For example, a sale by a mortgagee to an assignee, though in the form of a conveyance, is accepted by him as qualified by the rights of the mortgagor. So if a mortgagee dies, his heir, if he takes the title, holds it *in trust* for the executors, etc. In some of the States, this double view has almost disappeared, and the equity rule has become so predominant as to substantially displace that of the common law. Such is the case in New York and California and some other States. These States would hold that, for nearly all purposes, the mortgagor was owner, and the mortgagee had only a lien for his debt. The only way that he could acquire any more than this would be by foreclosure. He is even prohibited by statute in New York from ejecting the mortgagor, except in connection with a foreclosure.

Something further should be said in respect to assignment. In the ordinary case of an assignment of a debt and a mortgage the rule of equity is that the assignee must abide by the position of the one of whom he buys. If he for any reason cannot enforce the claim, the assignee cannot. It is therefore a usual and wise course before purchasing to inquire of the mortgagor whether he has any defences to the claim. If he states that he has not, and the assignee purchases on the faith of the statement, the mortgagor will be estopped from denying its truth. (See Estoppel.) It is judicious, though not necessary, to take the statement in writing. After the assignment notice should be given to the mortgagor, otherwise he will be allowed any payment which he may have made to the mortgagee in ignorance of the assignment. There are certain cases in which a person can compel an owner of a mortgage to make an assignment to him. An illustration is found in the case of a first mortgagee being about to foreclose, and a second desiring to take an assignment of the prior claim, in order to protect his right. There are also cases in which a court of equity will pay such attention to the intent and best interest of the parties as to convert a transaction which is in form a payment into an equitable assignment. The leading rule is, that if a person whose *duty* it is to pay off a mortgage pays it, he cannot give the transaction any other character than that of payment; on the other hand, if he is under no obligation to pay it, and does so in fact, the court under all the circumstances of the case will, if justice demands it, regard the formal payment as in substance a purchase. It is not necessary that an assignment be absolute. It may be made by way of security. In other words, an owner of a mortgage may himself mortgage it. The same trust relation will then spring up between the parties as has been already noticed. If such a mortgagee should foreclose and buy in the land, he would hold any surplus of value above what might be necessary to discharge his own lien in trust for the assignor.

Without further treatment of the rights of the mortgagee, reference may now be made to the estate of the mortgagor. In this respect legal opinions are not so divergent. It is now agreed that for most purposes the mortgagor is the owner. Thus, when a mortgagor dies his estate descends to his heirs, and his widow has dower. He can only part with his residuary interest by a regular conveyance. So the State treats him as owner in laying taxes and in taking possession of the land under the doctrines of eminent domain. A mortgagor may carve out of his estate other mortgages, which will have priority (in the absence of statutes requiring registration) in the order of their execution.

The right of redemption in the law of mortgages is of high consequence, and distinguishes the transaction from an absolute sale. Not only the mortgagor, but every one deriving an interest from him subsequent to the mortgage, may "redeem," or, in other words, may pay the debt and the interest, and thus be relieved from the mortgage. This privilege will extend to a mere speculator who may have purchased the mortgagor's estate for a nominal sum and with a view to redemption. Among those who have a right to redeem may be mentioned, by way of illustration, subsequent mortgagees and judgment creditors, heirs, tenants by the curtesy and in dower, lessees, and persons having incorporeal interests, such as easements. One who redeems must take up the entire mortgage. This rule will be applied to an owner of a fractional interest in the equity of redemption, who may then enforce against the owner of other interests such portion of his claim as is equitable and just. This right to redeem can be barred by the proceeding termed a "foreclosure," to be hereafter explained. So the right to redeem may be lost where the mortgagee is in possession by a neglect to call him to account for a considerable period of time. This time is sometimes fixed by statute; as, for instance, in New York at ten years. Still, even then, should the mortgagee by some appropriate act recognize the existence of the mortgage—as if, for example, he should commence an action to foreclose the mortgage—the right to redeem will remain.

Notice should be taken of the grounds on which a mortgage is inherently void, or, if originally valid, has lost its force and effect. A mortgage is void for any of the reasons which make contracts in general invalid, such as for want of consideration, duress, fraud, illegality, or the like. In some of the States the act of taking usury (see Interest and Usury) makes a contract wholly void. It is a frequent practice in these cases for the mortgagor or other person standing in his place to commence an action to set aside the invalid instrument, as being an apparent incumbrance upon the title of the owner. Mortgages having once been valid may become inoperative by reason of a material or fraudulent alteration made by the creditor, or by merger or extinguishment, by release or other discharge, or by payment, or by tender, or by lapse of time. One or two of these methods deserve explanation. A mortgagee's interest may be merged or extinguished by an acquisition of the interest of the mortgagor. As a general rule, the same person will not be regarded both as mortgagor and mortgagee. Still, it may be necessary in special cases to keep the two interests distinct. Thus, if there were a series of mortgages, and the owner of the first should become possessed of the estate of the mortgagor, the extinguishment of his mortgage would destroy the priority of his lien. This result may be prevented in a court of equity by sufficient evidence of an intent that there should be no merger. This might be shown by a clause in the conveyance to the effect that no merger should take place. By a release of a mortgage is meant a discharge of the whole or a portion of it by the mortgagee for a consideration. A sealed instrument will suffice, since a seal imports a consideration. So there may be a release of the lien of the mortgage without discharging the debt. When no rights of third persons are affected there may be a release of a portion of the premises without destroying the lien upon the residue. Payment of the debt has the effect of extinguishing the mortgage. No reconveyance to the mortgagor is in general necessary. In order to remove from the registry all appearance of a claim upon the land a written statement in a form prescribed by law, setting forth the fact of payment, is taken from the mortgagee. This is also registered. Such statement may be exacted by a court of equity should a mortgagee decline to give it. (See Record of Conveyances.) The tender of the amount of the debt upon the prescribed day, though unaccepted, destroys the lien of the mortgage, though it does not discharge the debt. Some of the States give the same effect to an unaccepted tender made after the mortgage has become due. Lapse of time, according to the ordinary rules of law, may lead to a presumption of payment, which may, however, be rebutted. Sometimes there is a positive bar to any claim by force of the statute of limitations. (See Limitations, Statute of.) The *debt* may in some instances be barred by this statute when the mortgage is not, as where different periods of time limit the right to proceed upon the debt and the mortgage respectively. While the debt continues no change in its form is fatal to the mortgage. Thus, if a new note is given in the place of an old one, or the time of payment is extended, the debt remaining unchanged, the mortgage is still in force.

On the death of a mortgagor an important question frequently arises as to the fund from which satisfaction of the mortgage is to be made; or, in other words, whether payment is to be made from the real or personal estate. The general rule is that it must be made from the personal property rather than from the real estate, upon the principle that the personal estate was increased by the money obtained upon the loan for which the mortgage was given. As the real estate, by the rules of the common law, passes to the heirs, and the personal property to the executors or administrators, the latter are accordingly *primarily* liable to pay the debt. A result of this rule is that the heirs become "sureties" for the executors, and if they are made to pay are allowed to proceed against the personal property. This rule has been changed by statute in England and in a number of the States, and the burden of paying the mortgage cast primarily upon the heirs. Under these statutes the executors become sureties for the heirs. The rule may be affected by evidence of the intent of the mortgagor that the burden of the debt shall be cast on either the one or the other portion of his estate. It has no application to the case of one who did not himself borrow the money, but acquired the estate subject to the mortgage, for in that instance his successor takes the property with its burdens.

Questions frequently arise as to the apportionment of the burden of the mortgage among different owners. It is a general rule that where a number of owners of land affected by a single mortgage stand in the same position as to rights they must bear its burden equally. Accordingly, if one is called upon to pay the whole, he has a right to enforce a proportionate part of the mortgage against the owners of the remaining lots. This case may be illustrated in this wise: Suppose that there is a mortgage upon a farm, which is subsequently divided into village lots, and sold in such a way to purchasers that one is entitled to no preference over another. In this case every purchaser should pay a proportional part of the mortgage. This would be plain if the lots were sold to different persons contemporaneously. If, on the other hand, they had been sold successively to purchasers paying the full price, the earliest purchasers, according to the present prevailing opinion, have a superior right or "equity" to the later ones. The lots last sold would be primarily liable to pay the mortgage. If a foreclosure should take place and a sale be had to satisfy the mortgage, the lots would be sold in the "inverse order of alienation"—*i. e.* the lots sold last by the mortgagor would be sold first on the foreclosure to pay the mortgage. The result would be that as soon as enough had been realized to pay the mortgage further sales would not take place, and the lots first sold by the owner would accordingly be altogether relieved. These principles would not be recognized in case the earlier purchaser bought subject to a portion of the mortgage or assumed its payment. In that case he would be obliged to bear the burden that he had taken upon himself.

It is proper to state more comprehensively the general effect of a purchase of land subject to a mortgage. There are several forms of expression used in conveyances which must be carefully distinguished. Thus, one may buy "subject to the mortgage," or he may "assume its payment." In the first case he is not personally chargeable. The land may be taken, but he is not required to pay from his own means. On the other hand, if he "assumes the payment" he becomes personally liable. The importance of the distinction may be seen from the following supposition: If one had bought "subject to a mortgage," and the land had diminished in worth, so that its value was greatly inadequate to satisfy the debt, the land would be relinquished, but no further charge upon the purchaser could be made; if he had "assumed the mortgage," he would be personally responsible for the deficiency. These rules will be applied if the clauses referred to are in the purchaser's deed, even though he does not attach his signature to it. He cannot take title under the instrument without accepting all its provisions.

Whenever a person holding the position of a surety is made to pay a mortgage, he is entitled to stand in the mortgagee's place and enforce the mortgage for his own benefit. This is known as the doctrine of subrogation. (See SUBROGATION.)

It only remains to refer to the matter of foreclosure. While the law gives the mortgagee and his representatives the right of redemption, it at the same time seeks to protect the creditor by giving him the power to cut off that right by an appropriate legal proceeding. If the debtor does not pay in the course of these proceedings, his right to redeem is for ever foreclosed and barred. The regular mode of foreclosure is by an action or suit in a court of equity. The creditor commences his proceedings by making parties to it all who have a right to redeem. If any are omitted, the proceedings are ineffectual as far as they are concerned. Foreclosure proceedings lead to one of two general results—either the land is vested in the mortgagee (strict foreclosure), or there is a sale, the mortgage being paid from the proceeds, and the surplus, if any, made over to the persons having the right to redeem. The creditor may at his option refrain from a foreclosure, and may collect his debt by an ordinary action. In some of the States he is allowed by statute in a single action to foreclose his mortgage and to have a judgment for any deficiency. The subject is largely regulated by statute, and is a matter of detail which must be examined in the books of practice in the respective States. After foreclosure the title vests absolutely in the mortgagor or purchaser as the case may be. There may also be a foreclosure under a power of sale. (See POWER.) There are also special statutory modes adopted in some of the States. (For further information on the general subject see Powell on *Mortgages, notes* by Coventry and Rand; Hilliard on do.; Fisher on do.; Washburn on *Real Property;* Kent's *Commentaries,* title *Mortgages.*)

II. *Chattel Mortgages.*—This subject has assumed much importance in modern times, though scarcely receiving any attention in the earlier lawbooks. A mortgage of an item of personal property or chattel is in law a conditional sale. It differs from a pawn or pledge in the fact that the latter is a bailment (see BAILMENT), the ownership remaining still in the bailor. If the debt is not paid on the appointed day, the title to the mortgaged chattel becomes, in the view of a court of law, absolute in the mortgagee. Still, even in that case a court of equity may interfere and enforce in favor of the mortgagor an "equity of redemption." Before the debt secured by the mortgage is due there is a legal interest still remaining in the mortgagor, which may be seized by a sheriff on an execution against him, and sold to pay his other debts. After the mortgage is due this is no longer true. Special clauses are frequently found in mortgage deeds giving the creditor the right to take possession of the property before the debt is matured, and retain it as a security for his debt. Such a clause would enable the mortgagee to displace the right of the sheriff to take the property for other debts.

There is not a little danger that chattel mortgages may be resorted to by unscrupulous debtors as a mere pretext, and with a view to withdraw their property from the reach of their creditors. Such an act of withdrawal would be regarded as a fraud upon the creditors, and might, at their instance, be declared void. To ensure publicity in this class of cases it is provided by legislation in a number of the States that the mortgage, when there is no change of possession, shall be filed in some public office. A failure to comply with this regulation would usually make the transaction void as to creditors and as to purchasers in good faith from the mortgagor, though the mortgage would still be binding as to the original parties and as to purchasers with notice of all the facts. It is in some instances further provided that if the debt secured by the mortgage duly filed is not paid within a brief period (*e. g.* a year), there shall be a public declaration filed by the mortgagee in the same office of the continuance of the indebtedness. A non-compliance with this regulation is visited with similar penalties.

Independently of such regulations, the fact that the mortgaged goods remain in the possession of the mortgagor is a circumstance indicative of fraud upon creditors, and requiring explanation. It is a rule in the law of sales of chattels, including mortgages (see SALE), that the retention of possession by the seller is a badge of fraud. The presumption thus created may, according to prevailing law, though with some diversity of opinion, be explained, and the possession be shown as a question of fact to rest upon grounds consistent with good faith. If no satisfactory explanation is given, the presumption becomes conclusive. It would be evidence of fraud sufficient to avoid the mortgage as to other creditors if its terms permit the mortgagor to sell the goods as his own, and appropriate the proceeds of the sales to his own use, without accounting to the mortgagee. The true theory of the transaction where the mortgagor remains in possession, and is permitted to sell, is that the sales, after deducting expenses, are to be applied to the reduction of the debt; and no other doctrine is consistent with the protection and the due enforcement of the claims of other creditors.

If the mortgage be valid, and be not paid at the appointed day, the remedy of the mortgagee to cut off the right of redemption is to foreclose by an action in equity. So he may sell under a power of sale, giving due notice to the debtor of the time and place of sale, and holding himself accountable to the mortgagor for any surplus realized above the amount of his claim. (The subject may be further pursued in the works on mortgages already referred to, and in the statutes of the respective States and in the reports.) T. W. DWIGHT.

Mortier′ (EDOUARD ADOLPHE CASIMIR JOSEPHE), duke of Treviso, marshal of France, b. at Cateau-Cambrésis, in the department of Nord, Feb. 13, 1768; received a mercantile education, but entered the army in 1791; was made a general of division in 1799 and marshal in 1804; fought with distinction in Germany, Spain, and Russia; was made duke of Treviso after the battle of Friedland 1808, and a peer of France during the first Restoration; accompanied Louis XVIII. across the frontier, but returned to Napoleon during the Hundred Days; was commander-in-chief of the fifteenth military division after the second Restoration; went as ambassador to St. Petersburg in 1831; took charge of the ministry of war for a short time in 1834, and was killed by Fieschi's "infernal machine" on the Boulevard du Temple July 28, 1835.

Mortification. See GANGRENE, by EDWARD J. BERMINGHAM, M. D.

Mor'timer (Roger), earl of March, baron of Wigmore, b. on the Welsh frontier about 1287; became a ward of Piers Gaveston 1303; was knighted, and served under Edward I. in the Scottish war 1306–07; was employed in high offices under Edward II. in Scotland and France; was lord lieutenant of Ireland 1317; joined the earl of Lancaster in his rebellion against the king's favorites 1320; was captured at the battle of Boroughbridge 1322, and imprisoned in the Tower; escaped to France by the connivance of Queen Isabella; entered the service of King Charles IV. of France, then at war with England; met Isabella at her brother's court at Paris 1325; became her paramour; plotted with her against her husband; obtained possession of the young prince Edward, heir to the throne; received aid from the count of Hainault; landed with Isabella at Orwell Sept. 24, 1326; was joined by the great nobles; deposed Edward II. Jan., 1327; proclaimed the young prince as king (Edward III.); ruled the kingdom in his name; was created earl of March and obtained the confiscated estates of the Despencers; murdered the deposed king at Berkeley Castle Sept. 21, 1327; executed the earl of Kent 1329; offended the people, the nobles, and the king by his cruelty and arrogance; was seized by the king and Lord Montacute at Nottingham Castle; attainted by a new Parliament called at Westminster, and was hung at Tyburn Nov. 29, 1330. His attainder was reversed as illegal in 1354, and the title and estates restored to his grandson, who by alliance with the royal family was ancestor of the Tudor and all later sovereigns of England.

Mort'main [Fr. *mort*, "dead," and *main*, "hand;" Lat. *mortua manus*], in law. I. *General Historical Sketch.*—In its widest signification this term may be used to describe any property the owners of which do not change, and which does not pass from hand to hand by sale or by inheritance. The word, however, is generally employed in a narrower sense, and is applied solely to lands of the Church, of religious corporations, and pious foundations. The expression *manus mortua* (Fr. *mort-main*, "dead hand"), which occurs in public documents as early as the middle of the ninth century, is derived either from the fact that land owned in this manner was inalienable, and was therefore figuratively spoken of as being in "dead hands," or, which is by far the more plausible derivation, from the fact that persons who became members of religious corporations and ecclesiastical communities were civilly dead—that is, were regarded in the law as dead, so that property held by them was literally in dead hands. The amount of the lands which during the Middle Ages and the centuries immediately succeeding thereto were possessed by ecclesiastical proprietors, by churches, cathedrals, chapters, abbeys, convents, and every other species of religious corporation, and which were thus mortmain, throughout all the countries of Europe, was enormous. The influence of the Church was constantly exerted to procure additional gifts from the laity, and its policy permitted no alienation of what had once been obtained. This vast accumulation was both a political and an economical evil, and could not fail to attract the attention of the civil authorities as soon as the true relations of the government with the state and the Church came to be even partially understood. It was justly regarded as detrimental to the prosperity of any country in which it existed; it arrested the progress of improvement in agriculture, and caused the smallest amount of productions to be obtained from cultivating the soil; it prevented the free interchange and diffusion of property: it diminished the public revenue; it perverted the religious sentiment by fostering the belief that sins could be atoned by gifts to the Church; it undermined the self-respect and self-reliance of the people by multiplying charitable institutions, which maintained multitudes of able-bodied men in idleness. From considerations of policy, therefore, political as well as economical, the governments of all countries at an early day resorted to measures against mortmain which were both repressive and preventive. The first of these legislative measures subsequent to the overthrow of the Western Roman empire was by the emperor Frederick Barbarossa, who by an edict in 1158 prohibited the transfer of fiefs to the Church without the consent of the superior lord, and the same was enacted by Louis IX. John Norton Pomeroy.

II. *Mortmain Law in England and the U. S.*—In England there has a policy prevailed from an early period in opposition to the appropriation of lands by corporations. This policy grew mainly out of feudal considerations. It was a rule of the feudal law that when an owner of land died his heirs should pay a fine called a "relief" to the feudal lord as an equivalent for taking possession of the estate. No such fine could be exacted from a corporation on account of its perpetuity. It was therefore resolved that as a prerequisite to an indefeasible title corporations should obtain a license from the king or other feudal lord; on granting this license a sufficient fee could be required. Although "religious houses" were made prominent in the preamble to the mortmain acts, yet the prohibitions were levelled against all indiscriminately, except that in *Magna Charta*, 9 Henry III. c. 36, which was directed only to religious *houses*. This provision in the Great Charter having been evaded, and being too narrow in its terms, a later statute (7 Edw. I., A. D. 1279) provided that no person, religious or *other*, should buy or sell any lands, etc., or receive them by reason of any title, so that they should come into mortmain. If this direction was transgressed, the chief feudal lord might within a specified time enter upon the land so held in mortmain, and if he neglected to do so the king might take the land. This statute was levelled at all corporations, whether religious or secular, and did not impair the capacity of the corporation to *take* the land, but only prevented it from *holding* in case the chief lord or king determined to exact a forfeiture. Similar provisions were applied by another statute passed in the same reign to collusive suits or actions which had been resorted to by way of evasion as a mode of passing title to corporations.

The effect of these acts was evaded by ecclesiastics and others by resorting to the doctrines of uses, introduced from the civil law into the common law of England. Instead of conveying land directly to the corporation, it became the practice to vest the title in some individual, who was directed to hold it to the use of, or in trust for, the corporation. The courts paid no attention to this direction, as they regarded the so-called "use" as wholly inoperative and void; courts of equity, then under the control of the clergy, on the other hand, regarded the use as affecting the conscience of the legal owner, and directed him to appropriate the rents and profits in the mode pointed out by his grantor. To meet this device an important statute was passed in the reign of Richard II. (A. D. 1391, 15 Rich. II., 2 *Statutes of the Realm*, pp. 78–80). The provisions of this act so clearly show the scope of the so-called "mortmain acts," and their application to *all* corporations, that they will be stated at some length. The preamble recites the abuse that had come to prevail, and that of late, by subtile imagination and by art and engine, religious persons had entered into lands adjoining to the churches, and by sufferance of the tenants and by bulls of the bishop of Rome had dedicated and hallowed the same, and "did make continually parochial burying *without license* of the king and of the chief lords." It was then provided that all who had become possessed of lands to the use of religious people should on pain of forfeiture amortise them before a specified time by the license of the king and the feudal lords, or else convey them to some other use. For the future it was established that no such purchase be made either for the use of religious persons or for guilds or fraternities, and that "cities, boroughs, etc. which have a perpetual commonalty be as perpetual as people of religion, and that from henceforth they shall not purchase to them and to their commons upon pains contained in the statute *De religiosis*" (7 Edw. I., before cited).

These expressions make it entirely plain that all corporations need the king's license to make a good title, but that any estate which they may acquire vests in them until it is withdrawn by legal proceedings attendant upon a forfeiture. An accurate writer, Mr. Shelford, says: "Notwithstanding this statute, grants to corporations, without any license in mortmain, are good for the purpose of vesting the land in the grantees, for corporations without such license have capacity to take, but not to retain." (See also the remarks of Wayne, J., in the case of *Perin* v. *Carey*, 24 *Howard's U. S. Reports*, 498 (A. D. 1860).)

Where the case is one of a devise to a corporation a different rule prevails. The provision is by the common law wholly void, since no devise of land can be made even to a natural person. Nor is the matter helped by the statute of wills (32 Hen. VIII.), as bodies politic and corporate are excepted from its operation. A question, however, arose after the adoption of the famous statute (43 Eliz. c. 4) known as the "Statute of Charitable Uses," whether it was not applicable to corporations, and would allow them to take the *use* of land by will, though they were debarred from taking the land itself. In fact, the question was still broader, and involved the inquiry whether even before this statute a court of chancery would not sustain in some form a devise to a corporation for a charitable purpose, though it had no capacity to take the title itself by will. The correct view undoubtedly is, that though a devise is made to a corporation unable to take real estate for a charitable use, the land itself is, by general principles of law, bound by the trust, which the court of chancery will carry out. This result was more fully recognized after the enactment of the statute already referred to, but was not created by it. During the reign of Henry VIII., owing to some statutes growing out of the religious reformation, a distinction was taken between "superstitious" uses and those which were deemed to be truly charitable. The former were such as were supposed to be contrary to the policy of the statutes and in opposition to the state religion, and were declared void. This subject is only incidentally related to corporation law, for the test whether a use is charitable or superstitious is the same whether the title to the land is vested in a corporation or an individual trustee. This subject will be more fully considered under the topic of TRUST (which see). An important statute was passed in the reign of George II., sometimes erroneously termed a "mortmain act," which was really levelled at charitable uses created by will. It was a special law against "improvident alienations or dispositions made by languishing or dying persons, or by other persons, to uses called charitable uses, to take place after their deaths, to the disherison of their lawful heirs." The statute simply provides that no lands or tenements shall be conveyed to any person or persons unless by deed executed at least twelve months before the death of the grantor. It has no relation to a mortmain act, which is aimed solely at corporations. It permits the charitable direction by deed, complying with the statute, but does not allow it by will. It makes the use void, while the mortmain acts vest the property in the corporation until forfeiture.

In the U. S. there are no strict mortmain acts, except in one or two of the States. Corporations are generally allowed to take conveyance of land for such purposes as may be necessary. Sometimes the value of the land which they may acquire is limited. In such a case, if the value is exceeded, they still hold the land by a defeasible title until there is a forfeiture by appropriate legal proceedings on the part of the State. If the value is not exceeded at the time of acquisition, and there is a subsequent increase, there is no ground of forfeiture. Ordinary or business corporations cannot take land by devise; charitable corporations are usually allowed to take it both by deed and by will. In a few of the States there are statutes restricting the creation of charitable uses by will somewhat resembling the English statute of 9 Geo. II. Thus, it was provided in New York in 1860 that no testator leaving a wife, child, or parent should devise or bequeath to a charitable institution or association more than one-half of his property, deducting his debts. If the devise exceeds one-half of his estate, it is valid to that extent. (Consult Shelford on *Mortmain;* Boyle on *Charitable Uses;* Duke on do.; Tudor on do.; and see the article on TRUST.) T. W. DWIGHT.

Morto da Feltro, b. in 1474 at Feltro, a town of Northern Italy, at that time belonging to the Venetian republic, studied painting in Venice, but during a visit to Rome he became so enamored with the ancient arabesque that he introduced that feature in the Venetian school. It was first used in the decoration of the Fondaco de' Tedeschi, which Morto executed together with Giorgione. He afterward gave up painting, entered a Venetian regiment, and was killed in 1519 at the siege of Zara, in Dalmatia.

Morton (CHARLES), b. in Cornwall, England, in 1626; educated at Oxford, where he became a fellow; was at first a royalist, but subsequently a Puritan; was minister at Blissland, Cornwall, until ejected in 1662 for nonconformity; established an academy at Newington Green, near London, where Daniel Defoe was one of his pupils; was subjected to such annoyances by the ecclesiastical courts that he emigrated to Massachusetts July, 1686, with his pupil, the future historian, Samuel Penhallow; was minister of Charlestown from November of that year until his death, Apr. 11, 1698. He was also vice-president of Harvard College; author of a *System of Logic*, long in use in that institution, and of several scientific works, published in England.

Morton (GEORGE), b. at York, England, about 1585; became a Puritan, and with a brother, Thomas, was among the earliest of the Pilgrims who settled at Leyden, Holland; married there in 1612; remained as the agent of the Pilgrims in London 1620; came to Plymouth, Mass., in the Ann 1623, bringing a reinforcement and supplies to the Pilgrims of the Mayflower; returned to England some years later, and d. in the N. of England. He was the editor of the first book published in England which gave an account of the planting of Plymouth colony, the work known as *Mourt's Relation* (1622), of which the best edition is that by Rev. H. M. Dexter (Boston, 1865).

Morton (HENRY), PH. D., b. in New York City Dec. 11, 1836; graduated at the University of Pennsylvania 1857, about which time he prepared for the Philomathean Society of that institution a translation of the hieroglyphic inscription of the Rosetta Stone, and executed on stone the drawings which accompanied its publication (1858), made by a committee consisting, besides himself, of Messrs. C. R. Hale and S. Huntington Jones. He pursued the study of law in Philadelphia for nearly two years, when his growing predilection for physical and for chemical science induced him to give them his entire attention. In 1863 he was elected professor of chemistry at Philadelphia Dental College; became in 1864 resident secretary of the Franklin Institute of Pennsylvania, and in April of that year began the delivery in the Academy of Music of Philadelphia of a course of sixteen lectures on light, which excited great attention both in the U. S. and in Europe, on account of the originality and brilliancy of their experimental illustrations (see *Les Mondes*, vols. xviii. *seq.*), so that several of them were repeated for the accommodation of vast audiences. In 1867, Prof. Morton became editor of the *Journal* of the Franklin Institute, and during the academic year 1867–68 filled temporarily the chair of chemistry and natural philosophy in the University of Pennsylvania. In 1869 he organized the photographic parties sent to observe the solar eclipse of Aug. 7, under the auspices of the *Nautical Almanac* office, having under his direction the three parties stationed at Burlington, Mt. Pleasant, and Ottumwa, Ia. (See *Journal of Franklin Institute*, vol. lviii.) In 1869 he was elected professor of chemistry in the University of Pennsylvania, and in 1870 was appointed president of the Stevens Institute of Technology at Hoboken, N. J., then just founded by a bequest of the late Edwin A. Stevens of that place. This institution, which is a school of mechanical engineering, has under the management of Pres. Morton achieved a high reputation, both for the instruction therein given and for the great number of scientific investigations conducted and published by members of the faculty. Pres. Morton has published a number of scientific papers in the *Journal* of the Franklin Institute, the *Chemical News*, and the *Philosophical Magazine*, several of which have been republished in the French *Moniteur Scientifique*. Among them may be noted those *On the Giffard Injector, On the Bright Line beyond the Moon's Edge in Partial Phase-Eclipse Photographs* (copied in *Comptes Rendus* of the French Academy of Sciences, vol. lxiv.), *On the Fluorescent Relations of Anthracene and Chrysogen, Do. of Some Solid Hydrocarbons found in Petroleum Distillates, Do. of Pyrene and Chrysene, On Thallene, a Solid Hydrocarbon produced in the Destructive Distillation of Heavy Petroleum Oils, On the Basic Salts of Uranium, On the Fluorescent and Absorption Spectra of Uranium Salts*, the latter comprising seven papers prepared in conjunction with Dr. H. C. Bolton (*Chemical News*, vol. xxviii., 1873; *Moniteur Scientifique*, vols. xv. and xvi.).

Morton (JACKSON), b. in Virginia about 1810; removed to Florida a few years after its annexation; became an extensive manufacturer; was U. S. Senator 1849–55, and a member of the Congress of the Confederate States. To him the country was indebted for the appointment of Mr. Buckingham Smith to an official post in Spain, which resulted in the acquisition and publication of a valuable series of manuscripts illustrating the Spanish history of Florida and Louisiana.

Morton (JAMES **Douglas**), FOURTH EARL OF, regent of Scotland, b. at Dalkeith in 1530, was a younger son of the great family of Angus; succeeded to the earldom and estates of Morton in right of his wife 1553; was a lord of the Congregation 1557; became privy councillor 1561, lord high chancellor 1563; was an accomplice in the murder of Rizzio 1566; escaped to England, but was soon pardoned and returned; was cognizant of the plot against Darnley, but refused to join it, 1567; reappointed chancellor and made lord high admiral 1568; was one of the commissioners at the conferences of York 1568; succeeded Lennox as regent Nov. 24, 1572; resigned and retired to Lochleven Castle Sept. 12, 1577; recovered his authority soon afterwards; was overthrown by the influence of the new royal favorites, Esme and James Stewart; tried and convicted of participation in the murder of Darnley, and executed at Edinburgh June 3, 1581.

Morton (JAMES ST. CLAIR), b. in Philadelphia in 1829; graduated at the U. S. Military Academy in 1851; entered the engineer corps of the army, and rose to be major of engineers in July, 1863; served as assistant engineer on the defences of Charleston, S. C., and of Fort Delaware; in 1855 was assistant professor of engineering at West Point, then engineer of the third lighthouse district, and engineer in charge of the Potomac aqueduct; led the Chiriqui expedition, Central America, in 1860, on his return resumed charge of the Potomac waterworks, and subsequently superintended the fortifications on the Tortugas; in May, 1862, reported to Gen. Buell as chief engineer of the Army of the Ohio; in Oct., 1862, was chief engineer of the Army of the Cumberland; commanded the pioneer bridge-brigade of that army, and became brigadier-general of volunteers, dating from Nov. 29, 1862; constructed the intrenchments about Murfreesboro'; took part in the capture of Chattanooga; was wounded at the battle of Chickamauga, and superintended the engineering operations at Chattanooga under Gen. Rosecrans; in Nov., 1863, returned to the corps of engineers; in the Richmond campaign of 1864 served as chief engineer of the 9th army corps, and was engaged in the battles of North Anna, Tolopotomy, Bethesda Church, and assault of Petersburg, Va., where he was killed while leading the attack, June 17, 1864. Among his productions are *An Essay on Instruction in Engineering* (1856), *An Essay on a New System of Fortifications* (1857), *A Memoir on American Fortifications*, etc. G. C. Simmons.

Morton (Archbishop John), Cardinal, b. at Bere, Dorsetshire, England, in 1410; educated at Cerne Abbey and Balliol College, Oxford; became principal of Peckwater Inn, now Christ Church; was present at the battle of Towton, and escaped with Queen Margaret to Flanders; attainted of high treason 1461; pardoned and attainder reversed 1471; made master of the rolls 1472, archdeacon of Winchester 1474; appointed by Edward IV. ambassador to the emperor of Germany and the king of France; bishop of Ely and lord chancellor 1478; imprisoned by Richard III. 1483, but escaped to the earl of Richmond in Flanders; was made privy councillor by Henry VII. 1485, lord chancellor 1486, and archbishop of Canterbury in July of the same year; was made cardinal by Pope Alexander VI. 1493; and d. at Knoll, Kent, Sept. 13, 1500. The union of the houses of Lancaster and York by the marriage of Henry VII. was the work of Morton, who was also noted as the early friend and patron of Sir Thomas More.

Morton (John), b. at Ridley, Pa., in 1724; was many years in public life; Speaker of the general assembly of Pennsylvania 1772–75; was sent in 1765 to the Stamp Act Congress; was high sheriff 1760–70, and became a judge in the provincial courts; was an active member of the Continental Congress 1774–76; signed the Declaration of Independence. D. Apr., 1777.

Morton (Marcus), LL.D., b. at Freetown, Mass., Feb. 19, 1784; graduated at Brown University 1804; became a lawyer; clerk of the Massachusetts senate 1811; M. C. 1817–21; a State councilman 1823; lieutenant-governor 1824; a judge of the State supreme court 1825–39; governor of Massachusetts 1840 and 1843; collector of the port of Boston 1845–48. D. at Taunton Feb. 5, 1864.

Morton (Nathaniel), son of George, b. at Leyden, Holland, in 1613; was brought by his parents to Plymouth, Mass., on the Ann in July, 1623; after his father's death was taken into the family of Gov. Bradford, whose wife was his mother's sister; early became assistant to his uncle in the management of public affairs, and by annual popular election was secretary of the colony from Dec. 7, 1647, until his death at Plymouth, June 29, 1685. In 1669 he published at Cambridge the first regular history of the colony, under the title *New England's Memoriall, or a Brief Relation of the most Memorable and Remarkable Passages of the Providence of God manifested to the Planters of New England.* Other editions were printed in London (1669), Boston (1721, with supplement by Josiah Cotton), Newport (1772), Plymouth (1825), Boston (1826, with valuable notes by Judge John Davis), and Boston (1855, with notes by the Congregational Board). The work was compiled at the request of the commissioners of the four united colonies, being chiefly based upon MSS. of Gov. Bradford, was attested as correct by the most eminent survivors of the earlier generation, and until the recovery of Bradford's own history (1856) was the chief early authority for the history of Plymouth colony. Morton also wrote in 1680 a synopsis of the Church history of Plymouth (published by Young in his *Chronicles of Plymouth*, 1841), and was author of a considerable number of occasional verses. Porter C. Bliss.

Morton (Oliver Perry), b. in Wayne co., Ind., Aug. 4, 1823; was educated 1826–37 in the house of his maternal grandparents at Glenville, O.; attended the Wayne county seminary 1837–43; entered in that year Miami University, Oxford, O., but left it two years later; began to study law in office of John S. Newman, Centreville, Wayne co., Ind.; admitted to the bar in 1847. Elected judge in 1852 by the Democrats, he separated from that party on the passage of the Kansas-Nebraska bill in 1854, and rose rapidly among the Republicans as one of their most prominent leaders. Elected governor of Indiana in 1861, he was one of the most brilliant war-governors, and although by paralysis in 1865 prevented from moving about without artificial support, he vindicated as U. S. Senator, after 1867, his prominent political position, till his death at Indianapolis Nov. 1, 1877.

Morton (Perez), a descendant of George, b. at Plymouth, Mass., Nov. 13, 1751; graduated at Harvard College 1771; became a distinguished lawyer and Revolutionary patriot; pronounced the funeral oration in behalf of the city authorities of Boston over the remains of Gen. Joseph Warren Apr. 8, 1776: married Miss S. W. Apthorp, the poetess, 1781; was Speaker of the Massachusetts house of representatives 1806–11; attorney-general of the State more than twenty years (1811–32), and a delegate to the State constitutional convention of 1820. D. at Dorchester Oct. 14, 1837.

Morton (Samuel George), M. D., b. at Philadelphia Jan. 26, 1799; received his medical degree from the University of Pennsylvania 1820, and at Edinburgh 1823; became a practitioner of Philadelphia 1826; recording secretary of the Academy of Natural Sciences 1825, its president 1840; professor of anatomy in Pennsylvania Medical College 1839–43; was widely known as one of the ablest of craniologists; author of *Illustrations of Pulmonary Consumption* (1834), *Human Anatomy* (1839), *Crania Americana* (1839), *Crania Ægyptiaca* (1844), and of a great number of valuable scientific papers upon ethnology, chemistry, zoology, geology, mineralogy, and other sciences. D. at Philadelphia May 15, 1851.

Morton (Sarah Wentworth **Apthorp**), called the "American Sappho," b. at Braintree, Mass., Aug. 29, 1759; married Hon. Perez Morton at Quincy 1781; acquired celebrity by her poems; contributed to the *Massachusetts Magazine* over the signature of "Philenia;" published *Ouabi, or the Virtues of Nature, an Indian Tale in Four Cantos* (1790), *Beacon Hill*, a poem in 5 books (1797), and *My Mind and its Thoughts*, a miscellany of prose and verse (1823). D. at Quincy May 14, 1846.

Morton (Thomas), D. D., b. at York, England, Mar. 20, 1564, of the same family with Cardinal Morton; graduated at Cambridge, where he became professor of logic; was successively dean of Gloucester and Winchester, bishop of Chester 1615, Coventry 1618, and Durham 1632; was imprisoned in the Tower 1645, during the civil war; was a learned theologian and author of numerous controversial treatises. D. at Easton Mauduit, Northamptonshire, Sept. 22, 1659. He is best known as the intimate friend of Isaac Casaubon. (See biographies by Barwick (1660) and Naylor (1669); also Pattison's *Casaubon* (1875).)

Morton (Thomas), b. in England about 1590; was a lawyer at Clifford's Inn, London; was leader of the colony sent by Weston to settle in Massachusetts June, 1622; went back to England; returned with Capt. Wollaston in 1625; settled at Mount Wollaston, now Braintree, where on May Day, 1626, he presided over a scene of merriment very obnoxious to Puritan ideas, setting up a May-pole and naming the spot Ma-re Mount or Merry Mount. The people of Plymouth, hearing of these proceedings, came in force two years later, cut down the pole, carried Morton away, and sent him back to England. He returned to Massachusetts in 1629, but was again seized and transported, and his house torn down 1630. He published a satirical work, *The New English Canaan* (1632), which contains, however, a good description of the country and of the Indians; came again to Massachusetts 1643; was imprisoned a year for his "scandalous book," and d. at Agamenticus, Me. about 1646. (See John L. Motley's novels, *Morton's Hope* (1839) and *Merry Mount* (1849).)

Morton (William Thomas Green), M. D., b. at Charlton, Mass., Aug. 9, 1819; became in 1842 a dentist and manufacturer of artificial teeth in Boston, and while attending medical lectures there conceived the idea of using ether as an anæsthetic. On Sept. 30, 1846, he successfully employed it in the painless extraction of a bicuspid tooth, and Oct. 16, Dr. J. C. Warren removed without pain a vascular tumor from the jaw of a man rendered unconscious by the inhalation of the vapor of ether. Dr. C. T. Jackson and Mr. Horace Wells each claimed the priority in the discovery of the use of anæsthetic agents in surgery, and both categorically rejected the claims of Morton. Morton, however, patented his invention, but derived no profit from it, being involved by it in lawsuits and almost ceaseless quarrels; and it seems, indeed, that neither of the three gentlemen can justly claim the discovery for himself. D. in New York July 15, 1868. (See Wells, Horace.)

Mosa'ic [It. *musaico;* Fr. *mosaique;* Lat. *opus musivum;* Gr. post class. μουσεῖον], the art of producing geometrical figures or pictorial representations by means of small pieces of variously colored stone, glass, or other hard substance, arranged according to the design and cemented together on a solid background. At a very early period ornamental pavements made of black and white pebbles firmly imbedded, and so alternated as to exhibit geometrical forms, were common among the Oriental as well as the more Western nations. The use of small dice-shaped pieces of colored glass, marble, or silicious stone for the same purpose can be traced to a time scarcely less remote, and with these brilliant pictorial effects were produced. The ancient Assyrians, Persians, and Egyptians practised this art, and the house of Demetrius Phalereus of Athens (300 B. C.) was adorned in this way. It was from the Greeks (Pliny, book xxxvi. ch. 28) that the Romans derived their knowledge of mosaic, to which they gave various names—*opus musivum, opus sectile, opus tessellatum, opus vermiculatum.* The general term *mosaic*, however, is usually applied to all works of this kind left to us from that age. The oldest Roman mosaic historically known to us was executed by order of Sulla in the temple of Fortune at Præneste. From this time it rose rapidly into favor. Cicero made use of it to embellish his porticoes and villas, and Cæsar, it is said, even to floor his tents. Under Augustus and his immediate successors it was lavishly employed in the decoration of palaces and temples. Some idea of the extent and perfection to which this art was carried may be formed by the many specimens left to our time. A representation of doves perched on the brim of a vase is mentioned by Pliny as of remarkable excellence, and a copy—or, as some think, the original—of this still exists at Rome. Smaller mosaics of almost microscopic fineness have also come down to us. Among larger ones may be mentioned *the Battle of Issus,* found in the House of the Faun at Pompeii, and now in the Royal Museum at Naples. No description can give an idea of this marvellously beautiful mosaic. Another scarcely less famous piece, representing the Nile and its banks, is in the Villa Barberini at Palestrina; and hardly a day passes in which the spade of the Italian laborer does not bring to light some buried treasure of this kind. The art declined in Italy with the declining Empire, and Byzantium became its chief seat. The new capital soon rivalled Rome itself in the extent and splendor of her mosaics, and in the church of Santa Sophia (erected in the sixth century) it was employed with a gorgeous profusion never before seen. The mosaics which still stand forth so wonderfully fresh and grand from backgrounds of gold in the ancient churches of Rome, Ravenna, and Venice are in part the work of Byzantine artists, then in some respects in advance of the Italians. This superiority, however, lasted but a short time, and the pupils soon surpassed their masters. The grotesque stiffness of the Byzantine school gradually disappeared, and the glorious cathedrals of S. Marco in Venice, of Monreale near Palermo in Sicily, and of Orvieto, are proofs of the astonishing skill to which the Italian mosaicists attained in the thirteenth, fourteenth, and fifteenth centuries. In more recent times this art, or rather this branch of it, has been chiefly practised at Rome, and St. Peter's and St. Paul's without the Walls are indebted to it for much of the splendor of their interiors. Laborious and expensive as these productions are, they have an immense advantage over oil-painting and fresco in point of durability, and many a famous picture will doubtless survive in its mosaic copy long after the frailer original has perished. In the Studio of Mosaic in the Vatican the processes of its manufacture may be seen; the remarkable Roman mosaic works of Dr. Antonio Salviati in Venice are also well worth a visit. At this last establishment large orders from England and other countries are executed.

The so-called Florentine mosaic (*lavoro commesso, pietre dure*), which dates from the time of the first Medici, instead of being composed of cubes of glass or marble, is made entirely of precious or semi-precious stones, such as the amethyst, lapis-lazuli, agate, onyx, jasper, etc., cut in forms best suited to produce the desired effects. The surface of this work is generally flat, but there are superb specimens, both old and new, in relief. The objects represented most frequently are birds, flowers, fruits, vases, sometimes buildings, and more rarely portraits and landscapes. The perfection of these representations is astonishing. The Medicean chapel in the church of San Lorenzo, Florence, is the finest example of this work on a great scale, but tables, cabinets, caskets, etc. of surpassing richness and beauty may be seen in the Uffizzi, Pitti, and other great Italian palaces. The royal manufactory of lavoro commesso in Florence now offers the wealthy visitor an opportunity of purchasing as magnificent objects in *pietra dura* as ever were owned by a Medici.

Much attention has lately been drawn to the famous monument of Taj Mahal at Agra in India, which is said to contain the whole Koran written in *pietre dure,* as well as to equally surprising works of the same kind at Delhi; and it is alleged that these mosaics are, in part at least, the work of Italian artists. The Bombay mosaics are made of ivory and metals: buhl, of tortoise-shell and metal. Mother-of-pearl is much used in modern Oriental mosaics. (For wood-mosaic see TARSIA.) The reader is referred to Ciampini, *Vetera monumenta, etc.* (Rome, 1690); Winckelmann, and Count Demetrio Carlo Finocchietti, *Delle Industrie, etc.* (Florence, 1869). CAROLINE C. MARSH.

Mosaic Gold. Applied to an alloy of copper and zinc, called *or molu* (see ORMOLU); and to a bisulphide of tin, prepared by heating to low redness a mixture of 12 parts tin, 6 parts mercury, 6 parts sal-ammoniac, and 7 parts flowers of sulphur. It remains behind as brilliant gold-colored scales, and is employed to coat surfaces in imitation of gilding, etc., though it never exhibits the same brilliancy. HENRY WURTZ.

Mosasau'ria, a group of extinct reptiles [from *Mosasaurus,* an extinct genus of marine reptiles, first discovered in 1780 in the upper chalk of St. Pietersberg, near Maestricht in Holland, on the Meuse River, hence the name, meaning "lizard of the Meuse"]. The first known species was called *Mosasaurus Hofmanni,* and the cranium was five feet in length. A few other species have been found in the Cretaceous of England and Europe, but their remains are much more abundant in the deposits of that age on this continent, and among these two families of several genera have been recognized. They agree in having an elongated and serpent-like body, which was more or less protected by osseous dermal plates of various forms and usually imbricate arrangement. The jaws were powerful and well armed with sharp conical teeth, which were ankylosed by their bases with the jaws, and occurred also on the palatine bones in the roof of the mouth. The two rami of the lower jaw were united at the extremity only by cartilage, as in the serpents, and a further provision for the wide distension of the mouth was afforded by a joint in the side of the lower jaw at the base of the splenial element. The other bones of the skull had much resemblance to those of existing lizards. The vertebræ were concave in front and convex behind. Those of the neck were few, and the anterior of these had usually a short conical bone articulating with the lower surface of the centrum. In the posterior cervicals this hypapophysis was united with the centrum, and gradually disappeared. The scapula and coracoid were flattened bones, the latter deeply emarginate in some of the genera. The ischium and pubis were more slender, and the ilium had a rod-like shaft, probably attached by cartilage to some of the pelvic vertebræ, as there was no true sacrum. The limbs were in the form of paddles with five digits, each having from four to six phalanges. The families now known are the Mosasauridæ and the Edestosauridæ. In the former the zygosphenal articulation of the vertebræ was wanting or rudimentary; in the latter it was well developed, as in modern snakes and iguanas. The better known genera of the first family are the following: *Mosasaurus,* in which the palatine bones were united on the middle line, and the chevrons were co-ossified with the tail vertebræ; *Liodon,* with the palatines vertical, separated throughout their length; the teeth smooth and compressed; chevrons articulating with the caudal vertebræ; *Baptosaurus,* without articulating hypapophyses on the cervical vertebræ; *Lestosaurus,* with the premaxillæ forming a short obtuse muzzle; quadrate bone large, with a large posterior hook; coracoid deeply emarginate; anterior paddle much larger than the posterior; chevrons articulated; lastly, *Tylosaurus,* with the premaxillæ united into an elongated, cylindrical muzzle; quadrate with a short posterior hook; hind and fore paddles nearly equal in size; chevrons articulated. Of the second family, *Edestosaurus* had the tail long and serpent-like; chevrons co-ossified; quadrate small, with the internal angle produced. The palatine teeth were pleurodont in the anterior half of the series, and in the posterior portion had the outer dental margin protected by a low parapet of bone. The united premaxillæ formed a short, obtusely-pointed muzzle. The anterior paddle was larger than the posterior. In *Clidastes* the palatines were distinct except at their anterior extremities, and bore a long series of teeth, according to Prof. Cope, but the genus is not certainly known except from a single vertebra. More than fifty species of Mosasauria have been found in the Cretaceous strata of North America. About fifteen of these are from New Jersey, half a dozen from the Gulf deposits, and the remainder from Kansas and other parts of the West. *Mosasaurus princeps,* from New Jersey, was probably 75 feet in length, and *Tylosaurus dyspelor,* from Kansas, scarcely less gigantic. These huge reptiles, with their long heads, widely opening jaws, strong sharp teeth, and elongated bodies, protected by bony plates, must have resembled the fabled sea-serpents of modern navigators. O. C. MARSH.

Mosasaur'idæ, a family of reptiles. (See MOSASAURIA.)

Moscheles' (IGNAZ), b. at Prague May 30, 1794; d. at Leipsic Mar. 10, 1870. His father was a Jewish banker. He studied first with F. D. Weber, director of the conservatory, afterwards with Albrechtsberger and Salieri;

went to Paris in 1820, but after a short residence of one year repaired to London, where he remained twenty-five years. In 1846, after a period of professional travel in France and Germany, he established himself in Leipsic; was made director of the conservatory there, and exerted great influence on the musical education and taste of his time. Thalberg and Mendelssohn were his pupils, the only two who by general admission surpassed their master. Previous to them Moscheles ranked with the most eminent, even with Hummel and Kalkbrenner. Moscheles was a composer of sonatas, concertos, fantasias, variations, and studies for the piano. His contributions to the method of the pianoforte are considered important. His translation from the German of Schindler's *Life of Beethoven* is well known. His own *Life* was edited by his wife, in 2 vols. (Leipsic, 1872–73; London, 1873). O. B. FROTHINGHAM.

Mosch'inæ [from *Moschus*, the name of the only living genus], a sub-family of the family Cervidæ, distinguished by the absence of horns in the males as well as females, and the great development of the canine teeth of the upper jaw in the males. To it have been referred by late systematic authors two genera—viz. *Moschus* and *Hydropotes*. The former was long regarded as the type of a peculiar family (Moschidæ), with which were associated the representatives of a very different group (Tragulidæ), because they agreed with that genus in the absence of horns and the development of the upper canines. Although thus agreeing in superficial characters, the two types are, however, widely distinguished in many others. (See the article TRAGULIDÆ.) The two genera retained in the sub-family are by no means very closely related to each other, and it is doubtful whether the group is a natural one. The anatomy of the musk-deer was examined in 1875 by Prof. Flower. He finds that although the animal is essentially a deer, it offers a few peculiar characters, and indicates a low and generalized form derived from the common stock of Bovidæ, Giraffidæ, and Cervidæ, but with the closest relations to the last. The musk-deer (*Moschus moschiferus*) is an inhabitant of the mountainous wooded districts of Thibet and China, where it lives mostly in a solitary state except in the autumn. It is about the size of a six-months' old Virginia deer. The musk, from which the name of the animal is taken, is only secreted in the male; it has the consistence of honey, is of a brownish-red color, and is developed in an oval sac situated on the median line of the abdomen, between the navel and the orifice of the prepuce; the sac is flat on its adherent, but covered with hair on its free, surface; in the mature male it is about three inches in length by somewhat less than two inches in width. When the musk is dry it is almost solid and granular, and is unctuous to the touch. Formerly, it was esteemed as a stimulant for the nervous and vascular systems, and was given in doses of from 8 to 15 grains. It is now, however, very little used. The other species of the family (*Hydropotes inermis*) is found on the islands of the Yang-Tsze in China, where it lives in droves and is very prolific, and, it is reported, as many as six fœtuses have been found, in an exceptional case, in one female. THEO. GILL.

Mos'chus, a Greek bucolic poet, b. at Syracuse; flourished in the middle of the third century before Christ. Of his works, four entire idyls, three small fragments, and an epigram are still extant, generally published in connection with those of Bion, who was his friend and probably his teacher. There is an edition by Manso (Leipsic, 1807).

Mosciano Sant' An'gelo, town of Southern Italy, province of Teramo, charmingly situated among the hills about 4 miles from the Adriatic, with an industrious population of 6359.

Mosco'so de Alvara'do, de (LUIS), b. at Badajoz, Spain, in 1505; was a captain under the brothers Pizarro in the conquest of Peru; accompanied his relative, the adelantado Pedro de Alvarado, in his conquest of the provinces of Northern Peru 1534; returned to Spain with great wealth, most of which was soon dissipated; united with Hernando de Soto in his expedition for the conquest of Florida 1538; succeeded to the command of the expedition on the death of Soto, June 20, 1542; conducted the remnant of his followers to Mexico 1543; accompanied the viceroy Mendoza to Peru 1551, and d. there about 1561.

Mos'cow, government of Central Russia, watered by the rivers Moskva and Kliazma. Area, 12,858 square miles. Pop. 1,938,358. Its surface is an almost level plain, consisting of a clayey or sandy soil, not very fertile. The government is the most flourishing manufacturing part of Russia. Whole villages are often engaged in the manufacture of one single article—cloth, silk, brocade, paper, pins, glass, mirrors, etc.—and the manufacture of many articles is carried to a high degree of perfection. Limestone and marble are quarried and extensively used for building purposes.

Moscow, the second capital of the Russian empire, the manufacturing and commercial centre of the country, and one of the richest and most interesting cities in the world, is situated in lat. 55° 45′ N., lon. 37° 33′ E., 400 miles by railway S. E. of St. Petersburg, in a hilly, fertile, well-cultivated, and beautiful district on the navigable river Moskva, and presents, when seen from the Sparrow Hills on its southern outskirts, a most picturesque and original view, half Asiatic and half European, its thousand gilded and brightly colored spires and domes in old Byzantine style rising beside palaces and public buildings of the modern French and Italian Renaissance, and overcrowded quarters with narrow, crooked streets, after the Oriental fashion, alternating with broad, open boulevards, after the Parisian model. Its circumference is 23 miles, including numerous large gardens, ponds and lakes, and extensive pleasure-grounds, and it consists of five different parts: I. Kremlin, the central part of the city, occupies a hill on the northern bank of the Moskva, is surrounded by heavy stone walls surmounted with towers, and consists of churches, palaces, and public buildings, which seen from some distance seem to form one gigantic but bewilderingly fantastic pile. Besides the palaces of the czar, the patriarch, and the holy synod, the arsenal with its splendid trophy of 875 cannons abandoned by Napoleon in 1812, the treasury, and other public buildings, here are the cathedral of the Assumption, in which the czars are crowned, built in the fourteenth century, and gorgeously decorated with columns of porphyry and jasper, with the floor paved with agates and carnelians, and the walls covered with costly mosaics; the cathedral of St. Michael, in which the czars before Peter the Great are buried; the tower of Ivan Veliki, 270 feet high, surmounted with a gilded dome 37 feet high, and containing thirty-two bells; the Kolokol, the largest bell in the world, weighing 448,000 pounds, placed on a pedestal close by, etc. II. Kitaigorod, or the "Chinese city," to the E. of the Kremlin, also surrounded by a wall with towers and gates, is the seat of the trade of the city, and contains extensive bazaars crowded with buyers and sellers from Tartary, Persia, Germany, and France. Here is the Petrovskoi cathedral, properly consisting of twenty-one chapels joined together. III. Beloigorod, or the "white city," because it is surrounded by a wall of whitish stone, encircles the Kremlin and Kitaigorod on three sides, and has many broad and elegant streets. Here are the palaces of the governor and the nobility, the university with its extensive buildings, several immense monasteries, the foundling hospital, the theatres, the post-office, and other government houses, and the famous drill-house, 560 feet long and 158 feet wide, the roof resting on the outer walls alone; during winter it is heated by numerous stoves, and affords ample room to drill for 2000 infantry or 1000 cavalry. IV. Zemlianoigorod, or the "earthen city," because it was formerly surrounded by an earthen wall, which now has been transformed into promenades. Lastly, V., the Slobodi, or suburbs. In these two parts of the city splendid mansions and magnificent monasteries, schools, hospitals, etc., surrounded with large and beautiful gardens, alternate with clusters of shanties, in which the working-people live, and with great, bustling manufacturing establishments; large tracts of waste land and commons are also found here. Among the 400 places of worship which the city contains there are chapels for the Roman Catholics, Lutherans, and other Christian denominations; also synagogues, and even mosques. The university was founded in 1755, and enjoys a high reputation. Connected with it are a library of 170,000 volumes, a printing establishment, a zoological and mineralogical museum, a botanical garden, an observatory, an anatomical theatre, and several scientific associations of high standing. Besides general schools of different grades, the city also contains special educational institutions—ecclesiastical seminaries, military schools, an academy of art, commercial and industrial schools—and its benevolent institutions are numerous and good. It has water-communication with the Baltic, the Black, the White, and the Caspian seas, and it is connected with St. Petersburg, Nizhnee Novgorod, Taganrog, and Warsaw by rail. Thus, it has become a commercial centre of great importance, and carries on an immense trade in tea, corn, fur, skins, tallow, metals, and its own productions. The opening of the port of St. Petersburg had, of course, a bad effect on the commerce of Moscow, but since that time both the trade with Asia and the inland trade of the city have increased immensely. In 1878 the railways of Moscow carried 162,343,500 hundredweights of goods out of 635,740,000 hundredweights for the whole of Russia, and 8,637,890 passengers out of 37,580,800; in 1880 the revenue of its custom-house (30,000,000 roubles) was nearly double that of St. Petersburg (15,620,000 roubles). It is also the first manufacturing place in Russia, and its factories of cotton, wool, silk, silver, and other metals employ between 30,000 and 40,000 men. Already in the fifteenth century the villages around Moscow were noted for the variety of small industries they carried on. During the seventeenth and eighteenth centuries the first large industrial establishments were founded in Moscow, and after 1830 its manufacturing activity rapidly increased, owing to a protective tariff. At present it numbers about 1000 factories, producing articles to the value of about $50,000,000 a year. There are 170 cotton-, 90 woollen-, and 70 silk-mills, 70 important workshops in metals, 50 tobacco-factories, 20 large tanneries, 20 large watch-manufactories, 15 large candle-works, etc.

Moscow was founded in the twelfth century, and in the fourteenth it became the capital of the rising empire and the residence of the grand duke of Moscow. In 1712, Peter the Great transferred the capital to St. Petersburg, but Moscow, being a sacred city, continued to stand as the first city in the estimation of the Russian nation. It was the winter residence of the Russian nobility, and by its commerce and industry it grew rich. In 1812 it had 9158 houses and 252,609 inhabitants. Napoleon, however, when he entered it (Sept. 15, 1812), found hardly 12,000 people in the city; the rest had fled, carrying away with them all the treasures and legal documents. From the 14th to the 21st of September a horrible conflagration raged, started by the inhabitants themselves, and the impossibility of wintering in a ruined city, together with lack of supplies and the liability to being continually attacked by Cossacks, compelled Napoleon to abandon the city. Only 2626 houses were left standing after the conflagration. Nevertheless, the city was soon rebuilt: it had 166,515 inhabitants in 1816, 348,562 in 1838, 611,970 in 1871, 670,000 in 1881.

CLEMENS PETERSEN.

Mosdok′, town of Russia, in the Caucasus, on the Terek, in a somewhat unhealthy locality, but has extensive silk and wine cultivation. Pop. 11,000.

Mose′ley (HENRY), D. D., F. R. S., b. in England about 1802; graduated at St. John's College, Cambridge, with high honors 1826; took orders in the Church of England 1828; was professor of natural philosophy and astronomy at King's College, London, 1831–45, was a distinguished champion of popular education, and one of the first inspectors of schools appointed by government; author of *Lectures on Astronomy* (1847), *Mechanical Principles of Engineering and Architecture* (1842), which is a textbook at West Point, and of several other works; became canon of Bristol 1853; chaplain to the queen 1855. D. at Olveston Jan. 20, 1872.

Moselle′, river of France, rises in the Vosges at an elevation of 2260 feet, and flows with a tortuous course of 330 miles through France, Belgium, Luxembourg, and Rhenish Prussia, where it joins the Rhine at Coblentz. Its broad valley is covered with vines, celebrated for the light, delicious wine they yield.

Mo′senthal (SALOMON HERMANN), b. Jan. 14, 1821, of Jewish parentage, at Cassel, in the Prussian province of Hesse; studied at Marburg, and received in 1851 a position in the Austrian government at Vienna. Of his many dramas, two—*Deborah* (1850) and *Sonnenwendhof* (1856)—have been translated into the English, Danish, Hungarian, and Italian languages. His dramas *Die deutschen Komödianten* (1863), *Der Schulz von Althüren* (1868), *Marqua* (1871), and his tragedies *Dyveke* (1860), *Pietra* (1865), have also proved successful on the stage. D. at Vienna, Austria, Feb. 18, 1877.

Mo′ses [Heb. משה, *Mosheh;* Septuagint and Vulgate, *Moyses;* Egyp. *Messou;* Coptic, *Moushe*] signifies "he who has been drawn out of the water," and refers to the beautiful story of his birth as told in Exodus—how the Egyptian Pharaoh had ordered that all the males among the Jewish children should be drowned; how Jochebed, the wife of Amram, succeeded in concealing her infant for three months; how she then put him in a basket of papyrus, placed the basket among the rushes of the Nile, and set his sister, Miriam, to watch from afar; how, finally, the king's daughter found the child, was struck with its beauty, determined to adopt it, and sent Miriam to fetch a Hebrew nurse, who was Jochebed. For the history of Moses there are several other sources besides the Bible. There is an Egyptian tradition (Manetho), a Jewish tradition (Midrash), Philo, and Josephus, and a Mussulman tradition in the Koran. The tradition, however, contains comparatively very little which is not simple elaboration and exaggeration of the account given in the Pentateuch, and it has generally a legendary character. The name of Moses is one of the greatest in history. He organized the Hebrew people; he formed the Hebrew character; and the influence which the Hebrew nation has exercised on the civilization of mankind, by being through many centuries the bearer of the monotheistic idea, can hardly be overestimated. According to Ex. ii. 10, Moses was adopted by the king's daughter, and according to Acts vii. 22, he was initiated in all the secret wisdom of the Egyptian priesthood; but the Bible tells nothing of his youth from his adoption by the princess to the day when he slew an Egyptian overseer for his barbarous treatment of a Jewish slave. He had then to flee from Egypt, and lived for many years in Midian with Jethro the priest, whose daughter he married and whose flocks he tended. Having been called to free his brethren from the slavery in which they lived, he returned to Egypt, but at first he was received by his countrymen with suspicion, and by the Egyptians with contempt. Nevertheless, he succeeded in his mission, leading the Jews across the Red Sea into the deserts of Arabia. The first part of the task was thus accomplished; the remaining, however, proved still more difficult. For many generations the Jews had lived in the most abject thraldom; they had lost all feeling of independence and self-confidence, and the peculiarities of their race were contaminated and perverted, instead of having been developed into a national character; they were utterly unfit for the conquest of a country, for the organization of a state, and for the part they were destined to play in history. According to the biblical narrative (in the Pentateuch and the book of Acts), Moses was 40 years old when he fled into Arabia, 80 when he led the march to Sinai, and 120 when he died on Mount Nebo. Under his leadership the Hebrew people, during their forty years of penal wandering in the desert, took on the religious and moral character which enabled them to begin their career in Palestine. (For the legislation of Moses see Warburton's *Divine Legation of Moses* (1737, 1741, 1788); Spencer, *De Legibus Hebræorum Ritualibus* (1685); Witsius, *Egyptiaca* (1683); Michaelis, *Mosaisches Recht* (1770–75); and Saalschütz, *Mosaisches Recht* (1846, 1848).)

Moshan′non Creek, a stream which constitutes a part of the boundary between Centre and Clearfield cos., Pa. It flows N. E. into the W. branch of the Susquehanna. Its valley contains valuable beds of semi-bituminous coal.

Mos′heim, von (JOHANN LORENZ), b. at Lübeck, Germany, Oct. 9, 1694; was theological professor at Helmstädt 1723–47; became in 1747 professor at Göttingen and chancellor of the university, and d. there Sept. 9, 1755. An able preacher and historian, his works are of great permanent value. The chief are *Institutiones Historiæ Ecclesiasticæ* (1726–39) and *De rebus Christianorum ante Constantinum* (1753), the former translated into English by Maclaine (1765–68), the latter by Murdock (New York, 1852). His theological standpoint occupies the middle between the two extremes, pietism and deism.

Moskwa, Battle of the. See BORODINO.

Mosque [Arab. *mesjid*, the "place of bowing" in prayer], a Mohammedan temple of worship. It usually consists of a series of porticoes surrounding an open court, having in its centre trees and a fountain for ablutions. The architectural character is usually peculiar; the dome (of Byzantine origin), the minaret (originally the Christian campanile, in which, however, the muezzin's cry takes the place of the forbidden bell), and the arched gateway are usual peculiarities, but the local modifications in the style of mosques are numerous. Lamps, arabesques, and passages from the Koran take the place of paintings and statues. None may enter save with unshod feet. The congregations are usually composed of males only. There are sometimes schools, dispensaries, and hospitals within the mosque. Mohammed himself built the first mosque at Medina.

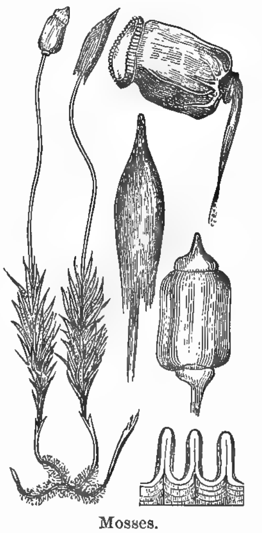
Mosque′ra (RUY GARCI′A), b. in Spain in 1501; accompanied Sebastian Cabot in his voyage in the Spanish service to the Rio de la Plata 1526; discovered Paraguay, from which he brought specimens of silver; was left by Cabot in charge of the colony of Espiritu Santo; narrowly escaped massacre by the Indians; established himself at Cape Santa Maria on the coast of Brazil, and subsequently on the island of Santa Catalina, after defeating the Portuguese, and in 1535 joined Pedro de Mendoza in founding Buenos Ayres, where he d. about 1555. The influential family of Mosquera in Colombia, which has furnished during the present century several presidents, generals, ministers, and bishops, is said to trace its descent from the navigator.

Mosqui′to [Sp., dim. from Lat. *musca*, a "fly"], a name given to many biting and blood-sucking dipterous insects, mostly of the family Culicidæ, and of the genera *Culex*, *Anopheles*, *Corethra*, and many others. The female insects alone bite, or rather thrust into the flesh their awl-like bristles, massed together into a tube, through which they draw the blood. The number of these insects and the distress they occasion are very great, not only in hot countries, but in some cold ones, like Lapland and Labrador. The use of mosquito-netting, the kindling of dense smoky fires, and the application of tar, pennyroyal oil, or decoction of feverfew to the skin, all have some effect in protecting the person from their attacks. It is not quite certain whether they really poison the wound which they inflict. The female mosquito deposits her eggs on the surface of the water, and the larvæ constitute an important part of the food of fishes. (See GNAT.)

Mosquito Coast, or **Mosquitia,** a territory of Central America, of which it is difficult to say where it begins or ends, and to whom it belongs. It lies between Costa Rica, Nicaragua, and Honduras, extending along the Caribbean Sea, but its boundaries are not well defined; its area is variously estimated at 15,000, 25,000, and 36,000 square miles. Its inhabitants, numbering about 10,000, are mostly aboriginal Indians, whose chief calls himself king of Mosquitia. The country was under English protection until 1859, when it was ceded to Honduras, which in 1860 handed it over to Nicaragua; it is now claimed by New Granada, but is actually held by Nicaragua, which seems bent upon keeping it.

Moss Agate. See MOCHA STONE.

Mosses [Lat. *muscus* (or in the plural *musci*); Ger. *Moos* (pl. *Moose*)], a natural order of low, tufted acrogenous plants arising from a filamentous (rarely persistent) prothallus, with a stem and distinct leaves, producing spore-cases, which usually open by a terminal lid and contain simple spores alone. Inflorescence (as in the Phanerogamia) synœcious, monœcious, diœcious, or polygamous. The male inflorescence consists of *antheridia, perigonia*—small, usually oblong-cylindrical bodies, opening at their apex at maturity for the emission of their contents, consisting of a mucous liquid filled with the very minute *sperm-cells*, which contain singly the *spermatozoids*—filiform-clavate biciliate spirally involute bodies, endowed with spontaneous motion (produced by their vibratile ciliæ), and resembling Infusoria, or more nearly the spermatozoa of animals. The antheridia are usually intermixed with hyaline articulated filaments, or *paraphyses*, and, with these, are commonly enclosed by the *perigonial leaves* in a small bud-like (*gemmiform*) or disk-like (*disciform*) flower. Their office is similar to that of the pollen-grains in the Phanerogamia. The female inflorescence consists of *pistillidia, archegonia*—small narrow, flask-shaped bodies (resembling the pistils of the Phanerogamia), also variable in number, mixed with paraphyses and surrounded with leaves of peculiar form (*perichætial leaves*). The archegonium (seldom more than one in a flower maturing) consists of an inner (at first invisible) portion (*germen*), which after fertilization becomes the fruit, and an outer, at length, membranous portion, which ruptures early near the base; its upper part is almost always carried up on the apex of the growing fruit, and becomes the *calyptra*, while its lower part is the *vaginula*, which partly encloses and partly is coalescent with the base of the fruit. The calyptra is terminated by a long and narrow funnel-mouthed tube (*style*); if it splits on one side, it is dimidiate or *cuculliform*; if not, *mitriform*. The fruit consists of a pedicel (*seta*), usually thread-form and considerably elongated, arising from the base of the interior of the archegonium; on its apex is borne the capsule (*theca*), which is rarely indehiscent or split lengthwise by four or eight valves, but usually opens by a lid (*operculum*); within or beneath the operculum are commonly one or two rows of rigid processes (collectively called the *peristome*), which are almost always some multiple of 4; those of the outer row are called *teeth*, those of the inner row, *cilia* or *processes*, their intermediate processes, *ciliolæ*; an elastic ring of cells or *annulus* usually lies between the rim of the capsule and operculum; the theca contains the sac or *sporangium*, in which the seeds (*spores* or *sporules*) are included around a central *columella*, which is, apparently, a continuation of the central portion of the pedicel through the capsule; the lower portion of the capsule is contracted into a *collum*, or neck, when the sporangium does not reach to its base; when the pedicel is uniformly enlarged under the capsule, it forms an *apophysis;* when protuberant on one side only, a *struma*. The spores consist of an outer coat (*exospore*) and an inner (*endospore*), containing usually an oleaginous or gummy substance; in germination the inner coat bursts through the outer at a certain point; the protruding portion elongating, and at length ramifying, forms the *proembryonal thallus* (*protonema, prothallus*), from which the stems arise, usually a great many from the thallus of a single spore. The plants are also often propagated by *gemmæ*, or buds, variously situated. Stems short and of a soft cellular structure, or most frequently more or less elongated, and then of a more solid and somewhat woody structure, radiculose at the base, and, when creeping, also from various points along the under side, or often densely tomentose-radiculose throughout their whole length; usually more or less (often much) branched (the branches proceeding from buds in the axils of the leaves); leafy, and besides sometimes clothed with laciniæ-like scales (*paraphylla*). Leaves sessile, never lobed or parted, but often serrate or spinulose on the margin, usually furnished with a mid-nerve (*costa*); the blade (*lamina*) rarely composed of more than one thickness of cells; surface smooth or papillose; costa often parted, sometimes lamellated above, but oftener furrowed on the lower side. Rootlets jointed and branched, often roughened or papillose, rarely tuberously thickened, and then containing starch, usually colored (brown, or not infrequently purple). Stomata are sometimes present in the capsule wall. Habitation on rocks, trees, rotten wood, dung of animals, and on the ground under extremely variable qualities and conditions of soil, in almost every latitude and climate. COE F. AUSTIN.



Mosses.

Mostaganem′, town of Algeria, province of Oran, carries on some trade, though its harbor is shallow, and has some manufactures of carpets, coverlets, woollen fabrics, and jewelry. Pop. 7200.

Mostar′, capital of Herzegovina, on the Narenta, which is here crossed by a celebrated Roman bridge consisting of one arch of 95 feet (hence its name, *Most Star*, "Old Bridge"), is situated 35 miles from the mouth of the river and 40 miles S. W. of Serajivo. It contains forty mosques, two Greek churches, a fine palace, and some few other buildings of note. It manufactures knife and sword blades and fine silks, and the vicinity produces an excellent wine. Pop. about 18,000.

Most Precious Blood, Congregation of the, an order of regular clerks (Roman Catholic) founded by Caspar Bufalo, who d. in 1837. They were first introduced into the U. S. in 1844.

Most Sacred Heart of Jesus, Congregation of, a society of secular priests founded at Innspruck in 1866; received the papal approbation in the same year. Their superior for the U. S. resides at Milwaukee, Wis. It is one of those numerous societies of the same or a similar name founded at various times and in various places by the Jesuits for devotion to the heart of Jesus. They all sprang from the institution which the Jesuit La Cambière based on the visions of Maria Alacoque, a nun in the monastery of Paray le Monial in Burgundy, d. in 1690.

Mo′sul, town of Asiatic Turkey, capital of the eyalet of Mosul, on the right bank of the Tigris, opposite the remains of the ancient Nineveh. It was formerly a manufacturing place of great importance; its fine cotton fabrics, called *muslins*, were exported to every European country. Now its manufacturing interest has completely ceased, and European goods are sold in its bazaars. It has importance only as a station of the transit-trade, and even as such it has greatly declined on account of the insecurity of the neighborhood, the districts to the N. being inhabited by Kurdish tribes which do not recognize the authority of the Turkish government and have not accepted Islam. The town has very few Protestants. Pop. about 30,000.

Motaz′ilites [from the Arab. for "sectaries"], called also **Kadarija,** "free-will men," and **Moattalites,** a former sect or body of sects among the Mohammedans. The sect originated in Mohammed's own days. Mabad, Wasil ben Ata, and Abul Hudail were its successive leaders. They opposed Mohammed's fatalism, and introduced philosophical and rationalistic discussion into the Moslem schools. There sprang from this origin numerous sects or schools—the Jobbaians, the Thamamians, the Pasharians, the Hashemites, the Mozdarians, and others. The sect called Sincere Brethren or True Friends was a later development of the Motazilite movement.

Motet′, or **Motetto** [It.], in music, a name frequently, but somewhat vaguely, given to certain compositions, chiefly of a sacred character, which, though of considerable length, are not equal to the anthem in extent or variety of movement. Formerly, the motet had the more definite signification of an elaborate vocal composition in several parts, often founded on the words of psalms or ancient hymns, and differing chiefly in length from an anthem or a short mass.

Moth [Ang.-Sax. *mogdhe*], a perfect insect of the nocturnal Lepidoptera. They are distinguished from butterflies and sphinges by the antennæ, which are filiform or pectinate in moths, mostly knobbed in butterflies, and enlarged in the middle in the sphinges. Moths are mostly, but not always, nocturnal; sphinges mostly crepuscular (flying by twilight); and butterflies diurnal. But the sphinges are frequently known as hawk-moths. Among the best known moths are the silkworm moths (*Bombyx mori*) and the clothes moths (*Tinea flavifrontella, T. tapetzella* or carpet moth, etc.). Their larvæ attack woollens, furs, feathers, etc., and more rarely cotton goods. Goods which are exposed to their ravages should be carefully shaken and inspected about the first of June. Powdered black pepper should be strewed under the edges of carpets. Spirits of turpentine, snuff, tobacco, camphor, cedar chips, corrosive sublimate, benzine, and carbolic acid are among the agents which are useful in checking their ravages.

Mother Carey's Chicken, or **Stormy Petrel** (the *Procellaria pelagica*), the smallest of web-footed birds, some six inches long, and black. It nests in clefts of rocks and holes along the N. Atlantic coast. It emits much oil from the mouth when caught, doubtless from the fish with which its stomach is filled. Sailors look upon this bird as ominous of evil, but they all have a superstitious dread of injuring it. Many believe that each one contains the soul of a shipwrecked mariner; others consider them witches. It is often seen in the most stormy weather, and frequently rests upon the waves. The bird has a disagreeable smell. Mother Carey's goose is the giant fulmar (*Ossifraga gigantea*) of the Pacific.

Mother-of-Pearl, a substance chiefly afforded by the shells of the pearl oyster (*Meleagrina margaritifera*), which also yields the greater part of the pearls of commerce. The shells are obtained in the Gulf of California at Panama, Cubagua, Ceylon, Madagascar, Swan River, Manila, the Society Islands, etc. Those from Manila are the best; they are of the black-lipped variety. The Society Islands furnish the silver-lipped sort, and Panama the "bullock shells." The genera *Haliotis, Turbo,* etc. also furnish some mother-of-pearl. It is principally used in knife-handles, shirt-buttons, for inlaying, etc.

Moth'erwell (William), b. in Glasgow, Scotland, Oct. 13, 1797; published *The Harp of Renfrewshire* (1819), *Minstrelsy, Ancient and Modern* (1827), and a volume of *Poems, Narrative and Lyrical* (1832). The latter contained some very fine ballads and lyrics, especially *Jeanie Morison*, which acquired great popularity. Motherwell was for some years sheriff-clerk depute of Renfrewshire and editor of the Paisley *Magazine* and *Advertiser*. He took charge of the Glasgow *Courier*, a Tory journal, in 1830, and conducted it until his death at that city Nov. 1, 1835. A new and greatly enlarged edition of Motherwell's *Poems* appeared in 1847, accompanied by a memoir, and was reprinted in the U. S.

Moth'erwort, a labiate herb, the *Leonurus cardiaca*, common in the U. S., though naturalized from Europe. It is used in domestic medicine, and prized for its sedative and diaphoretic powers, which are mild and safe in character. Its smell and taste are strong, and not pleasant.

Mo'tion [Lat. *movere, motum,* "to move"] consists in a change of position or place of a point or of a body, the successive positions of the point or body forming its path or trajectory.

There can be no definite conception of the motion of a point or body without reference of its positions to some other point or body in relation to which the motion is estimated. On the earth's surface we are accustomed to refer nearly all ordinary phenomena of motion to some point which is fixed on the earth. The motion of a person walking is unconsciously referred to the points on the ground over which he passes; the motion of a projectile is referred to the point at which it receives the impulse which produces its motion; and the conception of the motion of the solar system is possible only by referring it to some point or direction in space towards which the system as a whole is supposed to move. The fundamental idea, therefore, of a simple movement is that it is relative—*i. e.* it must have reference to some point and some direction which may be supposed fixed. The study of the principles of motion unconnected with the forces which produce it constitutes a branch of the science of dynamics to which the name *kinematics* (from a Greek word signifying "motion") has been given.

Velocity is a term which has reference to the *rate* of motion of a point or body. In popular language we speak of motion as being slow or swift, without attaching any very definite meaning to these terms, except such as belongs to the particular movement under consideration. A brook runs swiftly, and an arrow flies swiftly, but the swiftness of running water and the swiftness of an arrow represent two very different rates of motion; and although they convey quite definite ideas in one sense, yet something is still needed if we wish to compare these two motions definitely one with the other. The term *velocity* is used in such a comparison, and it may be said that the water of the brook moves with a velocity of 5 feet a second, and the arrow with a velocity of 200 feet a second, both being referred to points on the earth. The term velocity is thus employed to denote a definite measure of the rate of motion according to some particular unit of measure. The three simple units of measure by which natural phenomena are investigated are the unit of force, the unit of time, and the unit of distance or space. The two latter are employed in the determination of velocity; and from these two the measure of velocity may be obtained—viz. the space measured in units of space, passed over by a body in a unit of time. If a second be taken as the unit of time, the velocity will be the space passed over by a point or body in one second. In this manner all velocities may be compared by their measures in the same units; assuming the same interval of time for the unit of time, the velocities of bodies in motion may be compared definitely by the spaces passed over in this unit of time.

If the path or trajectory of a point is known, and its velocity given, the elements of its motion are thus completely determined. The motion is said to be *uniform* when equal portions of the path are passed over in equal times. It is *varied* when unequal portions of the path are described in equal times. It is *uniformly varied* when the successive changes of velocity, increasing or diminishing, take place by equal increments or decrements in the same time. The laws of motion require, therefore, not only that the path shall be known, but that the velocity at each point of its path, or the law by which the velocity changes, shall be known. In uniform movement this law is expressed algebraically by the expression

$$S = v\,t,$$

$$\text{or}\qquad S = v_1 + v\,t;$$

in which v_1 is the velocity which the body has at the point of its path from which the space is measured; v the constant velocity, and t the time, in seconds, during which motion has taken place from the initial point. In varied motion the velocity is continually changing, either uniformly or otherwise; and to determine the velocity of a point at any position of its path it is necessary to know the law of change. If the velocity increase or diminish at a uniform rate, the velocity at any instant t, measured from the instant at which the velocity was v_1, will be $v = v_1 + a\,t$; in which a is a constant denoting the rate of variation of the velocity, called the acceleration, and the space described will be represented by

$$S = v_1 t + \frac{a\,t^2}{2}.$$

If the velocity is neither constant nor uniformly varying, its rate of variation, and the relation between the space and time, may still be found by the methods of the differential calculus.

A point is said to have a motion of *translation* with reference to another point when the line joining the two points is altered in length. It is said to have a motion of *rotation* in reference to another point when the line joining the two points changes its direction. A point moving in a circular path has a motion of rotation with reference to the centre of motion, but no motion of translation in reference to this centre; and a point the trajectory of which is a straight line has a simple motion of translation with reference to all points in that straight line. The measure of angular movement involves the unit of time and the angle through which the body turns in a unit of time. This angle is usually estimated by the length of the circular arc passed over by a point at the distance unity from the axis, and this length is called the *angular velocity*. It results from this mode of measuring angular movement that if a represent the angular velocity, then the actual velocity of a point in the body at the distance r from the axis, in the direction of the tangent to its path, will be equal to the angular velocity multiplied by the distance from the centre of motion, or $v = a\,r$. For practical purposes, especially in the study of machines, it is often convenient to express the angular velocity in terms of the number of turns per second of the body about its axis. If N be the number of turns per second—by which it is implied that N may be a fraction or a whole number

—then $a = 2\pi N$, and $v = 2\pi Nr$ will be the actual velocity of a point at the distance r from the axis in the direction of the tangent, π being the ratio of the diameter to the circumference.

Starting thus with the general proposition that all motion is relative, the motion of one point with reference to another is usually composed of two elements—one a change of distance, and another a change of angular position. If a change of distance only takes place, the motion of either point referred to the other is a movement of translation; if a change of angle only takes place, the movement is one of simple rotation; and if both these changes occur simultaneously, the movement is a motion of translation and rotation combined. A rigid body is said to have a motion of translation when all points of the body describe parallel lines, and a motion of rotation when any line of the body changes its direction.

Relative and Comparative Motions of Points.—Two points moving in the same straight line have a *relative* motion equal to the sum or difference of their motions in reference to a third point in the same line. If the points move in the same direction, their relative motion will be the difference, and if in opposite directions the sum, of their motions in reference to the third point. If the points move with the same velocity, the distance between them will remain invariable when they move in the same direction, and will continually increase if they move in opposite directions. When two points rotate about a third, the three points lying in the same plane, if the two revolving points are rigidly connected, their angular motions and velocities will be the same; their *comparative* motions will differ only in their tangential velocities, which depend on their distances from the centre of rotation. Their *relative* motions will, however, be found to consist of a rotation about each other with the same angular velocity with which they revolve about the common central point. If two points connected together by an invariable line revolve about different centres, their relative and comparative motions may be found by the application of a theorem which forms the basis of nearly the whole theory of combination in mechanism—viz.: If two points are so connected that their distance apart remains invariable, the components of their velocities along the straight line joining them must be equal.

Composition of Translations.—If a point move over one side of a parallelogram, and then over the next adjacent side, the effect will be the same as if it had moved along the diagonal—*i. e.* its relative motion with reference to the starting-point will be the same. The two motions along the sides are called the components, and the diagonal motion the resultant motion. It follows from this that any motion of translation may be resolved into two components in any two given directions by constructing a parallelogram of which the diagonal is the original motion, the sides having the given direction. In the same manner the velocity of a point in a given direction may be resolved into two component velocities having given directions. It is only necessary to construct a parallelogram such that the diagonal shall represent by its length the velocity, and the sides drawn in the required direction will represent the component velocities. If the components are at right angles to each other, the parallelogram will be a rectangle.

Resolution and Composition of Rotations.—The rotation of a rigid body about a given axis is equivalent to the resultant of two component rotations about two axes parallel to the given axis and in the same plane, the angular velocities of each of the three rotations being proportional to the distance between the other two axes. It follows from this that if two wheels revolving about their centres remain in contact with each other, the point of contact being in the line joining the centres, the angular velocities of the wheels will be inversely proportional to their radii. This proposition forms the basis of the construction of spur-gearing. This kind of gearing illustrates the composition and resolution of parallel rotations. If one wheel be fixed, and the other roll around it, the motion of any point in the rolling wheel about the instantaneous axis or pitch-point may be regarded as compounded of the rotation about the axis of the rolling wheel and the rotation of the axis of the rolling wheel about the axis of the fixed wheel.

Rotations may be resolved and compounded in another manner. A rotation about a given axis may be regarded as equivalent to two rotations about two axes which intersect the given axis at the same point, the angular velocities about each of the three axes being proportional to the sum of the angle between the other two. This proposition is the basis of construction of bevel wheels. If one cone roll upon another having the same vertex, the surfaces of the two cones being constantly in contact along an element, any point in the rolling cone may be regarded as having a rotation about its own axis combined with a rotation of this axis about the axis of the fixed cone; or as having a simple rotation about the element of contact as an instantaneous axis. To find the diameters of two beveled wheels which shall revolve with given angular velocities about two intersecting axes, it is only necessary to draw two lines intersecting each other and making the required angle between the axes. If, then, from the point of intersection distances be laid off proportional to the angular velocities of the wheels respectively, the diagonal of a parallelogram constructed on these lines will represent the line of contact of two rolling cones. Such a construction may be called the parallelogram of rotations. This parallelogram determines the relative diameters of the bevel wheels.

Helical or screw-like motion may be regarded as either compounded of a rotation about an axis and a translation in the direction of that axis, or it may be considered as compounded of two rotations about two axes lying in different planes. The latter proposition is illustrated by the rolling of one hyperboloid upon another, their surfaces being in contact along the right-lined element which constitutes the instantaneous axis of the rolling hyperboloid. Such hyperboloids form the basis for the construction of skew-bevel wheels.

It follows from the principles of the composition of motions that the most complex motion of a rigid body may be regarded as equivalent at each instant to a rotation about an instantaneous axis, and a translation along that axis combined, each point of the body describing a helical path.

The combination of two motions of straight translation transverse to each other gives rise usually to curved trajectories. If one be a reciprocating motion of small amplitude, and the other a continuous motion, the curve takes an undulating or wave-like form. Harmonic motion is a reciprocating motion in a straight line, in which the velocity at every instant is equal to the component parallel to the straight line of another point which moves uniformly in a circle, the amplitude of the reciprocating motion being equal to the diameter of the circle. The motion of the piston of the steam-engine would be exactly harmonic if the connecting-rod were infinite in length. The motion is approximately harmonic in ordinary cases of piston-and-crank motion.

The motions of one curve rolling on another curve, or one body rolling on another body, present particular cases of the general proposition of the movement of rigid bodies, which are not only often observed, but which form the bases of useful applications. The case of a wheel rolling on another wheel has been referred to. In this case any point of the circumference of the rolling wheel describes about the instantaneous axes or point of contact a continuous curve called an epicycloid. A cylinder rolling on a plane furnishes an example in which a rotation is combined with a translation of the rotating body, the resultant motion of any point in the cylinder being a rotation about an instantaneous axis, which is the line of contact of the cylinder and plane. Any point of the cylinder describes a curve called a trochoid, and a point in the surface of the cylinder a curve called a cycloid. The crank-pin of a locomotive wheel describes a trochoid, and a point in the circumference of the wheel a cycloid, as the engine moves along the track. A point in a plane rolling on a cylinder, or a point in a string unwound from a wheel, describes an involute of the circle from which it is unwrapped.

The motion of the piston of a locomotive-engine furnishes an interesting example of comparative and relative motions of translation. In the forward motion it acts as the moving surface which gives rotation through the crank to the wheel, and in the backward motion as a point of resistance, the cylinder being pushed away from the piston; considered relatively to each other, the piston and cylinder have precisely the same motions as they would have if the locomotive were suspended from the earth. Considered with reference to the earth, the cylinder has a continuous uniform motion in a straight line, while the piston, at one point of each revolution, comes partially to a state of rest with reference to the earth. It would come to rest if the crank-pin were in the circumference of the driving-wheel. When a body is spoken of as being at rest, it is understood only as being at rest relatively to other points, there being no point of absolute rest in the universe.

It will have become apparent from this very brief discussion of the principles of motion that the actual path of a material point in space may be the result of a complicated series of motions. Leaving out of consideration the infinitesimal motions of vibration which the molecules of bodies have, and which constitute the cause or phenomena of heat, a particle may have a resultant motion which is compounded of an almost unlimited number of separate motions. Take, for instance, a point in a projectile: it usually has a motion of rotation about an axis within the body of the projectile; it has a parabolic motion with reference to the earth, while it partakes of the motion of the earth around the sun. It is thus made clearly evident that in discussing motion it must usually be restricted to certain relative conditions which constitute the particular points of any investigation. W. P. Trowbridge.

Mo'tions, a sort of simple dramatic exhibition, generally illustrating some scriptural narrative, the characters being represented by wooden puppets, while the dialogue was spoken behind the scenes. In England they prevailed from the fifteenth to the eighteenth century.

Motley (John Lothrop), LL.D., D. C. L., b. at Dorchester, Mass., Apr. 15, 1814; graduated at Harvard in 1831; studied at Göttingen and Berlin; was admitted to the bar in 1836; became in 1841 secretary of legation at St. Petersburg; U. S. minister to Austria 1866–67; to England 1869–70. After long and exhaustive researches and manifold preparations he published in London in 1856 *The Rise of the Dutch Republic* (3 vols.), which immediately attracted great attention both in America and Europe, and has been translated into German, French, Dutch, and Danish. *The History of the United Netherlands* (4 vols.) followed from 1861 to 1868, and the *Life of John van Barneveld* in 1874, with equal success. His pictures of characters, events, and social states are complete and vivid, and breathe in general a spirit of justice and truth, in spite of the very decided love and hatred with which he painted. D. May 29, 1877.

Mot'mot [named from their notes], a genus (*Momotus*) of passerine birds, usually assigned to the Coraciadæ, although their place in the class of birds is by no means certain. They feed upon fruits, reptiles, and other small animals, have remarkably brilliant plumage, and inhabit tropical America. There are several species. (See Momotidæ.)

Motril', town of Spain, province of Granada, is situated on an exceedingly fertile plain where vines, cotton, sugar-cane, and maize are cultivated with great success. The town is well built and enterprising. Pop. 16,665.

Mott (Gen. Gershom), b. in Trenton, N. J., in 1822; was an officer in the Mexican war; was successively colonel of the 5th and 6th N. J. Vols. 1861–62; served in the Peninsular campaign under Gen. McClellan; was wounded at the second battle of Bull Run; made brigadier-general Sept. 7, 1862; commanded the 2d New Jersey brigade at Chancellorsville, where he was again wounded; was distinguished at Gettysburg; appointed brevet major-general Sept. 10, 1864; commanded the 2d division of the 4th corps in the final campaign against Richmond, and received the rank of full major-general Dec. 1, 1865. D. Nov. 29, 1884.

Mott (Lucretia **Coffin**), b. at Nantucket, Mass., Jan. 3, 1793, of Quaker parentage; removed in 1804 to Boston, and in 1809 to Philadelphia, where in 1811 she was married to James Mott; became in 1817 a teacher, and soon after a preacher of the Society of Friends; adhered after 1827 to the Hicksite party; was one of the original founders of the American Anti-slavery Society (1833); for many years preached against slavery, war, and other evils, and finally became a leader in the woman-suffrage movement. D. Nov. 11, 1880.

Mott (Lydia). See Appendix.

Mott (Valentine), M. D., LL.D., b. at Glen Cove, L. I., Aug. 20, 1785, was the son of Henry Mott, an able physician; was educated in New York, London, and Edinburgh; held professorships of surgery in Columbia College and the College of Physicians and Surgeons, N. Y., 1809–26 and 1830–40; in Rutgers Medical College 1826–30, and was professor of surgery and relative anatomy in the New York University Medical College 1840–60. Dr. Mott was one of the boldest and most successful surgical operators of any age or country. The pupil of Cooper, Bell, Abernethy, and the ablest surgeons of Great Britain, he was inferior to none of them in practical skill or in successful treatment after the operation. Though a friend of conservative surgery, his capital operations were counted by thousands. Among his great operations were the successful tying of the primitive iliac artery for aneurism (its first performance); the successful removal of the right clavicle, with the application of forty ligatures; the tying of the innominate artery for aneurism; the resection of two inches of the deep jugular vein; the tying (forty-six times) of the common carotid, etc. He was the inventor of valuable surgical implements; had wide fame as an *accoucheur;* was a brilliant and able lecturer; published a translation of Velpeau's *Operative Surgery*, with large additions; a volume of travels in the East (1842), a volume of published clinical lectures (1860), and many professional papers and addresses. He was the recipient of many foreign distinctions and a member of numerous learned societies. D. in New York Apr. 26, 1865.

Mot'ta di Liven'za, town of Northern Italy, province of Treviso, on the left bank of the Livenza. This place is of very ancient origin, and was not without importance during the Middle Ages. It is now an industrious and prosperous town. Pop. 5677.

Motte (Rebecca **Brewton**), b. in South Carolina about 1740; married in 1758 to Jacob Motte, a planter, by whom she had six children; was left a widow before the Revolution, at which time she resided in a fine mansion near Buck's Head Neck, on the Congaree, which was occupied by a British garrison of 150 men under Capt. McPherson, and named Fort Motte. This fort was besieged by Marion and Lee, and set on fire by shooting combustibles upon the roof, Mrs. Motte herself furnishing a fine East Indian bow and bundle of arrows for the purpose. The British then surrendered, the flames were extinguished, and Mrs. Motte presided at a dinner to which the officers of both forces sat down. D. in 1815. Two of her daughters were successively married to Gen. Thomas Pinckney, and a third to Col. William Alston. (See her *Biography,* in Mrs. Ellet's *Women of the Revolution.*)

Motte (or **Mothe**) **Cadillac, de la** (Sieur Antoine), founder of Detroit, a Gascon nobleman, b. about 1660; served in the French army in Acadia, and in 1680 was sent to France by order of Louis XIV. with information regarding the colonies; was made in 1691 lord of Bonagnat and Mount Desert, including the shores of Frenchman's Bay, Me.; became in 1694 commandant of Michilimackinac; built in 1701 Fort Pontchartrain, now Detroit; had long struggles with the Canadian authorities, the Jesuits, the Miamis, and the Natchez; became in 1711 governor of Louisiana; was one of the originators of the Mississippi scheme; returned to France in 1717, and nothing farther is known of his career.

Motterouge', De la, b. in 1802, received his military education at St. Cyr; distinguished himself as a brigadier-general in the Crimean war; became general of division 1855; commanded the first division of the corps of MacMahon in the Italian war of 1859; was placed on the reserve list in 1867, and was elected a member of the Corps Législatif in 1869 from the department of Côte du Nord. In the German war of 1870–71, after the defeat of the imperial army, he was recalled to service, and received the command in Sept., 1870, of the army of the Loire, numbering about 30,000 men. With this army he pushed forward from Orleans, met a German detachment under Gen. von der Tann, was defeated at Artenay Oct. 10, and thrown back to Orleans, and defeated once more here and compelled to retreat to Sologne, after which events he resigned his command. August Niemann.

Mottley (John), b. in London, England, in 1692; the real author of *Joe Miller's Jests*, or *The Wits' Vade Mecum* (1739); also wrote five dramas, a volume of *Lives of Dramatic Authors* (1747), histories of Peter the Great (1739) and of the empress Catharine of Russia (1744), and other miscellaneous works. D. at London Oct. 3, 1750.

Motto'la, town of Southern Italy, province of Lecce, situated on a hill about 12 miles from the Gulf of Taranto. This town was a marquisate during the Middle Ages, and it was in its neighborhood that Dentatus obtained his great victory over Pyrrhus (275 B. C.). Pop. 5765.

Mouflon. See Sheep.

Mould [Ang.-Sax. *molde*], a term used in common language to denote any of the smaller filamentous fungi. The word is not susceptible of scientific definition, as the fungi popularly called moulds belong to several different orders and differ widely from one another in structure. Reference to bread-mould will be found in the article on Mucorini; to lettuce and onion mould in that on Peronosporæ. W. G. Farlow.

Moulding [Lat. *modulus*, "small measure"]. The art of moulding may be called the embodiment of the varied thought of the designer in enduring material, and hence it involves processes, methods, and materials differing widely from each other in their nature and treatment. The making of the pattern or model is the first step in this embodiment, and this often goes forward under the hand of the artist or designer himself, and sometimes by the skill of an under-workman, whose guide is the plan or sketch of the master-hand. In either case many contrivances are used for expediting the labor of the pattern-making, the necessity of this arising from the fact that a very large number of patterns are used only once or but for a very few times at most. The chief study in many patterns is to render the complex form of the design practicable at any reasonable cost, and in others to simplify the moulding so that great numbers of the castings may be produced in a brief time. The pattern for a massive bed-plate or some similar part of a marine engine may be named as an instance of the former case, and those used in the manufacture of door-hinges or of parts of stoves of the latter.

In moulding the plainer forms of castings the pattern is laid on a plane surface or follow-board, and a flask or frame of sufficient depth is placed around it. Into this flask moulding-sand is sifted, so that the fine particles shall fill all the crevices of the pattern. The sand is then rammed hard until the flask is filled, and a close board top is laid on it. The flask is then turned upside down, the follow-board is taken off, and a second, or cope-piece, of flask is laid on above what was at first the under side of the pattern. Coarse sand is then scattered over the surface which had lain on the follow-board, so that the mass of sand which is afterward rammed into the cope-flask may be neatly and perfectly separated from the first. The cope-flask, with the sand contained in it, is then lifted off, bringing in it in the sand the impression of the upper side of the pattern; and the pattern is carefully drawn out of the sand in the lower part of the flask. After a gate or passage-way, by which the metal may flow into the mould, has been cut in the sand, the two parts of the flask are put together again accurately, and the mould is complete for the reception of the metal or material from which the casting is to be made.

As castings have been made from almost every kind of metal or material which can be melted or softened by heat, so a wide variety of materials have been sought for and have been used for moulds. The idea of the moulding, however, has been substantially the same in each case, the method varying only with the special character of the pattern.

It is often needful to make openings into or through the casting; and when these are of moderate size they are made by placing cores in the cavity of the sand-mould. These are blocks or bars, which are made in suitable boxes from sand that has been moistened with a glutinous material, so that when dried the cores have a certain amount of strength. When the internal cavities are large, or the casting is of a box shape, the interior is built up or moulded in a somewhat different way from that indicated, but always so that the sections of the mould may be detached from each other and the parts of the pattern withdrawn. Many pieces of a simple cylindrical form are swept up by a method precisely analogous in the sand material to the process of turning in wood or iron. The sweep by which the outline of the mould is made is moved around the central axis, while the material is stationary, and takes the circular outline as it is built up piece by piece around the centre.

Whenever the exterior surface of the pattern has projections or parts that are under-cut, they are often made loose, so as to be left imbedded in the sand when the principal part of the pattern is drawn out, the loose under-cut parts being afterward drawn out separately.

A very large part of the work produced in leading branches of manufacture is that known as green-sand work, so called because the castings are made in sand that has been slightly dampened with water. If, however, castings are required to possess greater strength, to be more certainly free from imperfections, or if they must be large and complex in outline, they are usually made in dry moulds. For these the sand is moistened with some glutinous material, and after the mould has been completed, but before the parts of it are finally put together, it is thoroughly dried in an oven. By this means the chance is wholly removed of imperfections arising from the blowing into and through the melted metal of the vapor from the moisture contained in the damp or green sand.

It is invariably necessary to provide vents or outlets for the gases arising from the heating of the organic matter contained either in the material of the mould or of the cores, for these are likely to cause flaws in the castings if confined, or in some cases to give rise to quite disastrous explosions.

In order to give the smoothest possible surface to the castings when made in iron, the surfaces of the sand-mould are dusted over with finely-powdered coal, which is afterward smoothed down carefully. The effect of this facing is to prevent the fluid iron from burning into the sand, and thus causing an incrustation on the casting. In iron-work the metal is usually melted in a cupola furnace, which is a high vertical cylinder of sheet iron, with an interior lining of firebrick. The fuel and iron are put in together near the top, and the blast is admitted at the sides of the shell near the bottom. The melted iron is gathered in the lower part of the furnace, and is run out as required. In cases where the utmost strength is needed, as in iron guns, the metal is melted in a reverberatory furnace, in which it may be maintained in a state of fusion until, by repeated tests, it is found to be of the right quality. In this furnace the fuel and the iron are kept apart from each other, so that no injurious admixture may occur of any of the chance impurities of the fuel with the melted iron. In the melting of brass and of any fine metal a crucible is generally used for holding it, which is covered up in a furnace or melting-hole, and closely surrounded by the burning fuel. In casting from a crucible the metal may be poured directly into the mould, but from the cupola furnace the iron is run into a ladle, in which it may be taken over any distance to the mould as required.

In the management of large foundries it has been found expedient, and even necessary, to adapt special contrivances to the work of moulding, not only to save the cost of manual labor in handling the patterns and materials while making the moulds, but also to save at least a part of the cost of the patterns themselves. For this purpose very perfect machines have been devised for moulding such things as shot and shell for ordnance, hinges and locks for builders' use, and especially for such things as toothed wheels or gearing. Very costly patterns have always been made in years past for such wheels, each pattern being a complete duplicate of the proposed casting, and involving great labor and cost in its preparation. In the use of a gear-moulding machine the teeth in the mould are formed by ramming the sand around a very short section of the circumference at a time, a pattern giving the needful shape of the tooth being properly placed in the machine. The special office of the machine in this case is to enable the short piece of toothed pattern to be withdrawn accurately from the sand rammed against it, and to be moved around the exact required fraction of the circumference in readiness for another section of the moulding. In this way the great cost of making more than a very few teeth is saved, as compared with the older method of using a pattern of a full circumference. P. Barnes.

Moulins′, town of France, capital of the department of Allier, on the Allier, here crossed by one of the finest bridges in France. It is a beautifully situated and handsomely built town, with a fine cathedral, large cavalry barracks, and other public buildings, and important manufactures of cottons and cutlery. Pop. 21,156.

Moult′ing [Old Eng. *mout*], or **Exuviation,** the periodical casting off of shell, skin, horns, feathers, or other parts of the integument, such as takes place once a year or oftener (in some animals once every few days) among serpents, batrachians, spiders, insect-larvæ, etc. Birds in many cases shed their feathers annually, and many quadrupeds also shed their coat of hair nearly all at once. Deer mostly renew their horns completely every year. In man exuviation is a continual process; and this is the case with many of the lower animals.

Moul′ton, cap. of Lawrence co., Ala. (see map of Alabama, ref. 2–C, for location of county), has a female institute and a male academy. Principal occupation, farming. Pop. in 1870, 2006; in 1880, 3503.

Moulton (Ellen Louise **Chandler**), b. in Pomfret, Conn., Apr. 10, 1835; married in 1855 to William U. Moulton, a journalist of Boston; has published many contributions in prose and verse to periodical literature; author of *This, That, and the Other* (1854), *Juno Clifford* (1855), *My Third Book* (1859), *Some Women's Hearts* (1874), and other works.

Moulton (Col. Jeremiah), b. at York, Me., in 1688; was taken prisoner in childhood by the Indians 1692, but restored with other children in gratitude for the release of several Indian prisoners by Col. Church; commanded the forces which in May, 1724, destroyed Norridgewock, killing Father Sebastian Rasle, the French missionary; commanded a regiment at the capture of Louisburg 1745; was afterwards sheriff of the county, councillor, and judge of common pleas and of probate. D. at York July 20, 1765.

Moulton (Joseph White), b. at Stratford, Conn., in June, 1789; settled as a lawyer in New York City; published (with John V. N. Yates) a valuable *History of the State of New York* (2 vols., 1824–26); was author of *The Chancery Practice of New York* (3 vols., 1829–32) and *New York Seventy Years Ago* (1849), and edited John Freeman Mitford's *Treatise on Pleadings in Chancery* (6th ed. Amer. 1849), with copious annotations. D. Apr. 21, 1875.

Moultrie, cap. of Colquitt co., Ga. (see map of Georgia, ref. 7–H, for location of county), 30 miles N. N. E. of Thomasville R. R. Station. Pop. in 1880, 790.

Moultrie (James), M. D., b. in Charleston, S. C., Mar. 27, 1793; graduated in the University of Pennsylvania 1812, and succeeded his father as port-physician of Charleston, physician to the jail, and also of the magazine guards; in 1821 was president of the State Medical Society; at the organization of the South Carolina Medical College (1824) was elected professor of physiology, which office he still retains; in Philadelphia in 1847, when the American Medical Association was organized, was made a vice-president, and at the annual meeting in Charleston, S. C., 1850, became president. Paul F. Eve.

Moultrie (John), b. in Scotland; came to America about 1733, and for forty years occupied a leading position as a physician in Charleston, S. C. D. 1773.—His son John obtained his degree of M. D. at Edinburgh, became eminent in his profession, and was lieutenant-governor of Florida.

Moultrie (John), grandson of Gov. John, b. in London, England, Dec. 31, 1799; was educated at Eton, where he took part with his friends, H. N. Coleridge, W. S. Walker, and W. M. Praed, in editing the *College Magazine* and the *Etonian*, for which he wrote poems of great merit; graduated at Trinity College, Cambridge, in 1823; took orders in the Church of England 1825; became rector of Rugby, which post he retained through life; married a sister of James Fergusson, the historian of architecture; published several volumes of *Poems* (collected ed. 1854) highly appreciated by cultivated critics, a volume of *Sermons* (1852), and edited the poems of Gray (1845) and the *Poetical Remains* of his college-friend, W. Sidney Walker (1852), preceded by a memoir. D. at Rugby Dec. 26, 1874.

Moultrie (William), b. in South Carolina in 1731, son of Dr. John; commanded a company against the Cherokees 1761; an ardent advocate of liberty, he was in 1775 appointed colonel of the 2d South Carolina regiment, and in that year represented St. Helena parish in the provincial congress. In June, 1776, while engaged in constructing a rude defensive work of palmetto logs on Sullivan's Island, Charleston harbor, he was attacked by a British fleet (June 28) under Sir Peter Parker; an engagement of nearly ten hours ensued, resulting in victory for the little fort, which has since borne the name of its gallant defender. In September he was made a brigadier-general, and in Feb., 1779, defeated the British near Beaufort. In May he successfully resisted Prevost's advance upon Charleston, which place he was able to hold until the arrival of Lincoln; but in 1780, upon the surrender of the place, he was made prisoner and held for nearly two years, refusing repeated offers of bribery to desert the cause of his country. After his exchange (Feb., 1782) he was made (Oct. 15) a major-general; was governor of South Carolina 1785, and again 1794–96. Author of *Memoirs of the Revolution* (2 vols., 1802). D. at Charleston Sept. 27, 1805.

Moultrie, Fort. See Fort Moultrie.

Mound Bird. See Megapodidæ, by Prof. Theodore Gill, M. D., Ph. D., M. N. A. S.

Mound-Builders. See American Antiquities, by Prof. John S. Newberry, M. D., LL.D., M. N. A. S.

Mound City, cap. of Pulaski co., Ill. (see map of Illinois, ref. 12–E, for location of county), 7 miles from the mouth of the Ohio River, on the Wabash St. Louis and Pacific R. R., contains the Western naval station and a national cemetery. Pop. in 1870, 1631; in 1880, 2222.

Mound City, cap. of Linn co., Kan. (see map of Kansas, ref. 6–K, for location of county), on Little Sugar Creek, 8 m. S. W. of Pleasanton. Pop. in 1870, 635; in 1880, 443.

Mound City, Mo. See Appendix.

Moundsville, cap. of Marshall co., West Va. (see map of West Virginia, ref. 3–D, for location of county), on the Baltimore and Ohio R. R., has large rolling-mills, a woollen-mill, 2 large coal-banks, several saw-mills, the State penitentiary, and the largest Indian mound in the world. Pop. in 1870, 1500; in 1880, 1774. It was formerly called Grave Creek, and now takes its name from a large mound in the vicinity (for a description of which see American Antiquities).

Mount (William Sidney), b. at Setauket, Long Island, N. Y., Nov. 26, 1807; studied painting at the school of the Academy of Design; became an eminent portrait-painter, and produced some highly appreciated pictures of humorous subjects, chiefly dealing with negro life. D. at Setauket Nov. 19, 1868.

Mountain (George Jehoshaphat), D. D., D. C. L., b. in Norwich, Eng., July 27, 1789, was the son of Bishop Jacob Mountain; was educated at Trinity College, Cambridge; took orders 1812 and 1813; held rectorships in Fredericton and Quebec, of which in 1821 he became archdeacon; was Anglican bishop of Montreal 1836–50; bishop of Quebec 1850–63; author of *Songs of the Wilderness* (1846), *Journal of a North-west Mission* (1853), etc., and founded in 1844 the Bishop's College, Lennoxville. D. near Quebec Jan. 6, 1863.

Mountain (Jacob), D. D., b. at Thwaite Hall, Norfolk, England, 1750; was educated at Cambridge, and received valuable Church preferments. In 1793 he was appointed bishop of Quebec, and was the first Anglican prelate in Canada. He was distinguished for the faithfulness with which he performed the severe duties of his ecclesiastical position, as well as the important *ex-officio* civil functions which then attached to his office. D. near Quebec June 16, 1825.

Mountain Ash, or **Rowan Tree,** the *Pyrus Aucuparia* of Europe, and the *P. Americana* and *sambucifolia* of North America, both closely allied to the first and to each other. They are small trees, often seen in cultivation, and belonging to the order Rosaceæ, suborder Pomaceæ. They have pinnate leaves, and in autumn clusters of small acid bright red fruit. The European tree is more common in cultivation than our own native species. The wood of all is hard and suitable for turnery. The peasantry of nearly all nations of Europe ascribe supernatural qualities to the wood of the rowan tree, which is used for divining-rods and the like.

Mountain Blue, or **Chessylite,** is a carbonate of copper, composed of 25.43 per cent. of carbonic acid, 69.37 of oxide of copper, and 5.20 of water. When pure it contains 55.16 per cent. of copper. It occurs in the same localities as malachite, and results from the decomposition of other ores of copper. When crystallized it is of an azure blue, with a vitreous lustre varying from transparent to opaque. Chessylite is derived from Chessy, near Lyons, France, where it is found in blue crystals and also in a fibrous state.

Mountain Cork, a variety of asbestos, having the appearance of cork, and, owing to its structures of interlacing fibres, of so little density as to float on water. *Mountain leather* is an equally light variety of the same mineral, occurring in flexible sheets resembling leather. (See Asbestos.) E. C. H. Day.

Mountain Green. See Chrysocolla.

Mountain Home, cap. of Baxter co., Ark. (see map of Arkansas, ref. 1–C, for location of county). Pop. in 1880, 137.

Mountain Limestone, a name given in Great Britain to the great sub-Carboniferous limestone strata. It is there metalliferous, lead being the most important ore. Fluor-spar, a little petroleum, a few small coal-seams, quarries of building-stone, and some iron and copper ore are among its economic resources. Soils resting on it are commonly very fertile.

Mountain Meadow Massacre. See Utah.

Mountains. See Earth, by Prof. A. Guyot, Ph. D., LL.D., M. N. A. S.

Mountain View, cap. of Stone co., Ark. (see map of Arkansas, ref. 2–D, for location of county). Pop. in 1880, 99.

Mount Airy, Surrey co., N. C. (see map of North Carolina, ref. 2–E, for location of county), has cotton-factories, flouring-mill, shoe-factory, planing-mill, numerous tobacco-factories, also wool-carding machines and 2 mineral springs. Pop. in 1880, 519.

Mount Auburn Cemetery, Middlesex co., Mass. (see map of Massachusetts, ref. 2–H, for location of county), is in Cambridge and Watertown, outside of the city limits, but directly associated with Boston. It was established in 1831, principally through the efforts of Dr. Jacob Bigelow, and comprises about 125 acres of hill, dale, woodland, and lawn beautifully laid out.

Mount Ayr, on R. R., cap. of Ringgold co., Ia. (see map of Iowa, ref. 7–F, for location of county), is in a fine stock-raising section. Pop. in 1870, 422; in 1880, 1275.

Mount Carmel, Palestine. See Carmel, Mount.

Mount Carmel, city and R. R. centre, cap. of Wabash co., Ill. (see map of Illinois, ref. 9–G, for location of county), is on the Wabash River, and has saw- and flouring-mills and manufacturing establishments. Pop. in 1870, 1640; in 1880, 2047.

Mount Carmel, Pa. See Appendix.

Mount Car'roll, on R. R., cap. of Carroll co., Ill. (see map of Illinois, ref. 2–D, for location of county), 131 miles W. of Chicago, has a female seminary, a public library, a flouring-mill, and business in grain. Pop. in 1870, 1756; in 1880, not in census.

Mount Clem'ens, city, cap. of Macomb co., Mich. (see map of Michigan, ref. 7–K, for location of county), 20 miles N. E. of Detroit, on the Grand Trunk R. R., has a union school, numerous lumber manufactories, a furnace, a handsome Masonic hall, and a celebrated mineral and magnetic water-cure. Pop. in 1880, 3057; in 1884, 3827.

Mount Des'ert, post-tp. of Mount Desert Island, Hancock co., Me., occupies the central part of the island. Its principal villages are Somerville and North-east Harbor. Pop. in 1870, 918; in 1880, 1017.

Mount Desert Island, a mountainous island in the Atlantic and in Hancock co., Me., is 14 miles long and 7 wide. Soame's Sound divides it nearly in two. Bar Harbor, North-east and South-west harbors, Soamesville, Seal Cove, and East Eden are among the villages. It is divided into three towns—Tremont, Mount Desert, and Eden. It abounds in beautiful lakes. The highest point is Green Mountain, 1535 feet high. The island is a favorite place of summer resort. The French settled Mount Desert in 1608. They were driven out by the English in 1616. The English settled it in 1761. Pop. in 1870, 3935; in 1880, 4657.

Mount Desert Rock, a small rocky islet, 20 miles S. S. E. of Mount Desert Island; lat. 43° 58′ 7″ N., lon. 68° 7′ 22″ W. It has a brick lighthouse with a fixed white dioptric light.

Mounted Troops. See CAVALRY, TACTICS, and WAR.

Mount'ford (WILLIAM), b. in Kidderminster, England, May 31, 1816; was educated at Manchester College, York. Being unwilling to subscribe to the Thirty-nine Articles of the Church of England, he was forced to decline the pecuniary and social advantages of a scholarship in connection with one of the colleges of Oxford; came to the U. S. in 1849; was settled in Gloucester, Mass., 1850; married, retired from the active ministry, and became a resident of Cambridge, Mass. Mr. Mountford is the author of several books, among which *Martyria* (1846) and *Euthanasia* (1850) are worthy of special mention. He was for some time engaged in a work about Spiritualism, to which faith he was an early convert. O. B. FROTHINGHAM.

Mount Gilead, R. R. junction, cap. of Morrow co., O. (see map of Ohio, ref. 4–F, for location of county), 44 miles N. of Columbus, has a carriage manufactory and several mills. Pop. in 1870, 1087; in 1880, 1216.

Mount Holly, R. R. junction, cap. of Burlington co., N. J. (see map of New Jersey, ref. 5–D, for location of county), 18 miles N. E. of Philadelphia. The town is supplied with water, forced to the summit of a neighboring hill for distribution, and gas. It has also extensive iron-foundries and machine-shops, several saw- and planing-mills, large thread-mill, canning-factories, and a children's home. Pop. about 4500; not in census.

Mount I'da, cap. of Montgomery co., Ark. (see map of Arkansas, ref. 4–B, for location of county), 69 miles S. W. of Little Rock. Pop. in 1880, 60.

Mount Idaho, cap. of Idaho co., Id. (see map of Idaho, ref. 4–A, for location of county). Pop. in 1880, 159.

Mount Joy, Lancaster co., Pa. (see map of Pennsylvania, ref. 6–H, for location of county), 12 miles N. W. of Lancaster, on the through branch of the Pennsylvania Central R. R., has a male and female seminary, a soldiers' orphan school, young men's Christian association, manufactories of farming tools, foundry, steam flouring-mill, and carriage-factory. Pop. in 1870, 1896; in 1880, 2058.

Mount Lebanon, Columbia co., N. Y. (see map of New York, ref. 6–J, for location of county), 25 miles S. E. of Albany, on the Harlem division of the N. Y. Central and Hudson River R. R. The population is made up of Shakers, there being several families, and each family a community. Agriculture, horticulture, the manufacture of brooms, etc. form the principal business of the inhabitants. Pop. about 400.

Mount Morris, Ill. See APPENDIX.

Mount Morris, R. R. junction, Livingston co., N. Y. (see map of New York, ref. 5–D, for location of county), has an academy, a seminary, furnace, saw- and plaster-mill. Pop. in 1870, 1930; in 1880, 1899.

Mount Olive, cap. of St. Louis co., Mo. (see map of Missouri, ref. 4–J, for location of county). Pop. not in census.

Mount Olivet, cap. of Robertson co., Ky. (see map of Kentucky, ref. 2–I, for location of county), 20 miles S. W. of Maysville. Pop. in 1870, 254; in 1880, 317.

Mount Pleasant, city and R. R. centre, cap. of Henry co., Ia. (see map of Iowa, ref. 7–J, for location of county), contains the Iowa Wesleyan University, an academy, a female seminary, wagon-factories, flouring-mills, sash and blind factories, tannery, and gasworks. The Iowa State hospital for the insane is located about 1 mile from the town. Pop. in 1870, 4245; in 1880, 4410; in 1885, 3837.

Mount Pleasant, cap. of Isabella co., Mich. (see map of Michigan, ref. 6–I, for location of county), has large saw-mills, grist and flouring mill, sash and door factories, and a considerable lumber-trade. Pop. in 1880, 1115.

Mount Pleasant, Westmoreland-co., Pa. (see map of Pennsylvania, ref. 5–B, for location of county), 40 miles S. E. of Pittsburg, at the termination of the Mount Pleasant branch of the Baltimore and Ohio R. R., has an academy and graded public school, mill, and several tanneries. Principal employment, mining, manufacture of coke and lime, and shipping of limestone, quarried here in large quantities. Pop. in 1870, 717; in 1880, 1197.

Mount Pleasant, S. C. See APPENDIX.

Mount Pleasant, on R. R., cap. of Titus co., Tex. (see map of Texas, ref. 2–J, for location of county). Pop. in 1870, 275; in 1880, 452.

Mount Pulas'ki, R. R. junction, Logan co., Ill. (see map of Illinois, ref. 6–E, for location of county), 21 miles N. E. of Springfield, has elevators and mills. Pop. in 1870, 653; in 1880, 1125.

Mount Ster'ling, cap. of Brown co., Ill. (see map of Illinois, ref. 6–B, for location of county), on the Wabash St. Louis and Pacific R. R., equidistant from Quincy and Jacksonville, has manufactories of barrels, ploughs, wagons, and earthenware. Extensive deposits of coal exist near by. Pop. in 1870, 1352; in 1880, 1445.

Mount Sterling, cap. of Montgomery co., Ky. (see map of Kentucky, ref. 3–I, for location of county), on the Chesapeake and Ohio R. R., has several manufactories. Pop. in 1870, 1040; in 1880, 2087.

Mount Vernon, cap. of Montgomery co., Ga. (see map of Georgia, ref. 5–I, for location of county), near the E. bank of the Oconee, and 20 miles N. of Lumber City R. R. Station. Pop. in 1880, 69.

Mount Vernon, city and R. R. junction, cap. of Jefferson co., Ill. (see map of Illinois, ref. 9–E, for location of county), has a general manufacturing business and considerable trade. Pop. in 1870, 1167; in 1880, 2324.

Mount Vernon, R. R. centre, cap. of Posey co., Ind. (see map of Indiana, ref. 11–B, for location of county), on the Ohio River, has planing, flouring, and saw mills. Pop. in 1870, 2880; in 1880, 3730.

Mount Vernon, Linn co., Ia. (see map of Iowa, ref. 4–J, for location of county), 65 miles W. of the Mississippi, on the Chicago and North-western R. R., contains Cornell College and a woollen-factory. Pop. in 1870, 910; in 1880, 977.

Mount Vernon, cap. of Rock Castle co., Ky. (see map of Kentucky, ref. 4–I, for location of county), on the Louisville and Nashville R. R. Pop. in 1870, 252; in 1880, 90.

Mount Vernon, cap. of Lawrence co., Mo. (see map of Missouri, ref. 7–E, for location of county), has flouring-mill. Pop. in 1870, 558; in 1880, 527.

Mount Vernon, Hillsborough co., N. H. (see map of New Hampshire, ref. 10–E, for location of county), 4 miles N. of Milford, is the seat of McCollom Institute, and has 1 church and chapel, 1 hotel, box and desk factory, and stores. The village is a resort for summer tourists. Pop. of tp. in 1870, 601; in 1880, 517. S. H. KEELER.

Mount Vernon, R. R. junction, Westchester co., N. Y. (see map of New York, ref. 8–J, for location of county), has gasworks, a pen-factory, a horn and rubber jewelry factory, a glue-factory, and carriage-shops. Pop. in 1870, 2700; in 1880, 1857.

Mount Vernon, city and R. R. centre, cap. of Knox co., O. (see map of Ohio, ref. 4–F, for location of county), on Lake Erie division of the Baltimore and Ohio and the Cleveland Mount Vernon and Delaware R. Rs., contains extensive machine-works, railroad machine-shop, flouring and saw mills, a large linseed-oil manufactory, flax and twine factory, and several carriage and wagon factories. Kenyon College is located about 6 miles E. of this place. Pop. in 1870, 4876; in 1880, 5249.

Mount Vernon, cap. of Franklin co., Tex. (see map of Texas, ref. 2–J, for location of county). Pop. in 1880, 311.

Mount Vernon, tp. of Fairfax co., Va. (see map of Virginia, ref. 4–H, for location of county). It contains MOUNT VERNON, the residence of Gen. George Washington, on the Potomac, 9 miles below Alexandria. The mansion is a wooden building, erected by Lawrence Washington and enlarged by his brother and heir, the President. In 1858 it was purchased, with the tomb of Washington and 200 acres of land, by the Ladies' Mount Vernon Association for $200,000, from Mr. John A. Washington. Pop. of tp. in 1870, 2233; in 1880, 2555.

Mourning, the official or conventional expression of grief, has varied much at different times and in different countries. The Hebrews tore the garment, cut the hair and beard, strewed ashes on the head, went bareheaded and barefooted, and lay down on the ground weeping and smiting the breast; the period of mourning was seven days, but for Moses and Aaron they mourned thirty days. The Greeks cut off the hair, put on a coarse black garment, retired into seclusion, and wailed. When a great general died the whole army cut off their hair and the manes of their horses. The period of mourning was in Athens thirty days, but in Sparta only ten. With the Romans the mourning was mostly done by the women; the men wore black clothes, but only for a few days. Public mournings often occurred in the days of the republic on the occasion of some public calamity or on the death of some great man; during the empire, on the death of an emperor. Then all business stopped; the temples, the forum, the schools, and the baths were closed. The mourning color was black under the republic, but during the empire white became the mourning color for women. The mourning rites among barbarians and half savages are often horrible. In the Feejee Islands the women burn their bodies when a chief dies, and fifty or a hundred fingers are amputated to be hung on his grave. In the Sandwich Islands the inhabitants paint the lower part of their faces black and knock out their front teeth. Among civilized nations the mourning customs have become very similar in modern times, and consist mostly in retirement within the house and avoidance of what is bright and noisy. In Europe and America the mourning color is black; in Turkey, violet; in China, white; in Egypt, yellow.

Mouse, pl. **Mice** [Lat. *mus, mures*], a name applied to the smaller rodents of the family Muridæ (which see) and of some allied families, the larger species being called rats, hamsters, etc. They are of several groups. The jumping mice are mostly of the families Dipodidæ, Jaculidæ, etc. The house mice and rats are of the family Muridæ, group Mures. Of these, the *Mus musculus*, or common house-mouse, is worldwide in its present range, though brought first from the Old World. The New-World mice are many of them of the group Sigmodontes. Such are the harvest-mice (*Reithrodon*), the white-footed mice (*Hesperomys*), etc. The field-mice (Arvicolinæ) are of many species and are found in both hemispheres. (See Field-Mice.) The so-called shrew-mice are not mice at all, nor even rodents, but Insectivores. (See Shrew.) The number of species of mice is very great. The amount of damage done to agriculturists by mice alone is simply incalculable. It is certain that the farmer has no worse enemy (except noxious insects), nor one towards which his ingenuity could be more profitably turned with a view to the abatement of the evil. Theodore Gill.

Mousseline′, a thin cloth made of cotton, is supposed to have derived its name from *Masalia*, since called *Masulipatam*, near Madras, whence such fabrics were first imported to Europe. Up to the beginning of the present century all muslin used in Europe came from India, and the Indian fabrics of this name were often of an astonishing fineness, justifying their poetical name of "woven wind;" but since, European manufactures, English, French, Belgian, and German, have completely superseded the Indian in the markets of the world. Being made by more perfect machinery, they are much cheaper, and English cotton manufactures are now sold in the interior of Hindostan. Of late, similar fabrics have been made of wool, *mousseline de laine*, or of half wool and half cotton.

Mouth [Ang.-Sax. *mûdh*], **Diseases of.** The diseases of the lining mucous surface of the mouth are chiefly inflammatory. Inflammation of the mouth is designated stomatitis. Simple stomatitis or catarrh of the mouth results from the irritation of decayed teeth, of hot or cold food or drinks, of chemical or medicinal irritants, and by using tobacco and pipes. It occurs in infants during dentition; they may cease to nurse, and the irritation of the sensitive nerves of the mouth may cause reflex spasm or convulsions. Its symptoms are a sense of burning, tenderness, and tension, foul taste, the adherence of viscid mucus, and a diffuse redness. The treatment comprises the frequent cleansing of the mouth by cold water, alkaline gargles, as of carbonate of soda, and the correction of the known cause. Ulcerative stomatitis appears in points upon the tongue, the interior of the lips and cheeks, where mucous glands have been obstructed, swollen, and ulcerated, or inflamed in the course of catarrhal stomatitis. Aphthæ, or croupous stomatitis, present small white spots, with red borders, known as canker, and erroneously termed blisters or vesicles. They contain no fluid. The white spot is a fibrinous patch of inflammatory exudation upon the mucous membrane. This soon is thrown off, leaving a painful excoriation. Aphthæ occur most often among teething children who are poorly nourished. The spots may be numerous and isolated, or coalesce in irregular patches. Their treatment is by diet, correcting indigestion, and chlorate of potash as a specific. Diphtheritic stomatitis or *cancrum oris*, sloughing inflammation of the mouth, results from salivation and from defective hygiene in asylums for orphans and foundlings or among soldiers in barracks. With modern hygiene it has become infrequently contagious or epidemic. The first appearance of diphtheritic matter should be cleared away, chlorate of potash heroically employed, the patches cauterized with nitrate of silver, and the strength vigorously sustained. Scurvy causes stomatitis of variable severity. Nursing children contract primary syphilitic ulcers of the mouth from infected mothers or wet-nurses. Muguet or thrush, erroneously termed aphthæ, is a parasitic disease. It occurs in infants during the first month of life, and in adults only preceding death by slow, exhaustive disease. In these two states the mouth is much opened to the air, which dries secretion, and mastication is slow. The parasitic plant *Oidium albicans* gains entrance and attachment. It develops at first in white frosty patches on the tongue and sides and roof of the mouth. It consists of round spores and delicate filaments. Later, the patches are thick, curd-like, and yellow, due to fatty degeneration. The deposits should be removed and the exposed surfaces kept clean and bathed with specific washes.

E. Darwin Hudson, Jr.

Mouton (Alexander). See Appendix.

Movable Feasts. See Easter.

Mo′vers (Franz Karl), b. at Koesfeld, Westphalia, July 17, 1806; studied theology and the Oriental languages at Münster 1825–29; was pastor of Berkum 1833–39, and then professor of theology in the Roman Catholic faculty at the University of Breslau, where he d. Sept. 28, 1856. His principal work, *Die Phönizier* (4 vols., 1840–56), is the most comprehensive and exhaustive treatment of the subject.

Mowatt (Anna Cora). See Ritchie.

Mower (Joseph A.), b. in Vermont; at the outbreak of the Mexican war entered the army as a private in the company of engineers; was commissioned second lieutenant 1st Infantry 1855, and first lieutenant 1857; captain 1861, and commanded his company at the siege and capture of New Madrid; appointed colonel 11th Missouri Vols. May, 1862, and took part in the Corinth campaign, and was conspicuous in the battle of Corinth, Oct. 4, 1862, where he was severely wounded. Promoted to be brigadier the following month, and major-general Aug., 1864. Gen. Sherman thus refers to him in the order announcing his death: "He first fell under the immediate command of the present general of the army in the Vicksburg campaign, and soon attracted his notice by deeds of personal bravery that would require a volume to record. From that date to the close of the war he was engaged in every campaign in the West—at Jackson, Vicksburg, Meridian, the Red River, in Missouri, whence he was called personally to the aid of the general at Atlanta, and accompanied him, rising through all the grades, until the end of the war, when he commanded the 20th corps." In 1866 he was appointed colonel of infantry, and placed in command in Louisiana, where he "stood at his post through pestilence and sickness" until his death, which occurred at New Orleans Jan. 6, 1870. "A better soldier or a braver man never lived than Joseph A. Mower," is the high eulogy pronounced by the general of the army. Geo. C. Simmons.

Mowing-Machines. See Reaping-Machines.

Mow′ry (Sylvester), b. in Rhode Island about 1830; graduated at West Point 1852; served on frontier duty at San Francisco, Cal., 1852–53; was engaged in Pacific R. R. and other explorations and surveys 1854–57; was delegate in Congress from Arizona 1857–59; U. S. commissioner to mark the E. boundary-line of California 1860–61; published a work on the *Geography and Resources of Arizona and Sonora*, and wrote in various magazines on the Western country. D. in London, England, Oct. 16, 1871.

Moxa [Fr.], a form of the actual cautery whose use was derived from the Japanese and Chinese through the Portuguese. The down from the leaves of *Artemisia moxa*, the pith of the sunflower, cotton or lint soaked in solution of saltpetre and then dried, a pledget of spider's web, or a lump of amadou is rolled into a little cone and placed upon the part which it is desired to cauterize. It is then set on fire and held in place by a hairpin or an instrument called a porte-moxa. The blowpipe may be used to hasten combustion and increase the heat. The neighboring parts are surrounded by wet lint. It is often useful in spinal disease, neuralgia, etc. After firing, the part may be dressed with ammonia or ice. This process is the *moxiburium* or *moxicausis* of professional Latin.

Mo'xos, or **Mojos,** a nation of Indians in Eastern Bolivia, converted to Roman Catholicism by the Jesuits, who went among them in 1676, and during the succeeding century established among them fifteen mission-stations and reckoned 30,000 converts. They suffered great diminution from the attacks of Brazilian slave-hunters in the last century, and numbered little over 12,000 in 1833. They are lighter in color, taller, and more industrious than the surrounding nations, and employed a kind of hieroglyphics. Their language is harmonious, abounds in frequentative words, and lacks the letters *d, f,* and *l.* A grammar and vocabulary by Father Marban was printed at Lima in 1701, and a history of the mission was written by Father Francisco X. Iraizos.

Moy'lan (Gen. Stephen), b. in Ireland in 1734; settled at Philadelphia some years before the Revolution; presented himself to Gen. Washington at Cambridge, Mass., as a volunteer, and being a gentleman of good education and address, was appointed aide-de-camp Mar. 5, 1776, commissary-general June 5; commanded the 4th Light Dragoons 1777; participated in Greene's Southern campaign 1781; was appointed brevet brigadier-general Nov. 3, 1783; became a farmer at Goshen; was register and recorder of Chester co. 1792–93; for several years commissioner of law for the district of Pennsylvania, and vice-president of the Society of the Cincinnati 1800, and developed a great and beneficial activity in public life. D. at Philadelphia Apr. 11, 1811.

Mozambique', territory of the E. coast of Africa, extending along the Mozambique Channel from Cape Delgado to Delagoa Bay, between lat. 10° 41' and 26° S., and belonging to Portugal. Its area is estimated at 283,500 square miles, its population at 300,000, but its western boundaries are wholly undefined. The coast-land is low, with a rich, humid soil and a hot, moist climate, which make it extremely fertile. Large harvests of rice, maize, millet, and all varieties of tropical fruits are gathered wherever the ground is cultivated. Hippopotami, elephants, lions, crocodiles, and flamingoes abound. On the islands and shoals with which the coast is fringed turtles are caught in great numbers, and pearl-fishing is very remunerative; tortoise-shell is a staple article of export. The interior is higher, almost mountainous, and covered with forests, which yield many varieties of excellent timber and dyewoods. The authority of the Portuguese is very slight, and mostly confined to a few settlements and ports—namely, Mozambique, Quilimane, Sena, and Tete.

Mozambique, capital of the Portuguese territory of the same name, is in lat. 15° 2' S., on a small island. It is defended by three forts, has a good harbor and some trade in rice, gum, gold-dust, ebony, tortoise-shell, and timber. Pop. 8522, of whom 7000 are slaves, 1100 Arabs, and 34 Portuguese.

Mozambique Channel, the strait between the E. coast of Africa and the island of Madagascar. It is about 1000 miles in length, with a breadth of between 500 and 600 miles at its entrances, and of nearly 300 miles in the middle. The Comoro Islands are at its northern outlet.

Mozarab'ic Liturgy. The Christian subjects of the Saracens in Spain were called *Mozarabes,* "Arabs by adoption." Their liturgy, Ephesine in its type, if not in its origin, and not called Mozarabic till after the Mohammedan conquest in the eighth century, is, in its groundwork at least, coeval with the introduction of Christianity into Spain. At Braga, in 538, it was set aside for the Roman liturgy, but restored at Toledo in 589; and at the Fourth Council of Toledo in 633, after some improvements by Leander of Seville (d. 595) and Isidore of Seville (d. 636), the use of it was extended to all Spain. Further improvements were introduced by Ildefonso of Toledo (d. 667). But in the eleventh century (in Aragon 1071, and in Castile 1074) it gave place, by royal authority, to the Roman liturgy. Through the influence and example of Cardinal Ximenes (1436–1517) the use of it was revived in Toledo (after 1502), in Salamanca (1517), and in Valladolid (1567). By the concordat of 1842 provision was made for its continuance at Toledo, but nowhere else. It has been pronounced "the richest, the fullest, the most varied of all known liturgies." It has been edited by Leslie (1755), Lorenzana (1774), and Arevalus (1804). (See Migne's *Latin Patrology* (vols. lxxxv., lxxxvi., 1850), and John Mason Neale's *Eastern Church, General Introduction* (1850), and *Liturgiology and Church History* (2d ed., 1867).)

R. D. Hitchcock.

Mozart' (Wolfgang Amadeus, also Jean Chrysostome Theophile Sigismund), b. at Salzburg Jan. 27, 1756, and d. at Vienna Dec. 1, 1791, in his thirty-sixth year. When but an infant and without any apparent effort he absorbed a knowledge of music by listening to the lessons given his sister, Maria Anna. So precocious was he that at four years of age he played the piano with astonishing ease and expression, and composed minuets and simple pieces, dictating them to his father. When the boy was six years of age, the father, Leopold Mozart, visited Munich and Vienna with his two children, whose performances excited great admiration, particularly those of Wolfgang. Leopold brought home with them a small violin for Wolfgang, who learned by himself to play it, using it as a toy for odd moments. He had had this instrument but a few months when one night he played his part of a trio, reading at sight, without mistakes and without hesitation. In 1763, Leopold made a second tour with the children, visiting the most important cities of Europe, and although only eight years of age Wolfgang composed most of the symphonies which were played at his concerts, and which roused London to enthusiasm in 1764. Home for a few months in 1766, Wolfgang pursued the study of composition under his father. The works of Handel, which he brought from London, and those of Bach, became his classical models. He studied also some of the best Italian masters, getting from them his marvellous skill in making each of his vocal parts melodious and graceful even in the most constrained harmonic situations. In 1767, Leopold and the children went to Vienna, and remained there more than a year, hoping to improve their fortunes, but they reaped only loss and disappointment. The emperor, Joseph II., astonished at Wolfgang's genius, bantered him to compose an opera. Leopold mistook this jest for an order, and set the boy of ten years at work upon a libretto obtained after great difficulty and delay. The Italian court-musicians, piqued at this doubtful favor to the German child, even then formed their mean clique against him, and commenced the petty but effective annoyances that later marred the life they helped to shorten. The opera, covering 558 pages of MS., was never allowed a representation. From all these fruitless miseries the Mozarts escaped at last, the father and son travelling through Italy. Some idea of Wolfgang's wonderful abilities may be formed from the following programme of a concert given at Mantua Jan. 16, 1770: Two symphonies written by him; a concerto for piano that he would play at sight; a sonata that he would play at sight, transposing it into any key; he would improvise an air and its accompaniment to words given him at the concert; he would improvise a fugue and a sonata on a theme just given him; and lastly, he would complete and play on the piano a symphony at the first sight of only the part of the first violin. This programme is beyond the mature manhood of almost every other musician that ever lived. He wrote from memory, after hearing it but twice, the whole of a *Miserere* by D'Allegri. Happily, Wolfgang's facility and power in music were such that these feats were mere play to him, and even years of such performances did not impair the organization that made him the greatest of musicians. At Milan an opera by him, *Mitridate,* was brought on the stage and repeated twenty times. The whole tour was a success, and on his return he was appointed court-organist to the archbishop of Salzburg. From 1777 to 1779 he resided in Paris, where the battle between Gluck and Piccini was then raging. In 1780 he was called to Munich by Prince Charles Theodore of Bavaria to write the opera *Idomeneo.* In this entirely new creation Mozart laid the cornerstone of dramatic composition—a service which the most eminent of his successors fully acknowledge. Its originality and beauty became at once the delight of his audience, and earned him even more than his usual praises. The possession of merit was delightful to the archbishop of Salzburg; and the better to secure it, he at once had Mozart return with his honors from Munich, and in 1781 move with him to Vienna as a member of his household. The archbishop there lavished upon him the penury and ignominy with which he honored his menial servants. After a fruitless remonstrance, Mozart resigned, and unwillingly but needfully gave lessons for a living in Vienna, which thereafter was his home. In 1782 Mozart married Constance Weber, a pianist, whose care and love were his greatest help and happiness to the end of his struggling existence. Joseph II., fond of Italian music and of his Italian masters, the enemies of Mozart, was slow in granting him any privileges. Finally, *L'Enlèvement du Sérail* was ordered, and paid for with fifty ducats. The originality of this work at first hid its beauties from the people of Vienna, but the opera made a deep impression on the musicians there and on all classes in other parts of Europe. The emperor gave him the office of composer to the court and a salary of eight hundred florins, but with astonishing, lamentable indifference made his office a sinecure, for many years not asking a note from his hand. To sustain his family, he was obliged to give lessons, write waltzes and contredanses for balls, and give concerts in neighboring cities. It was not till his twenty-eighth year (1784) that these ephemeral labors were followed by uninterrupted industry in composition, when but seven years of life remained to him. The opportunity which wealth and royalty refused to give came unsought in the libretto of *Il Nozze di Figaro,* written for Mozart by the poor poet Da Ponte in 1786. This opera, finished in six weeks, had great success throughout Europe. Many offers came to him then from various courts, but Mozart was fond of Vienna, and even of his indifferent emperor. The people of Prague deserve mention for their warm and practical appreciation of Mozart. They asked an opera, and *Don Giovanni,* the triumph of dramatic composition, was written for them in 1787. In 1788 he commenced to feel depressed by his disease of the lungs and the nerves. He wrote with feverish activity to escape melancholy. A mysterious messenger came to him and engaged him to write a *Requiem,* refusing any information as to its destination. This mystery, some presentiment, and his melancholy fancies gave him the opinion that he was writing his own funeral service. He sank lower and lower, working more and more fatally in both senses of the word. In the single year of 1791, in such depths, when death, the mysterious messenger, had waited a twelvemonth, Mozart wrote *Die Zauberflöte* for indifferent Vienna, *La Clemenza di Tito* for loving Prague, and the requiem for himself. On a dismal day of rain, unfollowed by a friend, the bodies of Mozart and fifteen other dead were hurried through the streets of Vienna to the common burying-ground of the poor; and his grave is now unknown.

Mozart is considered the greatest composer of the world from the combined versatility and power of his genius. In every kind of composition he produced works of the greatest excellence, each of which is so original and comprehensive that his successors are almost of necessity his imitators. He wrote without showing the slightest weakness anywhere, operas, oratorios, symphonies, masses, quartets, solos for diverse instruments, sonatas, and dance-music. He was the best pianist of his time in Germany. His execution was precise, elegant, fervid, and delicate in expression. Not less remarkable were his improvisations, in which his clearness of thought, richness of harmony, and vividness of fancy were beyond the finished compositions of most other men. His fecundity is perhaps without a parallel. His life was less than half the usual length; half of that short life was spent in long concert-tours, and his delicate health and his lessons and other ephemeral work sadly diminished his productiveness. Yet he wrote 626 published works, and 294 compositions either unfinished or unpublished. Even a summary catalogue of them is too long to introduce here. Neither is it practicable to name his most esteemed works, for they are nearly all esteemed. *Don Giovanni, Nozze di Figaro, Die Zauberflöte,* the requiem, the symphony in G minor, the quartets Nos. 10 and 18, are but a small fraction of the delights this most favored genius gave the world. In Mozart's character we are struck with his cheerful temper, his childlike simplicity and sweetness, his matchless facility, his perfect confidence, his fertility of fancy, his unsurpassed capacity for exquisite sentiment, his depth of feeling, and his breadth of power. His compositions, charming pictures of his charming nature, are free from troubled thoughts and tortuous texts to be resolved in wonder. In every scene through which his universal genius leads us we follow in his music the accents of a loving, harmonious, confident soul in lucid beauties breathing joy to the heart for ever. C. H. Farnham.

Mo'zier (Joseph), b. at Burlington, Vt., Aug. 22, 1812; was engaged in mercantile pursuits in New York 1831–45; then visited Europe, studied sculpture in Florence and Rome, and practised that art with success. Among his best works are *Pocahontas, The Wept of Wish-ton-Wish, The Prodigal Son, Truth, Silence, Jephthah's Daughter, The Peri,* and *Rizpah.* D. at Faids, Switzerland, Oct., 1870.

Moz'ley (James Bowling), D. D., b. in Lincolnshire 1813; graduated at Oriel College, Oxford, 1834; became a fellow of Magdalen, vicar of Shoreham 1856, canon of Worcester 1869, regius professor of divinity, Oxford, 1871; author of a work on *Predestination* (1855), works on *Baptismal Regeneration* (1856–62), *Eight Bampton Lectures on Miracles* (1865), and other works. D. Jan. 4, 1878.

Mozyr, town of Russia, government of Minsk, on the Pripets, has trade in grain and cattle, and some tanneries and distilleries. Pop. 4166.

Mu'cilage [Lat. *mucus*], a solution in water of any gummy matter. (See articles on Arabine, Dextrine, Glue, Gum, Starch, and Tragacanth.) C. F. Chandler.

Mucori'ni [Lat. *mucor,* "mould"], an order of saprophytic fungi in which the oöspores are solitary and produced by a process of conjugation, and whose conidia consist of sacs containing one to many spores. The species of this order are very widely distributed, and amongst them are many fungi known as common moulds. They frequent articles of food, excrement of animals, and, in short, are found on nearly all decaying animal and vegetable matter. One species, *Phycomyces nitens,* K.ze, grows on oily substances, an unusual habitat of fungi. As a rule, the members of this order are quite small, although *P. nitens* has been known to attain the height of a foot. The mycelium, which is often found in large masses in some of the commoner moulds of this group, not unfrequently presents a shiny appearance, whence the common German word for plants of this order, *Schimmel,* "glitter," is derived.

Inasmuch as the species of this order conform tolerably closely to the type, we may select *Mucor mucedo,* a common mould growing on dung and other substances, as an illustration of the whole order. *M. mucedo* has occupied the attention of many botanists, but the most complete account of its development was given by Dr. Oscar Brefeld in a work entitled *Botanische Untersuchungen über Schimmelpilze,* Part i., published in 1872. In this publication there appeared for the first time an account of the oöspores, as well as the conidial spores of the plant in question. If fresh horse-dung be placed in a moist place, it will soon be covered by a coating of white glistening fibres, which are the hyphæ or mycelial threads of *M. mucedo.* They soon cover the surface of the dung with a cotton-wool-like mass, more or less dense according to the moisture and amount of nitrogenous matter in the dung, from which mass project certain threads, whose tips, at first white, afterwards black, are the conidia or asexual fruit, consisting of sacs containing a large number of spores. The threads, which grow upward to bear the spore-sacs, exhibit in *M. mucedo* a marked tendency to turn towards the light. In *M. stolonifer,* the common bread-mould, a nearly-related species, the stalks of the spore-cases, on the contrary, seem to be indifferent to the action of light. A microscopic examination of the hyphæ or threads composing the mycelium shows that, as in most fungi, they branch in all directions, and are occasionally divided by cross-partitions. The contents are colorless or slightly tinged with brown or gray, and the cell-wall, although, according to De Bary, it sometimes shows the blue color given by cellulose on the application of iodine and sulphuric acid, often fails to give that color. If submerged, the hyphæ live, at least for a certain length of time, but undergo certain changes; the cross-partitions become more numerous, and the cell-walls sometimes bulge a little. It has been sometimes supposed that yeast-cells were nothing but the altered mycelium of submerged plants of *M. mucedo.* This view is not now generally accepted, and it must be admitted that we have no proof that yeast-cells either come from *Mucor* or are changed into it. When, however, the mycelium of *M. mucedo* is kept quite moist, it undergoes a modification, and we have the production of what is known to German mycologists as *Brutzellen.* These are formed in the following way: The cross-partitions increase in number, and some of the cells thus formed swell until they become nearly spherical. The protoplasmic contents of the cells then roll themselves up into round masses resembling spores, which afterward are capable of germinating. The filaments, or hyphæ, which rise above the common mass of mycelium to bear the conidia, are generally from an eighth to half an inch high, but under exceptionally favorable circumstances may be as high as six inches. The ends of the hyphæ swell into a globular-shaped sac, shown in Fig. 1. The contents of the sac are at first continuous with those of the rest of the filament, but are afterwards cut off by a partition, which is not flat, like the cross-partitions found in the ordinary mycelium, but arched, as shown in section in Fig. 2, *a.* The expanded tip of the mycelium (Fig. 2, *b*), which projects into the spore-sac, is known as the *columella.* In *M. mucedo* it is very prominent. In most of the Mucorini it is smaller, and in a few cases is entirely wanting. In that part of the sporangium or spore-sac represented by *c,* Fig. 2, the spores are formed by free-cell formation. In *M. mucedo* they are very numerous and of an oval shape, 0.0066–0.0099 mm. long

Fig. 1.

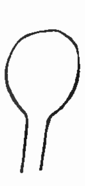


Fig. 2.

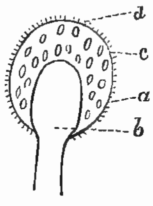


Fig. 3.

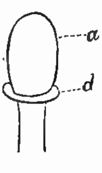
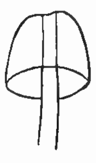


Fig. 4.



and 0.0033–0.0040 mm. broad. Their color is grayish-brown, and when seen in mass they often appear black. The external wall of the sporangium is composed of two layers, the outer of which is beset with short hairs. Within the sporangium is an expansible elastic substance, whose presence can be demonstrated before the spores are ripe by bursting open the outer wall, when the elastic substance projects as a globular mass, in which the young spores are imbedded. When ripe the spores are discharged with some violence by means of the sudden swelling of the elastic substance; the whole outer wall breaks away and disappears, except a small portion which remains, forming a rim about the base, shown in Fig. 3, *d*. This is sometimes so small that it can be seen only on close examination, and at first sight it appears as though the columella which remains were the young state of a sporangium. In *M. stolonifer* (bread-mould) it happens that not only is the outer wall of the sporangium destroyed, but the very large columella splits and collapses, falling back over the fruit-stalk like an umbrella or small toadstool, as in Fig. 4. The spores are often projected to a considerable distance, as may be shown by placing a piece of white paper two or three inches from a mass of *Mucor*, when it will soon be covered with black spots, which are the discharged spores. The spores placed on a moist surface swell to two, three, or even a greater number of times their original dimensions, but do not clearly show a division of their wall into two layers. Their germination takes place by the growth of one or more tubes, which soon assume all the appearance of the mycelium of *M. mucedo*, and in a short time, usually only a few hours, reproduce the conidia of the species.

When *M. mucedo* is cultivated on a decoction of horse-dung it only bears conidia. When growing spontaneously on horse-dung it not unfrequently produces oöspores as well. On breaking the dung open they are seen by the naked eye, looking like small round black bodies just below the surface of the dung. Their size varies from 0.0099–0.2145 mm., according to Brefeld's measurements. Examined with a rather lower power of the microscope, they are found to have two coats, the outer of which is black, opaque, and brittle, and roughened with irregular protuberances. On breaking open the outer coat, it is seen to be lined with a more delicate membrane, which fits into the inequalities of the outer layer. The inner coat is continuous; the outer is perforated by two circular openings diametrically opposite. This is where the suspensors were attached, as we shall see presently. The oöspores are produced in the following manner: Two hyphæ which are lying near each other send out lateral shoots, as shown in Fig. 5, which increase in size, gradually approaching each other until they meet, as in Fig. 6. The two parts in contact are next cut off by partitions from the hyphæ from which they respectively arose, as in Fig. 7. Finally, the cell-wall at the point of contact is absorbed, and the protoplasmic contents of the two cells unite into a globular mass, which afterwards becomes enveloped in a coating of cellulose and grows into a spore (Fig. 8), such as has already been described. In Fig. 8, *a a* are called the suspensors. The oöspore remains attached for some time to the mycelium, but is finally set free; generally, however, a small part of the suspensors remains attached. The oöspore germinates in the following manner: The thick outer coat opens, and from the contents of the spore there grows out a germinal tube, which soon assumes all the marks of the ordinary Mucor mycelium. This mycelium, arising directly from the oöspore, produces conidia, and sometimes almost immediately, as is illustrated in Fig. 9. No case has as yet been observed in which the mycelium from the oöspore of *M. mucedo* has produced another oöspore directly, without first having borne conidia. The oöspores of the Mucorini are called by De Bary *zygospores*, from their being produced by conjugation.

FIG. 5.

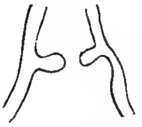


FIG. 6.

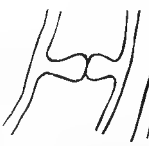


FIG. 7.

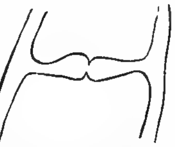
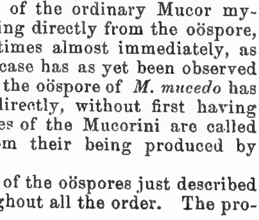


FIG. 8.



The method of production of the oöspores just described in *M. mucedo* prevails throughout all the order. The process, it will readily be seen, is similar to what is known as conjugation in certain orders of Algæ, as the Desmidiaceæ and Conjugatæ. The process consists in the direct union of the contents of two different cells, which resemble one another so closely that we cannot with propriety call one male and the other female. In the Desmidiaceæ it is the contents of two unicellular bodies which unite; in the Conjugatæ, the contents of two cells which are in different filaments. In one genus of the latter order, *Sirogonium*, we find a single filament, which bends upon itself, and the conjugation takes place between two cells of the same filament. In the Mucorini we have a conjugation between parts of different threads, but these threads may have both arisen from the germination of the same spore, so that the conjugation in this order is not necessarily between two different individuals, which must always be the case with Desmids. In those species of *Mucor* where there is a large amount of mycelium we do not know whether the mass has arisen from one or many spores; and when conjugation takes place in such cases it may have been between threads arising from different spores. Cultures of single spores have, however, been made, from which it is known that threads of the same individual may conjugate. This is shown particularly clearly in *M. syzygites*, De Bary, a common mould on toadstools, represented in Fig. 10, where the mycelium from a single spore is easily traced. It has been remarked that the two conjugating cells closely resemble one another. In *Chætocladium*, however, one of the cells is uniformly larger and of a slightly different shape from the other, but even in this case there is no distinction of antheridium and oözonium. The oöspores of the different species and genera of Mucorini vary in shape, size, and markings, but a detailed account would be out of place. The most striking form is *Phycomyces nitens*, whose oöspores are surrounded by a ring of branching processes.

FIG. 9.

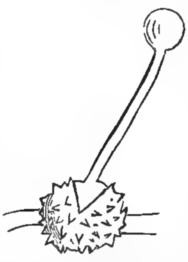


FIG. 10.

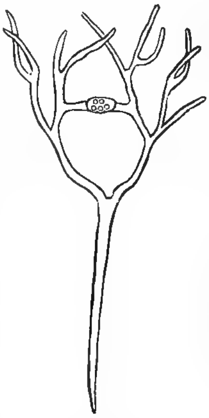


FIG. 11.

The older writers had no knowledge of the mode of production of the oöspores of this group, and the only form of fruit which they regarded in their classification of this order was the asexual or conidial form; and they considered the conidial sporangia to resemble the asci of the Perisporiaceæ. Modern research has shown that this is not the case; for, while the former are produced without the intervention of any sexual action, the latter are the result of a peculiar process of fertilization. By continental writers the Mucorini are considered one of the lowest of Fungi, and are placed just below the Peronosporæ. English mycologists still adhere to the older classification.

The principal genera of the order are *Mucor* (including *Phycomyces*), *Circinella*, *Helicostylum*, *Thamnidium*, *Chætostylum*, *Chætocladium*, *Mortierella*, *Piptocephalis*, *Syncephalis*, *Kickxella*, *Cœmansia*, *Martensella*, and *Pilobolus*.

W. G. FARLOW.

Mu'cous [Lat. *mucus*] **Mem'brane,** the lining membrane of the alimentary, respiratory, and genito-urinary tracts. Anatomically, it consists of the mucous membrane proper and the sub-mucous tissues. The first is composed of the secretory tubules, follicles, and glands, situated upon a basement or limitary membrane; the second consists of elastic connective or "areolar" tissue, and contains the capillary blood-vessels and nerve-filaments by which the secretory surface is nourished and vitalized. The special function of a mucous membrane is to secrete a viscid, gelatinous substance termed mucus, and thus to protect the passages which it lines from the contact, attrition, and irritation of their moving contents, as well as to facilitate such motion. By its corrugated structure, numerous reduplications, and villous processes it affords an extensive surface for the great functional glandular processes of nutritive absorption and the elimination of effete excretory products. Its free surface is lined with epithelial cells, related to the mucous tissues beneath as the epidermic cells, or cuticle, are to the skin. These epithelia are constantly exfoliated, and as constantly reproduced by young cells formed by proliferation in the cellular structures beneath. The secreted matter called mucus contains a limited number of mucous corpuscles, which are cast-off epithelia or escaped products of rapid cell-formation. But the homogeneous fluid portion is the peculiar secretion of the mucous follicles. It is clear, colorless, has nearly a semi-solid consistency, and consists of water, mucosine, and salts, especially chloride of sodium. When rich in corpuscles and mucosine, mucus is viscid and tenacious. It is thin and watery when salines are chiefly present, and often a rapid serous flow is scarcely more than transuded blood-serum. The mucous membrane is also the seat of glands of special function, as those producing the saliva, the gastric and intestinal digestive juices. Hypersecretion of mucus is designated catarrh. Catarrh of mucous surfaces has many causes. When the skin is chilled, or its circulation is sluggish by reason of uncleanliness or neglect of exercise, blood is determined to the internal parts. Rapid circulation of the blood and the elevated temperature of the body produce catarrhs in most acute inflammatory or febrile disorders. When large organs, as the lungs or liver, are diseased, the obstruction they offer to the circulation favors congestion of the extensive mucous surface, and catarrh. They are passively congested when the heart is dilated. Direct irritation more often causes catarrhs, as dust in the bronchi, or errors in diet producing the catarrhs of gastric and intestinal indigestion.

E. Darwin Hudson, Jr.

Mucus. See Mucous Membrane.

Mud Fish. See Amia Calva.

Mudge (Benjamin Franklin), b. at Orrington, Me., Aug. 11, 1817; graduated in 1840 at Wesleyan University; became a lawyer of Lynn, Mass., in 1844; mayor of Lynn 1852; engaged in chemical pursuits, and was connected with the coal-oil and petroleum industry in Massachusetts and Kentucky; State geologist of Kansas 1864–65; became in 1865 professor of natural sciences in the Kansas Agricultural College at Manhattan; has made many palæontological discoveries; became president of the State Teachers' Association in 1867 and of the Kansas Natural History Society 1868.

Mudge (Rev. Enoch), b. in Lynn, Mass., June 21, 1776; joined the itinerant ministry at the second session of the New England conference in 1793. All the other Methodist preachers in the Eastern States down to that date had gone thither from the Middle or Southern States. He travelled and preached through most of Massachusetts, Rhode Island, Connecticut, and Maine. In the latter State, which was then a province and a wilderness, he endured severe and romantic trials. He was a chief founder of its now prevalent Methodism. He was twice elected to the legislature of Massachusetts. The latter years of his life were spent in New Bedford, Mass., as chaplain to its mariners' chapel, where he was supported and beloved by all sects. He published a volume of excellent *Sermons for Mariners* and many poetical pieces of some merit. Notwithstanding his hardy early life and adventures as an itinerant, he was universally admired for the evangelical gentleness of his character. "In stature he was below the ordinary height, was stoutly framed, with a full round face, healthfully colored and expressive of the perfect benignity of his spirit. In manners he would have been a befitting companion for St. John. He was distinguished by excellent pulpit qualifications, by fertility of thought, warmth of feeling without extravagance, peculiar richness of illustration, and a manner always self-possessed and marked by the constitutional amenity of his temper." D. at Lynn, Mass., in 1850.

Abel Stevens.

Mudie (Robert), b. in Forfarshire, Scotland, in 1777, was in 1802 appointed professor of Gaelic in the academy of Inverness, and became in 1820 a member of the staff of the London *Morning Chronicle*. He was a self-taught man, but not without knowledge and talent, and his popular works on natural history (*The British Naturalist, Hampshire*, etc.) were much read. D. in London in 1842.

Muez′zin, or **Mueddin** [Arab., from *uzn*, "ear"], an official, usually blind, who at certain hours of the day and night chants the call to prayer from the minarets (*madneh*) of the mosque in Mohammedan towns. The call is made in loud, sweet, and melodious tones. In the daytime the call *Adan* is used: "God is most great; there is no God but Allah, and I testify that Mohammed is Allah's prophet! Come to prayer! Come to security! Prayer is better than sleep!" several times repeated. After the first *Adan* (called *Fegr* or *Subh*) the last sentence is omitted. The night-cry, *Ula*, is like the *Adan*, but ends in these words: "There is no God but Allah. He has no companion! he has no companion! To him belongs dominion; to him praise is due. He confers life and causes death; he is living and shall never die. In his hand is blessing and all power." The call *Ebed* is made an hour before day. Its first words are, "I praise the perfection of God, the Eternal One—the perfection of God, the wished-for, the alone-existing, the supreme."

Muf′ti ("expounder"), or **Sheikh-ul-Islam** ("lord of the faith"), called also the **Grand Mufti,** the second in rank of the great ministers of the Turkish court, or Porte, the head of the departments of religion and law. At present, however, he is neither priest nor magistrate, but the supreme expounder or interpreter of the law. The name *mufti* is also given to the numerous jurisconsults who are attached to the government councils, general and local, throughout the empire.

Müg′ge (Theodor), b. at Berlin Nov. 8, 1806; first employed in a mercantile office; became then a soldier, determined to go to South America and fight under Bolivar, but the war was over when he reached London; returned to Berlin; studied natural science, history, and philosophy for some time; devoted himself finally to literature, and d. at Berlin Feb. 18, 1861. Of his political writings, *France and the Bourbons* (1830), *England and the Reform* (1831), and *The Censure in Prussia* (1845), attracted much attention. The best of his travelling sketches are *Die Schweitz* (1847), translated into English by Mrs. Percy Sinnet (London, 1848), and *Nordische Bilderbuch* (1856); of his romances, *Toussaint* (1840) and *Afraja* (1854), translated into English by E. J. Morris (Philadelphia, 1854). His collected works were published at Berlin in 33 vols. (1862–67).

Muggleton′ians, the followers of Ludowic Muggleton (1607–97), a journeyman tailor of London, who was himself the follower of one John Reeve, a fanatic who professed to have prophetic gifts. They published several pretended books of revelation. Muggleton's complete works appeared in 1756 and in 1832. His sect, though still in existence after 1830, is believed now to be extinct. Its peculiar doctrines were mostly absurd and ridiculous.

Mugil′idæ [from *mugil*, the Latin name of the mullet], a family of fishes of the order Teleocephali and sub-order Percesoces. The body is always more or less oblong and compressed, and covered with cycloid scales of moderate size; the lateral line is absent; the head oblong and more or less depressed, but with the eyes lateral and well developed; the opercula unarmed; the mouth terminal, with the cleft moderate and mostly transverse or scarcely extending laterally; the teeth very small or entirely absent; the branchial apertures wide; branchiostegal rays, five or six; dorsal fins two, the first always with four stout, rigid, diverging spines, the second with nine (I. 8) rays (rarely eight or ten), and far behind; the anal opposite and resembling the dorsal; the ventrals sub-abdominal, but connected with the scapular arch, and each with one spine and five rays; the vertebræ are 24 in number—12 abdominal and 12 caudal; the stomach is muscular; the pyloric cæca undeveloped. This family embraces a large number of species (rather over 100) agreeing closely in physiognomy and in most of their characters; they are most numerous in the tropical waters, in all of which they are found, but a number of species also ascend far up into the temperate zones. Although strictly salt-water fishes, they more or less seek at stated seasons fresh waters. They generally associate together in large schools; they feed on organic substances which are found in the mud or sand. Several species are found in the Atlantic and Gulf slopes of the U. S.

Theodore Gill.

Muhalitch′, town of Asiatic Turkey, in Asia Minor, 13 miles S. of the Sea of Marmora, carries on a considerable trade with Constantinople. Pop. 11,000.

Mühlbach (Luise). See Mundt (Klara).

Mühl′berg, town of Prussia, province of Saxony, on the Elbe, famous on account of the battle fought here on Apr. 24, 1547, in which the army of the allied Protestant princes under Johann Friedrich was totally defeated by the imperial army, and which entirely changed the course of the Reformation. Pop. about 3500.

Mühlenberg (Frederick Augustus), b. at the Trappe, Pa., June 2, 1750; held important Lutheran pastorates in Pennsylvania and in New York City; was in Congress from Pennsylvania 1779–80 and 1789–97, and was twice Speaker of the House; held also important State and Federal offices, and d. at Lancaster, Pa., June 4, 1801; was son of Dr. H. M. Mühlenberg.

Mühlenberg (Gotthilf Heinrich Ernst), D. D., brother of F. A. Mühlenberg, b. at New Providence, Pa., Nov. 17, 1753; was educated at Halle 1763–70; held Lutheran pastorates in Philadelphia and Lancaster, Pa. (1780–1815); best known as a botanist; author of a *Catalogus Plantarum*

(1813), *Descriptio Uberior Graminum* (1816), and an unpublished *Flora Lancastriensis.* The genus *Muhlenbergia*, of the grass family, was named in his honor. D. at Lancaster, Pa., May 23, 1815.

Mühlenberg (Heinrich Melchior), D. D., b. at Eimbeck, Hanover, Sept. 6, 1711; studied at Göttingen and Halle; entered the Lutheran ministry; was an instructor at Francke's orphan-house, and in 1742 was sent as a missionary to America; was stationed first at Philadelphia, and afterwards at the Trappe, Montgomery co., Pa.; travelled extensively; founded the Lutheran ministerium of Pennsylvania, the first in America, and is justly regarded as the chief founder of the American Lutheran Church. D. Oct. 7, 1787. (See Stoever, *Life and Times of Mühlenberg*, 1756.)

Mühlenberg (Henry Augustus), b. at Lancaster, Pa., May 13, 1782; was Lutheran pastor of Reading, Pa., 1802–08; member of Congress 1829–38; was twice a Democratic candidate for governor; declined the Russian mission and the secretaryship of the navy; was U. S. minister to Austria 1838–40. D. at Reading Aug. 11, 1844.—His son, Henry A. (b. July, 1823; d. Jan. 9, 1854), was a graduate of Dickinson College; a lawyer; author of a *Life of Gen. Mühlenberg;* was sent to Congress in 1854, but d. soon after, having sat but one day in Congress. He was a man of great popularity and brilliant prospects.

Mühlenberg (John Peter Gabriel), b. at the Trappe, Pa., Oct. 1, 1746, a son of Dr. H. M. Mühlenberg; was educated in Halle, but ran away from college and enlisted in the dragoons; became in 1772 Lutheran minister of Woodstock, Va.; was much in public life, and soon after the outbreak of the Revolution threw off his gown in the pulpit, displaying a military uniform, read his commission as colonel, and ordered the drums to beat for recruits; served with great distinction at Charleston, Brandywine, Germantown, Monmouth, Stony Point, and Yorktown; became a brigadier-general in 1777, and afterwards a major-general; was vice-president of Pennsylvania 1785; M. C. 1789–91, 1793–95, and 1799–1801; U. S. Senator 1801–02; became in 1802 U. S. supervisor of revenue for Pennsylvania, and in 1803 collector of the port of Philadelphia. D. Oct. 1, 1807.

Muhlenberg (William Augustus), D. D., great-grandson of Heinrich Melchior Muhlenberg, was b. in Philadelphia Sept. 16, 1796; graduated at the University of Pennsylvania in 1814, and entered the Episcopal ministry in 1817. From 1817 to 1821 he was assistant rector of Christ church in Philadelphia under Bishop White. From 1821 to 1828 he was rector of St. James's church in Lancaster, Pa. From 1828 to 1846 he was at the head of a school, afterwards called St. Paul's College, founded by him at Flushing, L. I. From 1846 to 1858 he was rector of the church of the Holy Communion, erected by his sister, corner of 6th avenue and 20th street, New York City. In 1858 he became the first superintendent and pastor of St. Luke's Hospital, which owes its existence to him. The degree of D. D. was conferred upon him by Columbia College in 1834. He published *Church Poetry* (1823), *Music of the Church* (1852), and the *People's Psalter* (1858). He distinguished himself both as a philanthropist and a promoter of Christian union. But he will be longest remembered as the author of the hymns "I would not live alway" (1823; revised in 1865), "Like Noah's weary dove" (1826), and "Saviour, who Thy flock art feeding" (1826). D. at New York Apr. 8, 1877. R. D. Hitchcock.

Mühlhau'sen, town of the German empire, province of Alsace-Lorraine, on the Ill, which divides it into the old and the new city, and is crossed here by four bridges. The old town is rather indifferently built, though its streets are neat and clean; the new town is very elegant. Even a century ago Mühlhausen was celebrated for its woollen cloths; many other manufactures have since been added, such as cotton prints, muslins, watered silks, stained paper, parchment, starch, chemicals, etc., and it is now one of the most flourishing manufacturing towns of Germany. The town and its territory originally belonged to the Swiss confederation, but in 1798 it was incorporated with France, and by the treaty of Frankfort, 1871, it was ceded to Germany. Since that time it has increased very rapidly, principally by immigration from Germany. Pop. 63,629.

Mühlhau'sen, town of Prussia, province of Saxony, on the Unstrut, has large manufactures of optical and musical instruments, soap, chemicals, tobacco, and linen goods. It is surrounded by walls and was originally a free city of the empire. In the Peasants' War of 1525 it was the headquarters of Thomas Münzer, and also the scene of his execution. Pop. 23,478.

Mühl'heim-am-Rhein, town of Rhenish Prussia, on the right bank of the Rhine, not far from Cologne, has large manufactures of silk, satin, ribbons, and all kinds of woollen goods. Its prosperity dates back to the beginning of the seventeenth century, and was due to the settlement there of a number of Protestant emigrants from Cologne. The place is still principally Protestant. Pop. 20,420.

Mühlheim-am-Ruhr, town of Rhenish Prussia, on the Ruhr, has extensive manufactures of cotton and woollen goods, and an important trade in coal and iron from the mines in the vicinity. The Ruhr becomes navigable here, and a large number of vessels for the navigation of that river and the Rhine are built. The trade of the town is principally with Holland. Pop. 22,146.

Muir (John), D. C. L., b. at Glasgow, Scotland, in 1810; educated at Glasgow University and at the East India College at Haileybury; proceeded to Bengal as a writer in the civil service 1828; filled several important posts in the revenue and judicial departments; made a profound study of Indian languages, history, and antiquities; wrote some religious tracts in Sanskrit verse, and after retiring from the service in 1853 devoted his time and his fortune to the promotion of Oriental studies, especially such as have a religious bearing. To this end he had offered to the University of Cambridge in 1846 a prize of £500 for the best treatise pointing out the errors of the various systems of Hindoo philosophy and expounding the principles of Christianity to learned natives of India; which was awarded to a work by Dr. Rowland Williams. In 1862 he endowed with £5000 a chair of Sanskrit and comparative philology in the University of Edinburgh. Besides various contributions to the *Transactions* of the Asiatic societies and other learned associations, Dr. Muir published five volumes of *Original Sanskrit Texts on the Origin and History of the People of India, their Religion and Institutions,* collected, translated, and illustrated (1858–70)—a work of consummate erudition and of the utmost value to the students of Indian antiquities, mythology, and literature, particularly of the Vedic age. Noticeable among his other works is his *Remarks on the Conduct of Missionary Operations in Northern India* (Cape Town, 1853). He was also the author of *Metrical Translations from the Sanskrit*, many essays in the *Journal of the Royal Asiatic Society*, and an anonymous work on *Inspiration*. D. Mar. 7, 1882.—Dr. Muir's brother, Sir William Muir, b. in 1819, has also risen to high rank in India; became governor of the North-west Provinces in 1868, and has published a valuable *Life of Mohammed* (2 vols., 1858).

Muk'den [Chinese, *Fung-Thian*], town of Mantchooria, capital of the province of Leao-Tong, was the residence of the present Chinese dynasty before the conquest of China, and for that reason highly favored by the government.

Mulatto. See Mixed Races.

Mul'berry [Ger. *Maulbeere;* Lat. *morus;* Gr. μόρον], a small tree of the genus *Morus*, of which there are many species. Those only which produce the leaf best adapted for the food of the silkworm are of sufficient economical importance to be noticed here. The black mulberry is doubtless indigenous to Europe, and it was cultivated by the ancients for its fruit. Its foliage is sometimes employed to feed the silkworm, though now not often used, the leaf of the white mulberry (*Morus alba*) having proved more suitable for that purpose. The leaves of both species are good fodder for cattle, and in years of scarcity of forage are gathered in the autumn to serve instead of hay, though stripping the tree a second time in the same season to feed either cattle or a late crop of worms is injurious both to its growth and to the quality of the leaf. It is a common mistake of travellers to suppose that the small trees on which vines are trained in Italy are mulberries. The mulberry is indeed sometimes, but rarely, used as a support for the vine, the trees almost universally employed being the elm and a maple often miscalled a poplar—*pioppo* or *chioppo*—in Tuscany. The white mulberry is supposed not to have existed in Europe until after the introduction of the silkworm in the sixth century. Propagation and cultivation, by different methods and under different conditions, have developed several varieties of the *Morus alba*, and the Philippine, *M. multicaulis*, has been supposed to have thus originated, though now, we believe, considered by most botanists a distinct species. The stocks preferred in Italy appear to be the common white of the varieties *Morettiano* and orange or *arancino;* but there are varieties within varieties, and the opinions of cultivators as to their comparative merits differ widely. The relative value of the different varieties of mulberry is a complicated question, depending partly on the quantity of foliage obtainable from a given number of trees; partly on the proportion of edible matter furnished the worm by a given weight of leaves; and partly on the amount and quality of silk-forming material yielded by the foliage. The leaves of some mulberries, and even of other trees—as the Osage orange, for example—are readily eaten by the worm, but supply little and inferior silk-fibre for the cocoons. In others the proportion of stems, ribs, and other unserviceable parts is so large that an inordinate quantity of leaf is required for a moderate amount of nutriment. According to the tables of Cosimo Ridolfi, the leaf of the *arancino* contains 46 per cent., by weight, of nutritious matter, and upon a given extent of branches this variety produces five times as much leaf as the *Morettiano,* which latter yields 51 per cent. of edible substance, while the leaf of the *arancino,* weight for weight, yields but one-fourth as much silk as that of the *Morettiano.* These proportions, however, are variable, according to soil, season, and treatment, and the mere name of a variety is not a very certain indication of its properties. This should be borne in mind in attempts to introduce Italian mulberries into the U. S.; and it should further be remembered that the physical conditions of the two countries are so different that the experience of the one is of little value as a rule for agricultural practice of any sort in the other. Nothing but careful experiment and observation can guide the cultivator in the choice of the stock to propagate from, and in his modes of cultivation.

The mulberry requires a deep, light, rich soil, and thrives well neither in clay nor in sand. It is best propagated by seed, though the methods of layering and cutting are sometimes employed with the *multicaulis,* and grafting is practised with most varieties, though not often with the *multicaulis* or the *Morettiano.* Ungrafted trees yield the finest silk, but in smaller quantity than grafted. The quality of the leaf is found to depend scarcely more on the variety of stock than on the pruning and other treatment of the plant, the aim of the grower being to encourage the pushing of shoots, which of course increases the yield of tender leaf—and at the same time to produce a foliage neither so fleshy as to supply little silk, nor so fibrous as to furnish little pulpy nutriment for the worm. Irrigation may be employed with advantage to hasten the growth of young plants, but the leaf of freely-watered trees is neither a healthy food for the worm nor rich in material for silk. Water, therefore, should be applied only when clearly necessary. The mulberry may be said to be a long-lived tree, as in Italy it continues productive from the age of 5 years to that of from 50 to 110, and even more, according to soil and treatment. If stripped annually, it should yield, under the most favorable circumstances, from 11 pounds avoirdupois of green leaf at the age of 5 years, when its stem will have attained the diameter of four inches, to 110 pounds at the age of 100 years, with a trunk eighteen inches in diameter; but in inferior soils, the longevity of the tree and the quantity of the foliage are much less. (See Canevazzi, *Agrotimesia.*) The fresh leaf sells at about fifty or sixty cents per 100 pounds, and the weight of cocoons spun by the worms is about one-twentieth of that of the leaves consumed. Many high authorities maintain that it is better economy to strip the trees only in alternate years, the crop of leaf being more than double in quantity and superior in quality to that obtained by annual gathering. In Italy, where the mulberry is planted in grain-fields and other cultivated lands, about two square rods are allowed to a tree, or eighty trees to an acre; and in that climate other crops grown in the same ground do not suffer from the shade or from the spread of the roots, and the tillage of the soil is beneficial to the tree. In the Eastern U. S., however, it is doubtful whether other vegetables could be cultivated advantageously in mulberry orchards. Experiments have been made in Italy with a view of utilizing directly the fibrous material of the mulberry for industrial elaboration, but thus far without important results.

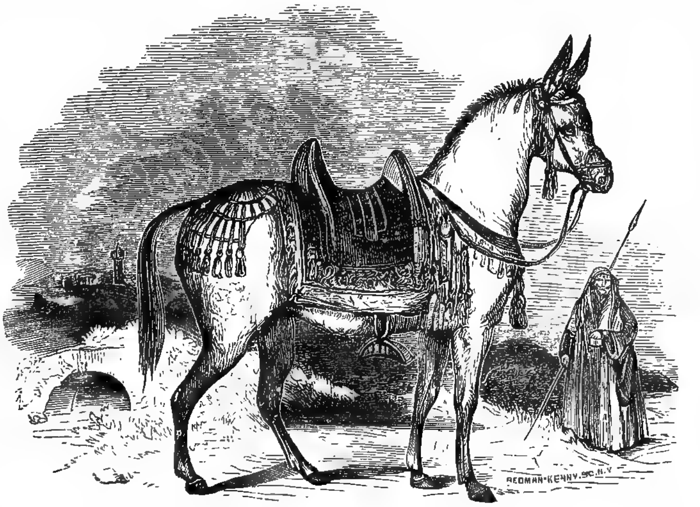
George P. Marsh.

Mulberry, Paper, the *Broussonetia papyrifera,* a tree of the same family as the mulberry, but of a very distinct genus, indigenous to Japan, and now widely distributed through various parts of the world—a favorite shade-tree in the Southern Atlantic States, barely hardy in the Northern States. From its fibrous inner bark it is said that the tapa cloth of the South Sea Islanders was made. In Tahiti, as we are informed by Capt. Cook in his relation of his first voyage, the finest and whitest cloth, worn by the chiefs and principal persons of the island, is entirely manufactured by a simple process of beating. But it is remarkable that the naturalists of Wilkes' exploring expedition "found not a single stem of *Broussonetia,* although former visitors speak of it as the tree from which the cloth was made." The principal and a very ancient use of this fibrous bark in Japan was for the making of paper of various qualities. The paper-mulberry tree of Japan is called *kadzu,* while the common mulberry is known as *kuwa.* The former grows in a wild state in some parts of Japan, but is extensively cultivated, and the varieties of paper manufactured from it number at least 300, ranging from a leather-like quality a quarter of an inch in thickness to the most delicate gossamer. Certain provinces are famous for their superior qualities of paper, and before the late revolution it was customary for the people to pay part of their annual taxes with paper, which is manufactured to a very great extent in private houses, as well as in regular establishments devoted wholly to that purpose. The part of the tree used in making paper is the bark, and the uses to which it is applied are almost numberless, and might with propriety cause Japan to be called the "paper empire." This paper mulberry is chiefly found in the mountain-districts, attains the height of an imposing tree, and its wood is only used for fuel; but the common mulberry is highly valued for its wood, which is used in making a variety of beautiful articles, as it has a fine grain and may be highly polished. There have been several Japanese books published on the paper mulberry, but none of them have been translated.

C. Lanman.

Mul′der (Gerardus Johannes), b. at Utrecht Dec. 27, 1802; studied medicine; practised in 1825 at Amsterdam; lectured in 1827 at Rotterdam on botany and chemistry, and became in 1840 professor of chemistry at the University of Utrecht. His *Chemistry of Vegetable and Animal Physiology* (translated into German by Kolbe in 1844, and into English by J. T. W. Johnston in 1849) occasioned a hot controversy with Liebig concerning the existence of Proteine (which see) as an independent compound. His *Chemistry of Wine* was translated into English by H. Bence Jones (1857). He also wrote the *Chemistry of Beer, De Voeding in Nederland, De Voeding van den Neger in Suriname, Chemical Researches,* etc., all translated into German, some into French. D. Apr., 1880.

Mule [Lat. *mulus*], a name in its widest sense synonymous with hybrid, as when we speak of the mule canary-bird, but more commonly denoting the offspring of the male of the domestic ass and of the mare; the corresponding offspring of the male horse and female ass being the jennet or Hinny (which see), a very different animal. The mule is a hardy, strong, serviceable animal, peculiarly adapted to hard work in hot weather, such as would be too hot for either the horse or ox. In Spain, Spanish America, and parts of Africa and the East mules are highly prized as saddle animals. In the U. S. they are extensively bred for use on the Southern plantations. Previous to 1783 there were but very few mules in the U. S., and those of such an inferior order as to prejudice farmers against them as unfit to compete with horses in work upon the road and the farm. But Washington, having convinced himself that the introduction of mules would prove a great benefit to the Southern planters, procured excellent specimens from the royal stables in Spain and from Malta, and soon



The Abyssinian Mule.

after a good breed was produced the advantages which the mule has over the horse for certain kinds of work became apparent.

Mule, or **Spinning-Jenny.** See COTTON MANUFACTURE.

Mule-Deer. See DEER.

Mulford (ELISHA), LL.D., b. Nov. 19, 1833, in Susquehanna co., Pa., graduated at Yale College in 1855; his education in law, theology, and philosophy was continued at the Union Theological School, at Andover, and at Berlin, Germany. In 1870 he published *The Nation*, a profound treatise on the philosophy of the state; in 1880, *The Republic of God*, a similar work on the philosophy of religion. He lectured on the philosophy of law at Columbia Law School, and on theology and philosophy at Cambridge Theological (Episcopal) School. D. Dec. 9, 1885.

Mul'grave (CONSTANTINE JOHN **Phipps**), BARON, b. in England May 30, 1734; entered the navy at an early age; became post-captain 1765; commanded an exploring expedition in search of a N. W. passage 1773; reached lat. 80° 48′ N., whence an impenetrable field of ice stretched northward; published *A Journal of a Voyage toward the North Pole* (1774); succeeded to the title 1775; was commissioner of the admiralty under Lord North's administration, and an ardent politician; was raised to the English peerage in 1784, and d. Oct. 10, 1792.

Mulgrave (HENRY **Phipps**), FIRST EARL OF, Viscount Normanby, brother of Constantine, b. in England Feb. 14, 1755; served in the British army in America during the war of independence; succeeded to his brother's title in the Irish peerage 1792; member of William Pitt's cabinet; became first lord of the admiralty 1807; bitterly opposed Catholic emancipation, and was raised to an earldom in 1812. D. Apr. 7, 1831. His son and successor in the peerage became in 1838 marquis of Normanby.

Mull, one of the Inner Hebrides, off the W. coast of Scotland. It is 30 miles long and 25 miles broad, high, rugged, but fertile, though not fit for agriculture on account of climate; cattle and sheep are reared. Pop. 6834.

Mul'lan (DENNIS W.), U. S. N., b. Nov. 10, 1843, in Maryland; graduated at the Naval Academy in 1863; became a master in 1866, a lieutenant in 1867, a lieutenant-commander in 1868, a commander July 3, 1882; served in the Monongahela at the battle of Mobile Bay, Aug. 5, 1864, and was commended for "gallantry." F. A. PARKER.

Mulla'ny (J. R. M.), U. S. N., b. Oct. 26, 1818, in New York; entered the navy as a midshipman Jan. 7, 1832; became a passed midshipman in 1838, a lieutenant in 1844, a commander in 1861, a captain in 1866, a commodore in 1870, a rear-admiral in 1874; served on the E. coast of Mexico during our war with that country, and participated in the capture of Tabasco; commanded the Oneida at the battle of Mobile Bay, Aug. 5, 1864, where he lost his left arm. In his official report of the part taken by his own vessel, the Galena, in this signal victory, Lieut.-Com. Wells says: "Before leaving the anchorage off Mobile bar the Galena was lashed to the port side of the Oneida, and occupied the rear of the line. Both vessels were repeatedly struck, but the Oneida suffered severely, losing a number of men killed and having a number wounded. Her captain, J. R. M. Mullany, under the most trying circumstances displayed the utmost courage and gallantry, while passing through a terrific fire, and only left the deck when he had been severely wounded." Retired Oct. 26, 1879.
FOXHALL A. PARKER.

Mul'lein [Lat. *malandrium*, a leprous disease], the common name of *Verbascum thapsus*, a plant of the family of Scrophulariaceæ or figworts, belonging to a widely-distributed genus which includes more than eighty varieties. The common mullein of the U. S. is a biennial plant attaining a height of from four to six feet, with oblong-acute leaves eight or ten inches long, covered with a soft wool-like pubescence. It is found in Europe and Asia, whence it was introduced into America, where it is a troublesome weed in the farm and garden.

Mül'ler (CHARLES LOUIS), b. at Paris Dec. 22, 1815; studied under Gros and Cogniet; began to exhibit in 1837, and was artistic director of the manufacture of the Gobelin tapestries from 1850 to 1853. His principal pictures are—*Le Martyre de Saint Barthélemy* (1838), *Episode du Massacre des Innocents* (1840), *Appeal des Dernières Victimes de la Terreur* (1850), placed in the museum of Luxembourg.

Müller (FRIEDRICH MAXIMILIAN), LL.D., known as MAX MÜLLER, a son of the poet Wilhelm Müller (1794–1827), b. at Dessau Dec. 6, 1823; studied at Leipsic, Berlin, and Paris, giving special attention to Sanskrit, under such masters as Brockhaus, Bopp, Schelling, and Burnouf; went in 1846 to England, and in 1848 to Oxford; became in 1850 deputy Taylorian professor of comparative philology; professor in 1854; curator of the Bodleian library 1856; fellow of All Souls 1858; and in 1868 received a new professorship of comparative philology. His chief works are—a translation of the *Hitopadesa* (1844), the *Meghadûta* in German (1847), *The Hymns of the Rig-Veda*, with the text and translation of the *Prâtis-âkhya* (1857), the *Rig-Veda* (Oxford, 1849 *seq.*); *History of Ancient Sanskrit Literature* (1860), *Chips from a German Workshop* (1868 *seq.*), a translation of the *Rig-Veda* (1st vol.), *Hymns to the Maruts* (1869), *Selected Essays* (1882), etc.

Müller (GEORGE), b. at Kroppenstädt, near Halberstadt, Prussia, Sept. 27, 1805; studied at the University of Halle; was licensed as a Lutheran preacher; directed his attention to the organization of philanthropical institutions; settled in England 1829, and founded at Bristol in 1835 an orphanage, which has become celebrated from its extensive usefulness, and from being supported entirely by unsolicited voluntary contributions which Müller regards as visible answers to prayer. (See his *Narrative of the Lord's Dealings.*)

Müller (JOHANNES), b. at Coblentz July 14, 1801, in humble circumstances; began to prepare himself for the Roman Catholic Church, but abandoned in 1819 his theological studies, and devoted himself exclusively to medicine; took his degree in 1822, and became professor of physiology and anatomy in 1826 at Bonn, and in 1833 at Berlin, where he d. Apr. 28, 1858. As the founder of the physico-chemical school of physiology he enjoyed the fame of being one of the greatest physiologists of his age, and his publications, numbering about 100, and ranging over the whole field of anatomy and physiology, brought new facts and new ideas to every point of his science. His principal works are—*Elements of Physiology* (1833; translated by Dr. W. Baly, 2 vols., London, 1837–42), *De Respiratione Fœtus* (1823, his first publication), *De Glandularum Secernentium Structura* (1830), *Vergleichende Anatomie der Myxinoiden* (1835–45, etc.).

Müller (JULIUS), a brother of Karl Otfried, b. at Brieg, Silesia, Apr. 10, 1801; studied theology at Breslau, Göttingen, and Berlin; held a position as a country clergyman 1825–31, and as preacher at the University of Göttingen, where he also lectured on theology 1831–35; was appointed professor of dogmatics and ethics at Marburg in 1835, and at Halle in 1839. His principal work is *Die christliche Lehre vom Sünde* (1839), often reprinted, and translated into English under the title *The Christian Doctrine of Sin*, by W. Pulsford (1852–53). With Neander and Nitzsch he founded in 1850 the *Deutsche Zeitschrift für christliche Wissenschaft und christliches Leben*, and as a representative of the evangelical union in the Berlin synod he published in 1854 *Die Evangelische Union*. D. Sept. 27, 1878.

Müller (KARL OTFRIED), b. at Brieg, Silesia, Aug. 28, 1797; was educated at Breslau and Berlin; became professor of antiquities at Göttingen in 1819, and became the leading authority in questions of Greek archæology; and while in the pursuit of his favorite studies d. at Athens Aug. 1, 1840. Author of *Ægineticorum Liber* (1817), *Geschichte hellenischer Stämme und Städte* (1820–25, incomplete), *Prolegomenen zu einer wissenschaftlichen Mythologie* (1825), *Die Etrusker* (1828), *Handbuch der Archæologie der Kunst* (1830, etc.), *Hist. of Greek Literature* (Lond. 1847).

Müller (PEDER ERASMUS), b. at Copenhagen May 29, 1776; was educated at Copenhagen; became in 1822 a bishop, and received in 1830 the see of Seeland; was long connected with the *Literary Gazette* of Denmark, and author of many religious and antiquarian works. His *Sagabibliothek* (1816–20) and *Kritisk Undersögelse af Danmarks og Norges Sagahistorie* (1823–30) are of permanent value. D. Sept. 16, 1834.

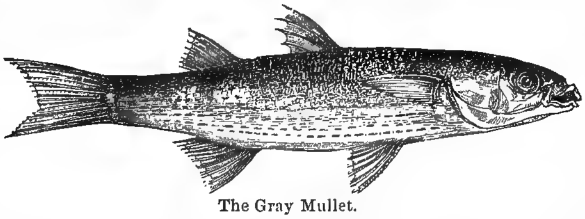
Muller (WILLIAM JOHN), b. at Bristol, England, in 1812; studied art under J. B. Pyne; travelled in Germany, Switzerland, and Italy; pursued for some time an artist's life in Bristol with slight success; visited Greece and Egypt in 1838, making a series of sketches which introduced him to public favor; settled at London 1839; published in 1841 *Picturesque Sketches of the Age of Francis I.*; accompanied the government expedition sent to Lycia in 1843 to bring the Xanthian marbles to the British Museum, and brought home a fine series of sketches, which were placed in the Royal Academy exhibition. Among his best pictures are views of Athens, of the ruins at Gornou in Egypt, of the Sphinx, of an Egyptian slave-market, of a Turkish burial-ground, and of a Xanthian tent-scene. D. at London Sept. 8, 1845.

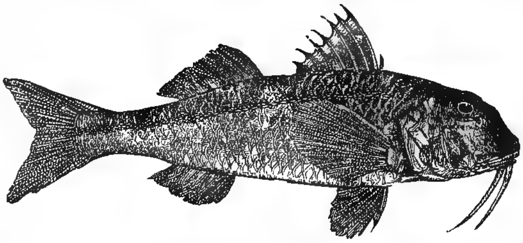
Müller, von (FERDINAND), BARON, M. D., F. R. S., b. at Rostock, Germany, in 1825; was educated at Kiel; investigated the botany of Sleswick and Holstein; emigrated to Australia 1847; made extensive botanical explorations in South Australia at his own expense 1848–52; was then made government botanist for the colony of Victoria; explored many mountain-ranges previously unknown 1852–55; was naturalist to Gregory's exploring expedition 1855–56; was director of the botanical garden at Melbourne 1857–73, raising that institution to high efficiency and usefulness in the introduction of foreign plants; published *Fragmenta Phytographiæ Australiæ* (8 vols.), *Plants of Victoria* (2 vols.), and *Flora Australiensis* (6 vols.), and other works, and was ennobled by the king of Würtemburg 1871. Many mountains, rivers, and lakes in Australia, as well as a mountain in Spitzbergen and a glacier and river in New Zealand, bear his name.

Müller, von (JOHANNES), b. at Schaffhausen, Switzerland, Jan. 3, 1752; studied theology and history at Göttingen; was prof. in Greek at the gymnasium of Schaffhausen 1772–74; retired into private life, and resided till 1781 in and about Geneva, occupied by preparations for his great work on the *History of Switzerland*, of which the first volume appeared at Berne in 1780; was professor of history at Cassel 1781–83, but retired again into private life, and lived at Geneva till 1786. In this year he was appointed court councillor and librarian at Mentz, and when the city was taken by the French in 1791 he repaired to Vienna, where he stayed till 1804, and was treated with much courtesy. The atmosphere of Vienna, however, he did not find congenial to him. Although he was much flattered on account of his Swiss history, he was forbidden to continue it. In 1804 he went to Berlin; was appointed historiographer to the king of Prussia, and received permission to use the Prussian archives for a history of Frederick II. Nevertheless, after the battle of Jena and the occupation of Berlin by the French, Napoleon succeeded in winning him over to his side, and in 1808 Johannes von Müller accepted a position as minister of state to the king of Westphalia. This act, and the very pronounced manner in which he extolled Napoleon, excited great indignation in Germany, and other circumstances, pecuniary embarrassments, political disappointments, etc., were added, making his last days very melancholy; he d. at Cassel May 29, 1809. Besides his great works, the *History of Switzerland* and *Twenty-four Books of Universal History*, he wrote a number of monographs and pamphlets, always rich in ideas and elegant in style, but sometimes indicating with respect to his principles a weakness similar to that which his life revealed in his character.

Müller, von (JOHANN GOTTHARD), b. at Bernhausen, near Stuttgart, May 4, 1747; received his first artistic education at the school of art in Stuttgart; went in 1770, with the support of Duke Charles, to Paris, where he studied engraving under Wille, and was appointed professor in 1776 at the academy of art at Stuttgart, where he exercised a great influence, had many pupils, and d. Mar. 14, 1830. Among the most celebrated engravings by him are the *Battle of Bunker Hill*, by Trumbull; the *Holy Cecilia*, by Domenichino; the *Holy Catharine*, by Leonardo da Vinci; and the portraits of Louis XVI., Dalberg, and Jerome Bonaparte.—His son, JOHANN FRIEDRICH WILHELM, b. at Stuttgart 1782, d. at Pirna, Saxony, May 3, 1816; was educated partly by the father, partly in Paris; became an equally celebrated engraver, and was professor at the academy in Dresden. His engraving after the statue *La Jeunesse* attracted great attention by the manner in which he undertook to imitate marble. But his most celebrated works are the engraving of *Madonna di S. Sisto* by Rafaello, and the portraits of Jacobi and Schiller after the busts by Dannecker.

Mul'let [Lat. *mullus*], a name common to the fishes of the family Mugilidæ (group Percesoces), and often extended to the very different family Mullidæ or surmullets and to other fishes. Of the true mullets of the American Atlantic and Gulf waters, the striped mullet (*Mugil lineatus*), the white mullet (*M. albulus*), and the rock mullet (*M. petrosus*) are small but esteemed food-fishes. The waters of the Old World abound in true mullets of many species. They are generally fine for the table, and often ascend rivers, and can be naturalized in fresh water. They are caught and cured extensively in Europe. The gray mullet (*M. capito*) is one of the best. The Mullidæ or surmullets are popularly called mullets, red mullets, etc. Of the typical genus, *Mullus*, there are several valuable marine food-fishes. *Mullus surmulletus* of Europe is the finest. It is called the striped red mullet. The red mullet of the Gulf of Mexico (*Upeneus maculatus*) is an abundant fish, caught extensively for table use, but rather soft and not excellent. The mullet of the Mediterranean was one of the finest fishes of the Roman table. (See MUGILIDÆ and MULLIDÆ.)


The Gray Mullet.


The Striped Red Mullet.

Mull'idæ [from *mullus*, the ancient Latin name of the red or surmullet, the typical genus], a family of fishes of the order Teleocephali and sub-order Acanthopteri. All the species have the body elongated and but slightly compressed; it is covered with large and very finely serrated, or almost entire, scales; the lateral line is continuous; the head oblong, and with the profile more or less parabolic; the eyes lateral; the opercular bones almost or quite unarmed; the mouth terminal, and with the cleft lateral and rather small; teeth feeble, and variable in development; branchiostegal rays four; hyoid apparatus with two barbels pendant at the chin; dorsals two, the first with seven or eight spines, the second far behind and with few (I. 8–9) rays; the anal like the second dorsal; ventrals thoracic, with one spine and five rays. The stomach is simple; the air-bladder variable in development. This family is remarkable for its homogeneous character, but less so than the Mugilidæ, although it includes quite a number of species (about fifty), some of which are found in all tropical seas and represent several genera. To it belongs the celebrated *mullus* of the ancients, or the sur- (sure or true) mullet, which has been immortalized in song and legend. One undetermined species is an occasional wanderer to the coasts of the U. S. THEODORE GILL.

Mul'ligan (Col. JAMES A.), b. at Utica, N. Y., June 25, 1830; removed to Chicago in childhood; studied at the University of St. Mary's, of which he was the first graduate, 1850; commenced the study of law; accompanied John L. Stephens in the survey of a route for the Panama Railway in 1851; edited a weekly Catholic paper, the *Western Tablet;* was admitted to the bar 1855; appointed to a clerkship in the interior department at Washington 1857, from which he retired at the outbreak of the civil war, when he raised in a few weeks a fine regiment of Irishmen in Illinois (23d Infantry), of which he became colonel; conducted the memorable defence of Lexington, Mo., July to Sept., 1861; was at last forced to capitulate; exchanged in November; reorganized his regiment; was engaged in several hard-fought engagements in Virginia, and was mortally wounded at the battle of Winchester, and d. July 26, 1864.

Mullingar', town of Ireland, capital of the county of Westmeath, has two much-frequented horse and cattle fairs. Pop. 5811.

Mul'lins (WILLIAM), b. in England about 1575; embraced the principles of Puritanism; settled with his family at Leyden, Holland, in consequence of the restrictions upon religious liberty in England; was one of the principal promoters of the colonization of Plymouth by the Pilgrims; came in the Mayflower, and was one of the signers of the "compact" drawn up on board that vessel in Cape Cod harbor Nov. 11, 1620. According to Morton's *New England Memorial*, Mullins was a man of considerable wealth and influence, and was expected to take a prominent part in the public affairs of the colony, but he d. in the spring of 1621, as also his wife and all the family except his daughter Priscilla, celebrated for her beauty, whose refusal of the hand of Capt. Miles Standish and marriage to John Alden forms the subject of Longfellow's poem, *The Courtship of Miles Standish.* The poet was a descendant of the fair Priscilla, as were also Presidents John and John Quincy Adams and many other eminent Americans.

Müll'ner (AMADEUS GOTTFRIED ADOLF), b. at Langendorf, in the Prussian province of Saxony, Oct. 18, 1774;

studied law at Leipsic, and practised from 1798 as an advocate at Weissenfels, where he d. June 11, 1829. He wrote on juridical subjects, novels, dramas, and critical essays, and became famous as the author of the two monster tragedies, *February 29* (1812) and *Die Schuld* (1816), which for ten years thrilled with horror the whole public of Germany, Austria, and Scandinavia, and which are still read by all students of German literature, though mostly as objects of mirth.

Mulock (DINAH MARIA). See CRAIK.

Mul'ready (WILLIAM), R. A., b. at Ennis, Ireland, Apr. 1, 1786; went to London in boyhood; became a student of the Royal Academy at the age of fifteen; first distinguished himself in the imitation of classic types, and afterward as a colorist in the delineation of nature. His first pictures were landscapes, but he afterwards became very successful in sketching incidents of every-day life. He was chosen an associate of the Royal Academy in 1815, and an academician in 1816. His pictures gained great popularity at the annual exhibitions, and a large number were purchased for the royal collection and for the Vernon and Sheepshanks portions of the National Gallery. His illustrations to the *Vicar of Wakefield*, published in 1840, are considered among the best efforts of the kind. D. at Bayswater, near London, July 7, 1863.

Multan', or **Mooltan,** town of British India, in the Punjaub. It is a military station, fortified, interesting on account of the ruins which surround it, and of late rising into commercial consequence through the construction of railways and the opening of steamboat lines. Pop. 80,966.

Multino'mial [Lat. *multus* and *nomen*], an expression composed of several terms connected by the sign + or —. (See ALGEBRA.)

Multinomial Formula, a formula for developing any power of a polynomial without performing the successive multiplications. (See Todhunter's *Algebra*, p. 324.)

Mul'tiple [Lat. *multus* and *plicare*]. One quantity is a *multiple* of another when the former can be divided by the latter without remainder. Thus, $8a^2b$ is a multiple of $4ab$. A quantity is a *common multiple* of several quantities when it can be divided by each without remainder. Thus, $20a^2x^3$ is a common multiple of $4a^2x$ and $5ax^3$.

The *least common multiple* of several quantities is the simplest quantity that can be divided by each without a remainder. Thus, $12c^2d^2y^2$ is the least common multiple of $2c^2y$, $4cd^2$, and $6c^2d^2y^2$.

Multiple Point, a point at which two or more branches of a curve intersect each other. If *two* branches intersect, the point of intersection is a *double* point: if *three* branches intersect at the same point, that point is a *triple* point; and so on. It is a characteristic property of a multiple point that the first differential coefficient of the ordinate at that point has two or more values. Thus, the curve whose equation is $x^4+2ax^2y-ay^3=0$ has a triple point at the origin, at which point the first differential coefficient of the ordinate has the three values, 0, $+\sqrt{2}$, and $-\sqrt{2}$. It may happen that two or more branches of a curve are tangent to each other at some point; this point is a species of multiple point, at which the corresponding differential coefficient of the ordinate has two or more equal values. (For the method of discovering multiple points of a curve see Courtenay's *Calculus*, p. 190.) W. G. PECK.

Multiplica'tion [Lat. *multiplicatio*], the operation of finding the product of two or more quantities. The product of two quantities is the result obtained by taking one of them as many times as there are units in the other. The quantity to be taken is called the *multiplicand*, and the quantity by which it is to be multiplied is called the *multiplier*. Both multiplicand and multiplier are called *factors* of the resulting product. In algebra the sign of the product of two factors is + when both factors have the same sign, and it is — when the factors have contrary signs. (For the methods of performing the operation of multiplication the reader is referred to the ordinary treatises on arithmetic and algebra. Also, see HORNER'S METHOD and LOGARITHMS.) W. G. PECK.

Mummius (LUCIUS), surnamed ACHAICUS, the conqueror of Greece and the destroyer of Corinth, was prætor in 154 B. C. and became consul in 146. The Achæan League was just running its mad course of wild, hazardous policy under the leadership of Critolaus and Diæus. Metellus had defeated the league several times, but had not been able to suppress it completely: perhaps he did not wish to suppress it. At the moment of Mummius's arrival in Greece the league had gathered an army on the isthmus of Corinth, but it proved very easy for Mummius to defeat and disperse it, and after the victory he entered Corinth, bent upon establishing an example which should deter other Greek cities from attempting resistance to the Roman supremacy. Many of the inhabitants had fled; the rest were either massacred or sold as slaves. The city was then pillaged and burnt; its enormous treasures of art and luxury were either sold to the king of Pergamos, carried to Rome, or ruined.

Mum'my, a preserved corpse or body, especially Egyptian—a term derived from the Persian and Arabic *mom*, "wax," from the material used in the preservation. In Egyptian mummies were called *sahu*, and the art of making them existed from the period of B. C. 3000 to A. D. 325. According to the Greek authorities, immediately after death and the raising of the wail or dirge the bodies of males were removed to the establishments of the *taricheutai* or embalmers—those of females kept at home. A scribe then marked with a reed a line on the right flank, and an operator (*paraschistes*) made an incision along the line under the ribs with an Æthiopian stone, either a flint or obsidian knife. The internal and soft parts were then removed, only the heart and kidneys being left in the corpse; the brain was extracted by a long bronze probe through the nostrils or the foramen magnum, and the body prepared in accordance with the expense laid out upon it. The most costly of the processes then in use cost a talent of silver, about $1218, and consisted in applying drugs, powdered resins, and cassia through the orifices, and in steeping the body in palm wine and soaking it in natron for seventy days. The second style cost about $406, or a mina, and in this the brain alone was removed, the viscera being left inside, but injected with oil of cedar, and the corpse soaked in natron as before, and the viscera left to come away. In the third manner, the poorest, the body was washed with myrrh and salted. The examination of numerous mummies, however, shows that no two are prepared exactly alike, and that certain general processes were used at different periods. Those of the so-called "old empire" appear to have been less carefully preserved, for they are found as mere skeletons which emit a faint odor of bitumen; at the time of the eleventh they are often in the same condition, or else yellow, dry, and brittle, although resins appear to have been employed. Under the twelfth dynasty the mummies become black from the use of bitumen, and the skin, though flexible, dried. From the eighteenth to the twenty-first dynasty the mummies found at Memphis are black and dry, owing to the use of bitumen, while those at Thebes are yellow from the employment of wax, and shining, the nails dyed with *henné*. These styles, with some modifications, continued till the twenty-sixth dynasty. After that age the mummies become black and heavy, forming a compact mass with their bandages, and only separated by force. Those at the Roman period are gray and lissom, but some of the later time only rudely bandaged and steeped in natron. The processes were drying in the sand, steeping in natron, and then drying, boiling in resins, bitumen, or in fine resins only—differences to which the color is due. After preparation they were at the oldest age covered with a shroud and deposited in a wooden coffin, in shape of a mummy with a face, placed in a rectangular sarcophagus with a flat cover of basalt, red granite, or limestone; more careful bandaging, and deposited in a rectangular sarcophagus or coffin made out of a single tree, filled with implements and utensils, appear at the time of the eleventh dynasty: and with scarabæi and other amulets under the thirteenth, but rich coffins and inferior mummies under the subsequent lines. At the time of the eighteenth the bandaging is more perfect, the tomb filled with sepulchral figures, and the viscera, distributed into four portions, and separately embalmed and bandaged, were deposited in the so-called canopi or sepulchral vases in shape of the four mummied gods or genii of Hades—Amset, Hapi, Tuautmutf, and Kabhsenuf—who presided over the four quarters of the compass, to which the viscera were thus symbolically distributed, or, according to the Greek writers, thrown away. For these vases dummies of stone or wood were sometimes substituted by the embalmers, and they were carried in a square chest with compartments, placed on a sledge, to the sepulchre. After this period at Memphis the mummies are provided with amulets of stone and porcelain, the flank incisions covered with rectangular tin plates on which is engraved a symbolic eye, and placed in monolith sarcophagi. At Thebes the bodies are more carefully bandaged in the shape known as that of a mummy, and made symmetrical by the use of pledgets; as many as 700 yards of bandages were sometimes employed, and a papyrus generally placed with the mummy, sometimes spread over the whole form, or else in wooden figures of Osiris deposited in the tomb. They were placed in painted coffins of sycamore-wood in shape of a mummy, the face of a fine wood and the eyes sometimes inlaid. They become more beautiful at the time of the twenty-second and following dynasties, when the exterior bandages have a kind of leather brace about an inch wide passed round the neck and edged with scarlet leather, stamped at the end with the name and titles of the reigning monarch and scenes of adoration to the god Khem. In other instances the mummies have their outer bandages encased by a cartonage or outer covering of many layers of linen plastered smoothly with a thin coat of lime, on which are painted religious scenes in gay colors *in tempera*, sometimes enhanced by varnish. These are fashioned to the form, and were laced up behind, and the mummies were then placed in coffins not very elaborately decorated, sometimes as many as three in number. The principal mummies of the twenty-sixth and following dynasties, till the conquest of Egypt by Alexander the Great, B. C. 332, come from Memphis, where, however, as at Thebes, the art of embalming was in its decadence, some of the mummies being literally boiled in bitumen and incapable of being developed. At the time of the Ptolemies some good mummies are, however, found, and the custom introduced of gilding the skin in places apparently where it had shown signs of decomposition; the jaws of Greeks were tied up, and the mouth covered with a golden plate or else one of tin. The body still preserved its conventional shape. The sarcophagi of the later period of their reign, and under the Romans, are rectangular, sometimes with a vaulted cover and four rectangular pillars at the corners, a flat board being substituted for the chest on which the mummy was laid, and covered as by a dish cover; the bodies are less carefully bandaged, and covered with another linen covering or shroud, on which is painted a representation of the deceased—when a Greek, in national costume. Sometimes, when plain bandages were used, a well-executed portrait of the dead on panel in thin cedar-wood, painted in encaustic, was placed over the head in the case of Græco-Egyptians. The art, however, rapidly declined, although some well-prepared bodies, the skin of which is well tanned by the different preparations, and the features tolerably preserved, have been found at the Roman period. At this time the hair was often separately embalmed in a mass, the viscera rolled up in packets, placed with the body, and waxen figures of the four genii of Hades placed with them or in the internal cavities of the body. Several mummies of this later period are, however, masses of bitumen adhering to charred bandages; others are prepared with the limbs separately bandaged, while some have the cartonage at the face moulded in the human shape, with Greek wreaths round the head; and at the commencement of the Christian era some few have their shrouds covered with extracts and vignettes of the ritual.

On account of the expense of the funeral, the mummies in their cases were sometimes kept in the house, and occasionally pawned or pledged. All persons, even malefactors, were mummied. It appears that the mummies even of illustrious persons were accessible, for that of Alexander the Great was handled by Augustus, and those of Antony and Cleopatra found in the time of Heraclius. Some of the Hebrews were mummied, Jacob and Joseph having received that rite. The sacred animals, birds, reptiles, and fish, were also embalmed, wrapped in linen bandages, and deposited in sarcophagi or cases, but unaccompanied by amulets. The most remarkable are those of the bulls Mnevis and Apis, coffins and bodies of the last prepared with bitumen, portions only having been found at the Serapeum near Memphis, deposited in immense sarcophagi; the sacred crocodiles from the pits at Manfalut; the cats from Abusir; the ibis deposited in red brick sugarloaf-shaped pots at Sakkara; but other mammals, as apes, the sheep, oryx, dogs, wolves, and jackals, and hawks, vultures, and varieties of snakes and fish, have been found. In the fifteenth and sixteenth centuries the bitumen and other parts of mummies, besides elixirs and preparations made from them, some spurious, formed part of the nauseous pharmacopœia of the period, and the admired dusky backgrounds of many pictures, then and later, is said to be composed of ground mummies. Spurious mummies, even, at the present day, have sometimes been made to impose on collectors of these antiques.

Some other nations practised, but by different processes, the art of embalming. The Persians used for the purpose wax, the Assyrians honey, the Hebrews spices and honey; the Romans also embalmed, but the dry climate of Egypt has alone preserved for centuries bodies so prepared. The idea of preserving the body is in fact universal, but the various means used in modern times have in very few instances kept the body for two or three, never for thirty, centuries. Some dried bodies of Spaniards and Mexicans in the New World, and others in the cloisters of Palermo in Sicily, have been preserved by natural conditions of atmosphere without artificial aid. The ancient inhabitants of the Canary Islands, the Guanches, employed, like the Egyptians, certain processes for preserved bodies or mummies, removing the viscera by an incision, inserting fat, salt, and antiseptic herbs, and after adjusting the corpse in a squatting position sewing it up in the skin of a sheep or goat. Bodies in a similar attitude, but apparently without herbs, have been found in large earthenware jars at Durango, Bogota, and the Paraiba River, and dried bodies in elegant cotton dresses and ornaments have been discovered at Arica and other sites in Peru. In Burmah bitumen has been used for preserving bodies, and cocoanut oil in Nukahiwa in the South Seas, but such temporary expedients can only class with the preservation of animal bodies in spirits of wine or other antiseptics. Some medical men have attempted for scientific illustration, and with more or less success, to preserve bodies by means imitated from the Egyptians. This mode of preservation of the body has proved of great importance for historical and ethnic problems. (See also EMBALMING.) S. BIRCH.

Mumps [Dutch *mumms*]. This is one of the infectious and contagious diseases, and belongs to the same class with whooping-cough, measles, scarlatina, etc. It is often met with when the two latter are prevailing. In some localities with a moist and cold climate it is very frequent (endemic). The principal sufferers are children (mostly male) of from seven to fourteen years, but adults are not exempt. Its period of preparatory development (incubation) lasts from one to three weeks; its principal symptoms are—moderate fever; pain on pressure over the region of the parotid gland, mostly of the left side (but of the opposite side also, and sometimes of both) in front of and below the ear; considerable swelling of that region and the whole cheek and chin; difficulty in deglutition and respiration, corresponding with the amount of swelling; change of the voice; fulness of the head, and dizziness. In many cases the spleen and numerous lymphatic glands are also tumefied. In men the testicles and seminal glands, in women the ovaries, may also swell, and catarrh of the mucous membranes of the eyelids, nose, and mouth is not unfrequent. The disease lasts from a few days to a week; the swelling will subside gradually; in some cases, however, the parts remain large and hard; in a few an abscess will form. The treatment is simple. Regulate the diet, give less meat, more milk, gruel, fruit; vegetable-acids (lemonade) or dilute muriatic acid (ten to fifteen drops in a tumblerful of water) as a beverage, mild purgatives (Rochelle salts, seidlitz powder, cream of tartar). The best local applications are raw cotton and cold water; warm water or poultices only when an abscess has commenced to form. No internal treatment except quinine when the fever is high, and iodide of potassium when induration remains behind. It is understood, however, that such treatment ought to be under the superintendence of a physician. A. JACOBI.

Munch (ANDREAS), b. at Christiansand, Norway, Oct. 19, 1810; studied law at the University of Christiania; was employed at the university library from 1850 to 1860, and received in the latter year a pension as a poet from the Storthing. A collection of poems, *Sorg og Tröst* (1852), and several of his dramas, *Salomon de Caus* (1854) and *Lord William Russel* (1857), attracted some attention in the Scandinavian countries.

Munch (PETER ANDREAS), b. at Christiania, Norway, Dec. 15, 1810; studied philology and history at the university of his native city; was appointed professor of history there in 1837, and d. at Rome May 25, 1863. His principal work, *Det Norske Folks Historie* (9 vols., 1852–63), is an exceedingly interesting book, rich in original researches undertaken in Scotland, England, France, and Rome, but sometimes misleading by its audacious hypotheses and too subtle combinations.

Münch-Bellinghausen. See HALM.

Münchau'sen, von (HIERONYMUS KARL FRIEDRICH), BARON, b. of noble family at Bodenwerder, Hanover, in 1720; served in his youth in the Russian cavalry against the Turks 1737–39, and d. at Bodenwerder in 1797. The baron was throughout life accustomed to entertain his friends (in a singularly modest way and with an air of truthfulness) with wonderful tales of his exploits in the wars, and enjoyed the reputation of being the greatest liar in Germany. It is believed that the first published collection of his stories appeared in English, and was written by Rudolph Eric Raspe, a German exile, and published in 1785 in London. Many of the tales ascribed to him are very old; and it is stated that Raspe composed the work as a satire upon the *Mémoires* (1784) of the baron de Tott (1733–93).

München-Gladbach, town of Rhenish Prussia, 16 miles S. W. of Düsseldorf, is an important manufacturing centre, especially linen and damask, but also woollen, silk, machines, etc. Pop. 37,387.

Mun'cie, city and R. R. centre, cap. of Delaware co., Ind. (see map of Indiana, ref. 5–F, for location of county), 110 miles N. W. of Cincinnati, has a large number of manufacturing establishments, a public library, and a lyceum association. Pop. in 1870, 2992; in 1880, 5219.

Muncy, R. R. junction, Lycoming co., Pa. (see map of Pennsylvania, ref. 3–F, for location of county), on the W. branch of the Susquehanna, and on the Philadelphia and Reading and the Philadelphia and Erie R. Rs., has a female seminary, planing-mill, flouring-mills, several saw-mills, and a patent hay-fork factory. Business, farming and lumbering. Pop. in 1870, 1040; in 1880, 1174.

Mundt (Klara), best known under her pseudonym "Luise Mühlbach," b. at Neubrandenburg Jan. 2, 1814; married Theodor Mundt in 1839; d. at Berlin Sept. 27, 1873. She wrote about 100 volumes of romances, the greater part of which treat subjects of modern Austrian, Prussian, French, and Egyptian history.

Mundt (Theodor), b. at Potsdam Sept. 19, 1808; studied philology and philosophy at Berlin and Leipsic; travelled much; settled in 1839 at Berlin, and began to lecture at the university on literature and history in 1842; was appointed professor at Breslau in 1848, but returned in 1850 as director of the university library to Berlin, where he d. May 30, 1861. Of his critico-historical sketches several have great value: *Charlotte Stieglitz* (1835), *Nicolo Machiavelli* (1851), *Paris and Louis Napoleon* (1858).

Mundy (Sir Robert). See Appendix.

Mun'ford (William), b. in Mecklenburg co., Va., Aug. 15, 1775; graduated at William and Mary College; studied law under George Wythe; sat in the Virginia house of delegates 1797–1801, in the senate 1801–05, and in the privy council 1805–11, and was thereafter clerk of the house of delegates for the remainder of his life. In 1806 he began, in conjunction with W. W. Hening, to report the decisions of the supreme court of appeals of Virginia (4 vols. 1806–09), and afterwards published 10 volumes from his own pen, continuing that collection (1810–20); he was also one of the assistants of Benjamin Watkins Leigh in the revision of the Virginia statutes in 1819. Munford published a juvenile volume of *Poems* (Richmond, 1798). Much of his leisure throughout life was devoted to translating the *Iliad* of Homer into blank verse, which was posthumously published (1846). D. at Richmond June 21, 1825.

Munfordville, cap. of Hart co., Ky. (see map of Kentucky, ref. 4–G, for location of county), on the N. bank of Green River, and on the Louisville and Nashville R. R., 73 miles S. of Louisville. It was an important point during the civil war, and was captured by Gen. Bragg Sept. 17, 1862. Pop. in 1870, 249; in 1880, 274.

Munger (Rev. Theodore Thornton), D. D., was b. in Bainbridge, N. Y., Mar. 5, 1830; graduated at Yale College in 1851, and from the Yale Theological School in 1855, and took charge of the village church in Dorchester, Boston, in 1856. He has been pastor of churches in Haverhill, Lawrence, and North Adams, Mass., and published *On the Threshold*, a volume of essays (1880), *The Freedom of Faith* (1883), and *Lamps and Paths*, a volume of sermons for children (1883).

Mun'go (Saint), or **Kentigern,** one of the three earliest missionaries who introduced Christianity into Scotland. Whilst his associates, Sts. Columba and Ninian, devoted themselves respectively to the tribes of the S., W., and N., Mungo was the apostle of the Welsh or British races inhabiting the districts between the Clyde and the northern boundaries of Cumberland. The son of a British prince, he was b. at Culross, on the Forth, about 514, and d. at a monastery he had founded on the site of the cathedral of the modern Glasgow about 601. Many miracles were ascribed to him, and numerous fabulous biographies are preserved.

Mun'goos, or **Mongooz** (a native Malagasey name), the name of the *Lemur mongoz*. (See Lemuridæ, etc.)

Mu'nich [Ger. *München*], capital of Bavaria and residence of the king, with 230,023 inhabitants, is on the Isar, 1868 feet above the sea, at the southern extremity of an extensive plain. The city proper is situated on the left bank of the Isar; only some suburbs extend along the right bank. In architectural respects it is the most beautiful and interesting city in Germany, and one of the richest in sculptures and paintings. A perfect building of almost every known style is found here. Nearly in the centre of the city, on the Max-Joseph place, which contains the bronze statue of King Max (1825) by Rauch, is the royal palace, consisting of three parts—the king's house, the banqueting-house, and the old residence. The king's house was built by Klenze 1826–35, and is an imitation of the Palazzo Pitti in Florence. Its interior is very rich in marbles and frescoes, among which are the celebrated Nibelungen frescoes by Schnorr. The banqueting-house was built by Klenze 1832–42 in Renaissance style, and has a large balcony resting on ten Ionic columns. The old residence was built at different periods, and contains many beautiful bronze statues, among which the most celebrated is the fountain group, an imitation of Benvenuto Cellini. The palace is connected by a winter garden with the theatre, which is the largest in Germany, having seats for 2500 persons; it was burnt down in 1823, but rebuilt in 1825, after plans by Fischer, and is 150 feet high, 195 feet broad, and 235 feet long. On the other side of the palace the royal garden is situated, surrounded on two sides by arcades which are connected with the banqueting-house. On the southern side of the Max-Joseph place stands the post-office, in Florentine style. The so-called generals' hall, an imitation of the Loggia dei Lanzi in Florence, was built in 1844 by Gärtner, and consists of an open hall 58 feet high, 117 feet broad, and 39 feet long, in which stand the bronze statues of Tilly and Wrede. From this building begins the Ludwig street, running northward, terminating at the Siegesthor ("Gate of Victory"), and consisting almost entirely of monumental buildings. Among these are the Odeon, built in 1828 by Klenze; the palaces of the duke of Leuchtenberg and of Duke Max; and the ministry of war—all built by Klenze; the library, built by Gärtner 1832–42, in Florentine style, and containing 800,000 volumes and 24,000 MSS.; the university, the seminary, and the Max-Joseph School, which three buildings, built in 1840 by Gärtner, form a large square. The Siegesthor, an imitation of the triumphal arch of Constantine at Rome, was commenced by Gärtner and finished in 1856 by Metzger; on its top stands Bavaria on a quadriga drawn by lions, after a design by Schwanthaler. Starting from the royal palace to the N. W., and passing by the Theatiner church, built 1661–75 in Italian rococo style, the Wittelsbacher place is reached. It contains the equestrian statue of the elector Maximilian I. by Thorwaldsen, and the Wittelsbacher palace, commenced by Gärtner and finished by Klump in 1850, in mediæval style, with pointed arches. At the end of the Brienner street is the Propylæum, built by Klenze in imitation of the Propylæum of Athens, with reliefs by Schwanthaler. On this side of the gate is the Kunstausstellungsgebäude; to the right, the celebrated Glyptothek, built 1816–30 by Klenze in Ionic style, with a portico resting on twelve columns, and a magnificent tympanum with a marble group by Wagner and Schwanthaler. Twelve rooms are arranged around a quadrangular courtyard, from which they are lighted, the building having no windows on the exterior side; eleven rooms contain antique marbles, the twelfth modern. Near by are the establishment for painting on glass and the famous Pinakothek. The old Pinakothek was built 1826–36 by Klenze in Renaissance style, is 520 feet long, and contains 1300 pictures arranged in nine large rooms lighted from above, and twenty-three smaller rooms lighted in the ordinary way. The ground floor is occupied by a collection of engravings, containing about 300,000 pieces, a collection of drawings, numbering about 9000, and a collection of Grecian and Etruscan vases. To the W. of this building is the Polytechnicum, a structure in rich Renaissance style, and to the E. the new Pinakothek, which was built 1846–53, after a plan by Voit, and contains pictures by modern artists. It comprises six large, five minor, and fourteen small rooms. The exterior of the building is covered with frescoes, executed by Nilson after Kaulbach's sketches. Other noteworthy buildings are the bronze-foundry, with a collection of models and an exposition room; the Schwanthaler Museum, containing nearly all the plaster models by this artist; the Academy of Science and Art, with an immense collection of fossils, a collection of minerals, of coins, of physical and optical instruments, etc. To the S. W. of the city, near the Karl Gate, stands the Ruhmeshalle ("Hall of Fame"), built in the form of a horseshoe, with forty-eight Doric columns, and finished in 1853 after a plan by Klenze. It contains the busts of seventy-six renowned Bavarians. In front of the buildings stands a colossal figure of Bavaria, 66 feet high, modelled by Schwanthaler. A beautiful view towards the Alps can be had from the interior of the head. The principal churches are the Frauenkirche, the metropolitan church of the archbishop of München-Freysing, built in the fifteenth century in Gothic style, and containing a beautiful monument over the emperor Ludwig of Bavaria; St. Michael's Hofkirche, built in the latter part of the sixteenth century, in Roman Renaissance style; the Auerkirche, built 1831–39 by Ohlmüller in Gothic style, with beautifully painted windows; the Basilica des heiligen Bonifacius, an excellent imitation of the old Italian basilica, built by Ziebland and finished in 1850, with sixty-six columns, beautiful frescoes, and thirty-four medallion portraits of popes. Here is the tomb of Ludwig I. (Ludwigskirche), built 1829–43 by Gärtner in the Italian round-arch style. Over the portal stand Christ and the apostles by Schwanthaler; the interior contains beautiful frescoes by Cornelius and his disciples. The Allerheiligenkirche or Neu Hofkapelle, E. of the royal palace, was built in 1837 by Klenze in Byzantine style, and is a very elegant though small structure. The Protestantische Kirche was built 1827–32 by Pertsch. The city is generally well laid out, and has broad streets and many large public squares. It has grown rapidly: in 1801 it had but 40,000 inhabitants. It is thus, for the most part, a new city. The artistic epoch which King Ludwig inaugurated proved lasting. The Academy of Fine Arts, comprising three divisions — architecture, sculpture, and painting — and under the leadership of able men, attracts steadily a great number of young students. The same is the case with the famous Conservatory of Music. The city occupies also a high rank in science. The university is frequented by 1500 students. There are many scientific associations, good educational and numerous benevolent institutions. The manufacturing industry is not important, though of late several branches have been started with success in the suburbs of Thalkirchen and Haidhausen. The bronze-foundries, the porcelain manufactures at Nymphenburg, the glass-painting establishments, all founded by the government, flourish; also the optical institute founded by Fraunhofer. The breweries are very extensive; the commerce is not important; corn is the principal article.

The city appears for the first time in history in the twelfth century; in 1254 it was fortified, and from the emperor Ludwig of Bavaria it received many privileges. In 1632, Gustavus Adolphus of Sweden entered it victoriously. The elector Karl Theodor improved the fortifications at the end of the eighteenth century. In 1800 it was captured by the French. In 1814, King Maximilian I. commenced the rebuilding and beautifying, which were continued in a brilliant manner by Ludwig I. and Maximilian II.

AUGUST NIEMANN.

Munic'ipal Corpora'tions. The general nature and powers of a corporation have been stated in a former article. (See CORPORATION.) It is only proposed to refer at this time to some principles of law of special value in their application to such organizations as towns. counties, cities, and villages.

The object of such institutions is to administer local government. Theoretically, the entire business allotted to cities and villages might be conducted by the central authority, or, in other words, by the state. Convenience demands that the state should refer to the people of the district the management of those public concerns which most nearly affect them, while it reserves to itself the control of those subjects of more general importance and interest in which the entire community are concerned. It will lie with each state to determine precisely where the line between general and local government is to be drawn, and what powers are to be reserved to itself and what are to be delegated to these local bodies. This delegation of powers is made by law, and may at any time be withdrawn. Whatever may have been true of municipal corporate charters in mediæval times as to their being treaties between feudal lords and commercial communities, it cannot be claimed that the organization of a city or a village by a State of this country has within it any of the elements of a contract. The State may accordingly change its so-called "charter" at will, now enlarging and again restraining its powers. There has been in some quarters a disposition to make a distinction between the power of the State to change at will the organization of the corporation, and to appropriate its property to other public uses. It is claimed that while the powers of the city, etc. are public, its property is *private*, and that it thus has vested rights which the State cannot interfere with, as they are within the ordinary constitutional restrictions. Though this distinction has considerable authority to sustain it, its inherent soundness may well be doubted. All of the city property is in the eye of reason impressed with a public use. When the State appropriates the property to other public uses than those at first designated, there is no change in the substance of the use, but only in the form of application. The other view makes the mere formal existence of the corporation the test of ownership. The more philosophical theory is, that the city is but the instrument of the State, and that all its acquisitions are State property, held by itself as a mere trustee. An important qualification of the theory is, that the State could not so interfere with the rights of the city's creditors as to prevent the municipal property from being appropriated for their benefit in a way contemplated by their contract. A cognate question may be suggested as to the right of the State to tax the inhabitants of a city or town without their consent for such public purposes as it may see fit. It would seem that this power cannot on principle be denied in those States where there is no constitutional restriction upon the capacity of the legislature to levy taxes. The legislature may in that case tax a portion of the State without taxing the residue for any purpose for which taxation is generally admissible. Of course, the rules already stated must give way when there are constitutional provisions interfering with their operation.

It is of great importance to determine what powers may properly be exercised by municipal corporations. Under a system of universal suffrage there is naturally a tendency on the part of municipal councils and managing boards to strain powers of raising and expending money to their utmost tension. It is also possible for unprincipled political leaders to turn such powers as may be under their control to purposes of personal or party aggrandizement. The question is becoming a pressing one as to the best mode of checking a truly alarming tendency to incur the most extravagant expenditure, principally in the way of incurring debts to be liquidated at a future and perhaps distant day. Constitutional restrictions will probably be the only safeguard in such cases, securing the check of the action of the entire people of the State against local wastefulness.

In considering the powers of these corporations the leading question is as to what may be fairly implied from their ordinary functions. Will they, for example, have an implied authority to borrow money for the purpose of accomplishing an object conceded by their charter? Can they give negotiable notes? Can they furnish entertainments to citizens or guests on public occasions? Can they make pecuniary grants to railway companies to aid in constructing roads which if constructed will apparently conduce to the prosperity of the municipalities? What is their police power as exercised in the way of prevention of fires, or in the establishment of quarantine laws or rules for the preservation of the health of the citizens?

In solving such questions as these it is a reasonable conclusion that whatever can be regarded as proper and necessary to carry into effect the powers granted in the charter may be implied. Thus, if a city were authorized to erect expensive public buildings, and it were necessary under all the circumstances to borrow money, the power to borrow would be granted by implication. It would be very difficult to suppose that under any usual grant of corporate powers there would be any authority to give public entertainments to citizens and others, or to render pecuniary aid in the construction of railways. There are, however, not unfrequently found in the municipal charters express provisions defining the corporate powers as to these subjects. A question of great magnitude has arisen as to the constitutional power of the legislature to authorize towns or cities to raise money for railroads. The real basis of this inquiry is, whether such aid is given for a public use. If it be, then the legislative authority may properly be regarded as an exercise of the power of local taxation. On the other hand, if the contribution to the railroad be considered as essentially a gift to a private corporation for its own purposes, then the legislative act would transcend constitutional limits. The true view is, that the subscription to the railroad is for a public purpose, and accordingly it is within the taxing power of the legislature to authorize it. Roads have always been regarded as governmental affairs, and the legislature, in the absence of constitutional restrictions, may exercise in their favor the power of "eminent domain," as well as the power to tax. Still, these views would lend no color to the proposition that the legislature might authorize a town or a city to raise money to contribute to a purpose essentially private, as to aid in fostering individual enterprise, even though that might incidentally contribute to the general prosperity. In order that the power to tax may be properly exercised, the use to which the proceeds are to be devoted must be public *in its own nature*. Guard this doctrine as we may, it is a dangerous power to trust without limitation to a State legislature. There is a growing tendency among the people of the respective States to limit by constitutional restrictions the action of legislative bodies in this respect. The experience of the last few years has been fruitful in warnings as to the evils of permitting towns at will to call upon the legislature to sanction the creation of debts which on their face appear to be incurred for objects the most meritorious and useful to the public. It is possible, however, that the magnitude of the evil will to a certain extent work out its own cure. The heavy taxation thereby occasioned is so distasteful to property-owners that it will probably become more and more difficult to obtain legislation authorizing expenditures even for purposes so universally recognized as public in their nature as the building of railways.

It is not expedient in an article like the present to give any sketch, however general, of the specific powers conferred by legislatures upon municipal corporations. The laws upon this subject may be either general or special. In a number of the States there are general laws for the incorporation of villages. Such a system might, one would think, be advantageously applied to the cities. It would seem that a general scheme might be supplied for all such matters as the cities had in common, while special clauses might be adopted to meet any subordinate points of difference growing out of the varying circumstances of the municipalities. The time of the courts would in such a case be much less occupied with the interpretation of crude and imperfectly framed charters, and municipal government, administered in the main with uniformity throughout a State, would be more readily understood by its citizens, and defects in its practical working would be more readily supplied.

It is important to notice a fundamental distinction in the modes by which municipalities are managed. In some of them—*e. g.* the New England towns—all the members act at a regularly constituted meeting. The principle of representation is not introduced. In others the citizens select by vote (usually by ballot) members of councils, and perhaps a mayor, who, on the principle of representation, make the ordinances and more or less fully manage the business of the corporation. In this last class of cases the people at large have no authority to perform corporate acts. Their function is at an end when their representatives are elected. Legal rules are provided to fix the times and places of meeting, to supply notice when deemed necessary to the members, to regulate casting of votes, and the mode of determining the validity of an election. The details upon these points must be sought in the treatises upon this subject.

Municipal corporations, like other corporate bodies, have power to make by-laws. These often assume great importance, and are known as "ordinances." These are various in their nature. The authority to enact particular ordinances is in some instances expressly granted; in others it is inferred from the general clauses conferring powers. Where the right exists the ordinance may be enforced by a pecuniary fine, but cannot be attended with forfeiture of property or imprisonment without clear expressions to that effect on the part of the legislature. The common mode of collecting the fine is by an ordinary action in some appropriate court. There are frequently municipal courts, such as mayor's, recorder's or city courts, in which business of this kind can be transacted.

There are frequently to be found in the charters provisions not only as to the contracts which can be made, but also as to the mode of entering into them. An instance is that certain work must be done by contract made by the corporation with the lowest bidder. In such a case as this a contract made without complying with the direction is illegal and void, and cannot be enforced against the corporation. Such a provision must receive a reasonable construction, and be confined to a case where competition is possible. Accordingly, it could not be extended to a contract for lighting the streets made by the city with a gas company which had by law the exclusive right to supply gas. A very leading question on this branch of the subject has been whether a municipal body is bound by its negotiable bonds, put upon the market and transferred to holders in good faith, when they have been issued without entire conformity to the statute authorizing them. It will be conceded on all hands that if there is a *total lack of power* to issue such bonds, they are of no value in the hands even of an innocent holder, for he is bound to consult the statute to ascertain the corporate powers. The difficult point has been whether, if the power was granted subject to certain conditions, the holders of the bonds must prove affirmatively that those conditions existed, and whether the certificate of the officers empowered to issue the bonds would be sufficient to support the title of a purchaser in good faith, even though as a matter of fact the conditions had not been performed. The Supreme Court of the U. S. has gone very far in the interests of commerce and the ready circulation of such instruments in upholding their validity under such circumstances. The result of their view is, that the municipal body is *estopped* as to such purchasers as have been referred to (see Estoppel) from denying the truth of the certificate granted by the commissioners having the issue of the bonds in charge that the necessary preliminary steps have been taken.

There are other points of much importance concerning the exercise of the power of "eminent domain," the control of public streets, the responsibility of the corporation for defects in highways and consequent injury to travellers, as well as of local taxation and assessments, and the rules of proceeding to divest the title of landowners in case of non-payment. It is impossible to follow these out into their details, and reference can only be made at the close of this article to accurate sources of information.

The great frauds practised by unfaithful and corrupt officials upon the city of New York have brought recently into much prominence the right of the State, as distinguished from the city, to interfere and bring an action to recover from the wrongdoers the amount misappropriated by them. The State court of appeals expressed some doubt upon the point whether a well-known rule of the English court of chancery, that the attorney-general, representing the king, may sue to enforce the execution of trusts by public corporations or their officers, prevails in the State of New York, and decided that even if it does, it does not authorize or sanction an action in a court of law as distinguished from equity to recover from a wrongdoer either money or other property belonging to the corporation, or damages for a fraud practised upon it. It has also been decided that this principle is not affected by the fact that the city and its officers, having authority to act in the premises, have with full knowledge acquiesced in the misapplication and colluded with the wrongdoer to shield him from responsibility by means of judicial remedies. A full exposition of the reasons governing the decision will be found in the cases of *The People* agt. *Ingersoll*, 58 New York Reports 1, and *The People* agt. *Fields*, ib., 491. The result of these cases, if generally acquiesced in, puts the rights of taxpayers upon a most precarious footing, and imperatively calls for well-studied and efficient legislation to render municipalities amenable to judicial investigation. It is worthy of consideration whether the doctrine underlying these decisions can be maintained—viz. that when the obligations of a municipal corporation are issued under an unfounded pretence of authority, and the moneys raised thereon paid into its treasury, they become the funds and property of the corporation invested with the security of private or individual rights. However, if this be true, as the court has determined in the absence of all legislation, it will scarcely be pretended in any quarter that the legislature cannot control and qualify municipal ownership, and impress such a trust upon it and confer such rights of action as to enable the courts to fully protect the taxpayers, and relieve them from the burdensome effects of malfeasance on the part of the corporation or its officers.

(For further information consult for the history of municipal corporations Guizot's *History of Civilization;* Smith's *Wealth of Nations;* Hallam's *Middle Ages;* Merewether and Stephens's *History of Boroughs and Municipal Corporations.* See also the treatises on general corporation law of Grant, Kyd, and Angell and Ames; the special treatises of Willcock, Glover, and Dillon on *Municipal Corporations.* Refer also to Kent's *Commentaries,* lecture 33, and Abbott's *Corporation Digest.*) T. W. Dwight.

Municipal Government. See Municipal Corporations, by Prof. T. W. Dwight, LL.D.

Municipal Law of England and the U. S. The general nature of law and jurisprudence has already been sufficiently considered in the articles on jurisprudence and law. (See Law and Jurisprudence.) The civil or Roman law, the basis of the municipal law of the states of continental Europe, has also been referred to. (See Law, Civil.) The scope of this article is a general description of the municipal law of England and the U. S. This consists of the whole mass of legal rules adopted in England or in any of the States to control the civil conduct of the people. It is divided into two principal branches, common law and statute. The "common law" is supposed to consist of customs, either of general or particular application, handed down from ancient time, or, in legal phrase, from time "whereof the memory of man runneth not to the contrary." These customs are divisible into two leading classes, general and particular. The former prevail throughout the State or country; the latter are recognized in particular localities, and must be proved, as a matter of fact, to exist. The general customs are of course by far the most important. They are such general rules as these: that a deed must be in writing, sealed and delivered; that under the rules of descent land passes to the eldest son of the ancestor; that a corporation is an artificial person, capable of suing and being sued as an individual, etc. etc. There are also many maxims or enunciations of general principles that are component parts of the common law. (See Maxims.) When any question arises concerning these general rules, they are referred to the courts, through the medium of a controversy between particular parties known as a "case," and the judges in deciding the case apply what they deem to be a pertinent general rule to its facts. The rule thus stated is supposed, more or less correctly, to have existed from time immemorial. Whether that be a fact or not, the enunciation of the principle becomes a rule to govern other cases presenting the same substantial facts. It is only in this way that legal rules become officially recognized. The opinions of text-writers, however convincing as arguments, do not strictly become law until they receive, in the way just pointed out, the sanction of the courts. Nor can the judges themselves, without some statutory or constitutional provision to that effect, state a legal rule except as applicable to what appears to be an actual controversy between parties. The common law thus consists of principles derived from a collation of precedents or decisions of actual cases. (See PRECEDENTS.) These decisions are collected in books called "reports" of cases, which form a large and indispensable part of every legal library. (See REPORTS.) There are undoubtedly some serious objections to this mode of generating law. Still, it has some important advantages. Chief among these are that its tendency is to elicit thorough discussion, owing to the great interests frequently involved in the controversy, and that the judiciary, instead of regarding legal questions from a purely scientific and abstract point of view, are apt to consider them in their practical bearing and their application to the wants of the people. Every careful observer is able to note a progressive tendency in the rules of the common law, and a close adaptation to the business and social movements of the age, which he would perhaps look for in vain in a non-elastic code of purely written law, under which the judges might be occupied with the mere construction of words instead of the discussion of principles.

Upon the emigration of Englishmen to this country at its first settlement it would naturally be expected that they would resort for general principles of law to the system with which they were familiar at home. This result actually followed, and they adopted such principles of the common law as were suited to their condition, while they rejected such as were not adapted to their altered states and circumstances. On similar grounds, it may be maintained that the early English statutes were adopted as part of the common law of the colonies, while the later ones could only become binding by means of an express enactment. When the Revolution occurred the American States were plainly at liberty to reject the whole body of the English law and to adopt another system. They, however, as was natural, determined, either by tacit consent or by express statutory or constitutional provision, to adhere to their ancient usages. An illustration will be found in the early New York constitution of Apr. 20, 1777. In the 30th article it is provided "that such parts of the common law of England, and of the statute law of England and Great Britain, and of the acts of the legislature of the colony of New York, as together did form the law of said colony on the 19th day of Apr., 1775, shall be and continue the law of this State, subject to such alterations and provisions as the legislature shall from time to time make concerning the same." The same clause has been inserted in later constitutions. Similar provisions in other States applicable to this subject are industriously collected by Mr. Joel P. Bishop in his work entitled *The First Book of the Law*, ch. 6, note 4 to section 58. The only State to be regarded as an exception to the general rule is Louisiana. Before the cession to the U. S. of the territory from which that State was formed it was governed by the "civil law" of Spain. This law still forms the basis of its civil jurisprudence, modified to some extent by the rules of the common law. While there is thus a common substratum of law in all of the States of the Union (excepting Louisiana), it would readily be supposed that there would be some divergence of decision among them in the development of legal principles. The courts of each State are supreme and without appeal except in matters involving the construction of the Constitution of the U. S. and of the laws and treaties made under it, in which case the Supreme Court of the U. S. is the final interpreter. The State courts of final appeal have in important instances reached conclusions upon the same state of facts diametrically opposite. Such results are highly inconvenient between States so closely allied to each other in business interests. It is to be hoped that at some not distant day measures may be adopted whereby the respective States may arrive at harmonious results upon points not involving any sacrifice of principle. This might, perhaps, be accomplished on the recommendation of a competent commission by means of supplementary legislation.

It should be added that there is no common law of the U. S. as distinguished from that of the separate States. The general government was called into being by a written constitution, which is the measure of the powers of the legislative and other departments organized under it. Although Congress may by an enactment adopt the rules of the common law as applicable to subjects coming within its power, still, in such a case, the basis of the law is the underlying statute. On the other hand, the common law of the States precedes the statute or constitutional provision which may sanction it. (Consult upon this point the case of *Wheaton* v. *Peters*, 8 Peters's Reports, 591; *Kendall* v. *U. S.*, 12 ib., 524.)

In regard to the second branch of the common law (particular customs) but little need be said. There may grow up in localities or in particular departments of trade or business special customs applicable to persons dealing in that locality or engaged in that branch of business. The validity of the custom, when proved to exist, is to be tested by established legal rules. It must be shown to have existed for a sufficient time to be notorious, and to have met with general acquiescence, to be sufficiently distinct and certain, and not to be unreasonable and contrary to justice. Knowledge of the custom must be brought home to the person to be affected by it. Such knowledge, however, may be presumed when it has become generally known to persons residing in the locality or engaged in the business to which the custom appertains. Special questions arise when it is sought to alter or add to the terms of a written instrument by evidence of a custom. (See INTERPRETATION.)

The second principal department of municipal law is statute law. In this connection reference should be made to provisions found in State constitutions which are in their nature only rules of municipal law. It can be seen at a glance that if the promoters of a mere rule of municipal law desire to give it an irrepealable character, they have no means of doing so by force of an ordinary statute. If, however, they can secure its insertion in a constitution, it will remain law until the constitution itself is amended. It may thus happen that a constitution may to some extent part with its true character as a statement of the fundamental principles of government, and become a mere repository of rules of municipal law which should regularly be found in a statute. The necessity of statutes or rules adopted by the legislature can be readily perceived to follow from the very nature of the common law. When a principle announced by the courts as fully settled is found to work a hardship or to be unsatisfactory in its nature, the people, through their representatives in the legislature, have an efficient remedy at hand. They may at once change the common law by means of a statute. Statutes are adopted in England by Parliament, in this country either by a State or territorial legislature or by Congress. They are, as it respects the persons to whom they are to be applied, either public or private; as to their nature, they are either declaratory or remedial. A statute is said to be declaratory when it reaffirms the common law, which is for some reason obscure or has perhaps fallen into disuse; it is remedial when it changes or modifies the former law, perhaps making its rules more comprehensive or restricting their operation. The general principles governing the interpretation of statutes have been stated in a former article. (See INTERPRETATION.) When a conflict occurs between the common law and a statute, the former must give way, and the same rule is applied as to inconsistencies between earlier and later statutes, or even between earlier and later clauses in the same statute. The former law, though there be no express words, is in such a case repealed by implication. No legislation is irrepealable. Each successive legislative body has control over the entire domain of legislation, except so far as there may be a restraint of a constitutional nature already referred to. It is a rule of general application that the statute, where there are no words to the contrary, acts simply within the territorial dominions of the State which enacts it. Still, in special cases, where the intent is apparent, a State may govern the acts of persons beyond its limits, assuming that they or their property at a subsequent time may come within reach of its tribunals. Statutes of a State in this country must be made to correspond both with the State and national constitutions, while the acts of Congress must correspond with the national Constitution; otherwise, they are ultra-constitutional and void. The proper tribunals have power to pass upon the question of such correspondence, the State courts in general being the final interpreters of the validity of a State law when compared with the State constitution, and the U. S. Supreme Court of the correspondence between either a State law or one of Congress in the U. S. Constitution.

It was the former practice to frame statutes in circuitous and involved forms of expression, with provisions and qualifications and many repetitions, with the design thereby of securing greater accuracy of statement. To a person not trained in the law they were obscure and forbidding, so that even an eminent English statesman is reported to have said that nothing was more distasteful to him than to read an ordinary act of Parliament. In modern times it is quite the practice to arrange statutes in chapters and sections, and to use ordinary and familiar forms of expression. Codes of statutory law have thus been introduced under the name of "revised statutes." This is true both of statutes of the States and of the U. S. A revision of the early statutes is also making in England.

Statutes are cited in different ways—in early times by the Latin words with which they commenced, as "Quia emptores," etc. Sometimes they are referred to by the towns where the Parliament was held, as the "Statutes of Merton" or "of Gloucester." The acts passed in the interval between the execution of Charles I. and the Restoration of Charles II. are no part of the English law, but are published in a separate volume, known as *Scobell's Acts.* For many years statutes have been cited as of the year of the reign of the king or queen in which they were passed. The separate acts passed are termed "chapters." In this country they are cited under the name of the State which enacts them and of the year when passed. The annual laws are commonly termed "session laws," and are arranged for publication in the order of time of their enactment as chapters. In some of the States the annual laws are classified for publication into public and private.

Municipal law, originating in the modes which have thus been sketched, when complete supplies a legal rule to govern all the business transactions of life. Some of its most important topics will be found in this work under appropriate heads, such as AGENT, PARTNERSHIP, SALE, BAILMENT, INSURANCE, BILL OF EXCHANGE, MORTGAGE, TRUST, etc. A comprehensive division of the whole subject with which the civil branch of it has to do is rights and remedies. These are so closely connected that it is a legal maxim that "Wherever there is a right there is a remedy" (*ubi jus, ibi remedium*). It is plain that an assertion of a right is of no practical value where its violation is left without remedy. Rights may refer either to the person, without reference to the ownership of property, or they may concern such ownership. Personal rights may be strictly individual, such as the right to life, liberty, and reputation, or they may have reference to other persons under the various relations of master and servant, husband and wife, parent and child, guardian and ward. A corporation is for many legal purposes regarded as a person. The interests which one can have in property can only be accurately understood in English and American systems of law by a separate study of the rules respectively governing personal property and real estate. These branch out into great detail, and can be mastered only by long-continued and patient labor. The violation of any of these rights is regarded as a "wrong," and to vindicate the right in such a case the law establishes an appropriate remedy. The most usual course is to give the injured party pecuniary compensation. (See MEASURE OF DAMAGES.) There are, however, in certain cases, preventive remedies, such as an injunction. (See INJUNCTION.) In some instances a party to a contract is compelled to fulfil it. (See SPECIFIC PERFORMANCE.)

That important branch of municipal law known as the "criminal law" is based upon the theory that a right of society has been violated, and that the wrongdoer should consequently be punished. The true theory of punishment, and its relation to a violated rule, will be hereafter considered. (See PUNISHMENT.) It frequently happens that a violation of an individual right also affects society in such a way that the act can be regarded as a crime. In this case the act has two aspects: considered as an injury to the individual, it is a wrong (tort); regarded as an injury to society, it is a crime. The two qualities of the act are so distinct that they can be prosecuted separately. There are also cases where the crime has no such relation to an individual—*e. g.* where there is an embezzlement of public funds or a wilful destruction of public buildings by fire—that the State is attacked in such a way that it has a civil remedy for the wrong done to its property, as well as a right to prosecute criminally. It may be considered that the State in such a case has a corporate character, and that it has in that capacity been wronged as to its property, so that it is entitled to redress, as though it were an individual, by a civil action. So there may be instances where the act done is purely criminal, and without any element of a violation of right susceptible of redress by an ordinary civil action; *e. g.* treason. Considerations such as these have led authors like Blackstone to arrange the whole subject of municipal law under four principal divisions—(1) personal rights; (2) rights to property; (3) private wrongs and remedies; (4) public wrongs and their punishment. The true classification distinguishes in the civil law between rights and remedies, including in the latter modes of procedure, and in the criminal law between crimes and methods of obtaining conviction and sentence, to be followed by punishment.

(For a general historical sketch of the rise and progress of the English law see Blackstone's *Comm.*, book 4, ch. 33; Reeves's *History of English Law;* Crabb's do. On the general subject of this article consult Blackstone's and Kent's *Commentaries;* Austin on *Jurisprudence;* Pomeroy's *Introduction to Municipal Law;* Dwarris on *Statutes.*)

T. W. DWIGHT.

Munjeet′ [Hindu, *manjît*], **Rubia Munjista,** or **East Indian Madder,** a plant extensively cultivated in India, its root being used as a dyestuff for producing colors similar to those of common madder. It was formerly supposed to contain the same coloring-matters as madder, alizarine and purpurine. Dr. Stenhouse (*Proc. Roy. Soc.*, xii. 633; xiii. 86, 145) has shown that it contains purpurine, but no alizarine. The substance supposed to be alizarine he has shown to be a distinct body, *munjistine*, having properties very similar to those of alizarine, and giving the formula $C_8H_6O_3$, the correctness of which is doubtful. Munjistine exists in the stems and root of the plant in considerable quantities. It is extracted by boiling the powdered munjeet in a solution of 2 parts sulphate of aluminum and 16 of water, repeating two or three times. The red liquor is filtered hot, and on adding hydrochloric acid a bright-red precipitate is obtained. This is washed, dried, and digested in a percolator with boiling bisulphide of carbon. The solution is evaporated, leaving a residue which consists chiefly of munjistine and purpurine, from which the former is extracted by boiling water, precipitated by hydrochloric acid, and purified by recrystallization from alcohol. It may also be extracted directly from the munjeet by boiling water, precipitated by hydrochloric acid, and purified as above. E. Kopp's process with sulphurous acid is not applicable. Munjistine crystallizes in brilliant golden-yellow plates or scales both from alcohol and by sublimation. It is slightly soluble in cold, more readily in boiling water, forming a yellow solution, from which it separates in flocks on cooling. It is somewhat soluble in cold, much more in boiling alcohol, and is not precipitated from this solution by water. It is soluble in concentrated sulphuric acid, and the solution may be heated nearly to boiling without change; on dilution it is deposited in yellow flocks unchanged. Nitric acid converts it (like purpurine and alizarine) into phthalic and oxalic acids. With carbonate of soda it forms a bright red, with ammonia a brownish-red, with caustic soda a rich crimson solution. It dyes with alumina an orange, with iron a brownish-purple, with Turkey-red mordant a deep orange. These colors are moderately permanent, and bear treatment with bran and soap tolerably well. Munjistine resembles the *rubiacine* of Dr. Schunk, the *madder-orange* of Runge, but differs in the color of the carbonate of soda solution, in the absorption bands of the spectrum, and in the fluorescence of the ethereal solutions. Munjeet is inferior to madder as a dyestuff. The garancine from munjeet is said to yield much richer shades with alumina if a portion of the munjistine is removed by boiling water.

C. F. CHANDLER.

Munk (SALOMON), b. at Glogau, Silesia, May 14, 1805, of Jewish parentage; was educated at Berlin and Bonn; studied Oriental languages in Paris; visited Oxford in 1835; received an appointment in the Oriental department of the National Library of Paris in 1840; travelled in Syria and Egypt, and was made professor of Hebrew, Chaldaic, and Syriac in 1865 at the Collége de France, though in the mean time he had become entirely blind. From 1856 to 1866 he gave an annotated edition of Maimonides' *Doctor Perplexorum*, with accompanying French translation. Among his other works are *Palestine, Description géographique et historique* (1845), articles on Arabic and Hebrew philosophy in *Dictionnaire des Sciences philosophiques*, *Cours de Langue hébraique, chaldaïque et syriaque* (1865).

Munkacs′, town of Hungary, on the Latorcza, manufactures alum, saltpetre, and hosiery. The surrounding districts contain iron and rock-crystals, and produce wheat and wine of superior quality. Pop. 9644.

Munkaczy (MICHAEL), b. at Munkacz in 1844, studied painting at Pesth, Vienna, Munich, and Dusseldorf, and made his *début* at the exposition of Paris in 1870 by his *Dernier jour d'un condamné*. Among his later works is *Milton dictant le Paradis Perdu* (1878).

Muñoz′ (JUAN BAUTISTA), b. at Museros, near Valencia, Spain, in 1745; studied at the University of Valencia; became a priest, and endeavored in several treatises to introduce a more liberal philosophy into Spanish theology. To this end he wrote his treatises *De recto Philosophiæ recentis in Theologia Usu* (1767), *De Scriptorum Gentilium Lectione et profanarum Disciplinarum Studiis ad Christianæ Pietatis Normam exigendis* (1768), and *Institutiones Philosophicæ*

(1768), and republished the Latin writings of Fray Luis de Granada, preceded by notable introductions. These works procured him the enmity of the ruling clergy, but recommended him to the enlightened monarch Charles III., by whom he was appointed to a post in the colonial office and made "cosmographer of the Indies." In 1779, Charles requested him to prepare a complete history of the discoveries and conquests of the Spaniards in America—a work to which he devoted the remainder of his life, but had published only the first volume of his *Historia del Nuevo Mundo* (Madrid, 1793) at the time of his death in Apr., 1800. The work was never continued, but the extensive collection of historical manuscripts classified and arranged by him have been the chief documentary sources of the important histories of Navarrete, Irving, and Prescott. (See Ticknor's *History of Spanish Literature*, vol. iii.)

Munro′ (Hugh Andrew Johnstone), D. C. L., b. at Elgin, Scotland, Oct. 14, 1819; educated at Trinity College, Cambridge, where he became a fellow 1843; published an esteemed critical edition of *Lucretius* in 1860, an entirely new edition, with a literal translation, in 1870, and a valuable edition of *Horace* in 1869. Dr. Munro was the first university professor of Latin from 1869 to 1872, when he resigned.

Munro (Sir Thomas), Bart., b. in England in 1760; went to India at an early age; was engaged in the campaigns against Hyder Ali (1780–84) and Tippoo Sultan (1790–91 and 1799); became lieutenant-colonel 1804; was knighted 1819; made governor of Madras 1820; made a baronet for distinguished service in the Burmese war 1825; was about to be appointed governor-general of India when he d. in India July 6, 1827. Sir Thomas Munro was one of the ablest generals and administrators the British government ever had in India. (See *Life*, by Rev. G. R. Gleig, 1830.)

Munroe (Nathan), b. at Minot (now Auburn), Me., Mar. 16, 1804; graduated at Bowdoin College 1830; studied theology at Andover; was licensed to preach Apr., 1834; was for some months principal of Delaware College; was pastor of the First Congregational church at Bradford, Mass., 1836–53; was for several years New England secretary of the American Sunday-School Union; editor of the Boston *Recorder*, and Boston correspondent of the New York *Evangelist*. His efforts were directed during the last three years of his life to obtaining an endowment for Bradford Academy. He was a distinguished collector of rare and valuable books, and was possessed of fine literary ability. D. at Bradford July 8, 1866.

Mun′sees, or **Minsees,** a tribe of American Indians of the Algonkin stock, long closely associated with their kindred, the Delawares, with whom they were driven to Ohio. Originally they claimed all the land from the Mississippi to the Hudson, and were very hostile when, in the beginning of the eighteenth century, settlers began to encroach upon them. Some were converted by the Moravians. A considerable number of Christian Munsees were killed in the massacre of 1782. We afterward hear of them in many parts of the West. Some few Munsees occupy a poor reservation in Wisconsin with the Stockbridge Indians. Another band of Christian Munsees live with a few Chippeways 40 miles S. of Lawrence, Kan. They are few in number, intelligent, and industrious.

Mun′sell (Joel), b. at Northfield, Mass., Apr. 14, 1808; removed in 1827 to Albany, N. Y.; acquired fame as a printer, publisher, journalist, and author; has written, edited, or compiled a large number of volumes containing documents and valuable materials for history, such as *Annals of Albany* (10 vols., 1850–59), *Collections on the History of Albany* (3 vols., 1865–70), *Historical Series* (10 vols.), etc.

Munson (Æneas), M. D., b. at New Haven, Conn., June 24, 1734; graduated at Yale College 1753; studied divinity under Pres. Stiles; was chaplain in the French war of 1755; studied medicine under Dr. John Darby; began practice at Bedford, N. Y., 1756; removed to New Haven 1760; enjoyed there a high professional reputation during a career of more than fifty years; was professor in the Yale Medical School from its first organization; was president of the Medical Society of Connecticut, and often a member of the legislature. D. at New Haven June 16, 1826.

Mun′ster, the largest of the four provinces of Ireland, bounded N. and E. by Connaught and Leinster, and S. and W. by the Atlantic. Area, 9476 square miles. Pop. 2,404,460 in 1841; 1,865,600 in 1851; 1,513,558 in 1861; 1,393,485 in 1871; 1,331,115 in 1881. The province is divided into the counties of Cork, Clare, Kerry, Limerick, Tipperary, and Waterford.

Münster, town of Prussia, capital of the province of Westphalia, on the Aa, is an old but well-built and picturesque town, surrounded with beautiful promenades (its old fortifications), and containing many open places planted with trees and lined with elegant houses. The most remarkable among its buildings are the cathedral, which was the scene of the Anabaptist catastrophe in 1536, and the town-hall, in which the Peace of Westphalia was signed in 1648. From the twelfth to the eighteenth century Münster was the capital of an independent principality of the German empire. In 1719 it was merged into the archbishopric of Cologne, and in 1814 it was given to Prussia by the Congress of Vienna, together with most of its territory. It has many good educational institutions, manufactures of leather, woollens, starch, sugar, spirits, and carriages, and it carries on a considerable trade in its own manufactures and the products of the surrounding district. Pop. 40,433.

Munster (George Fitzclarence), Earl of, b. Jan. 29, 1794, son of William IV. by the celebrated Mrs. Jordan; entered the army; served in the Peninsular war; went to India under Lord Hastings; distinguished himself in the Mahratta war, and carried home the overland despatches, which led to his work, *Travels in India* (1819); in 1830 was created earl of Munster, Viscount Fitzclarence, and Baron Tewkesbury; became major-general in 1841; his peculiar position in society probably led him to kill himself Mar. 20, 1842.

Muntaner′ (Ramon), an eminent Catalan chronicler, b. at Peralada in 1255, d. in 1336; the most important authority on the early history of his country, as well as one of the most valuable of mediæval annalists. After having filled many positions of trust under his sovereign, and participated in the remarkable Catalan expedition to Rumelia and Greece, Muntaner retired to Xilvella, near Valencia, and at the age of sixty years began the composition of his chronicle. His narrative covers the period between the "miraculous" birth of King Jaume I., the founder of the Catalan nationality, in 1208, and the coronation of King Alphonso in 1328, and embraces the conquest of Majorca, Minorca, and Ivica, Valencia, and Murcia from the Moors; the defeat and capture of Manfred and Conradin, and the subjugation of Naples and Sicily by Charles of Anjou; the Sicilian Vespers; the disastrous campaign of Philip the Bold in Catalonia; the Catalan expedition to the Greek empire in 1303, and many interesting episodes of contemporaneous history. Muntaner's annals of this era of stirring and feverish action are full of picturesque and romantic incident, and are composed in a fiery and enthusiastic style, well suited to so exciting a subject. There is, no doubt, a good deal of patriotic exaggeration in the way of epithet and in minor details, but the main facts are generally truly stated, and there is no room for questioning the fidelity of Muntaner's pictures of the life and manners of his time, or his substantial accuracy so far as his means of information extended. In spirit and vivacity the chivalrous Muntaner has no superior, and his chronicle is quite as good authority, in matters of fact, as the more prosaic recitals of the monkish annalists of the same period. Muntaner's chronicle was first printed at Barcelona in 1558 in a folio volume of about 500 pp., under the title *Chronica o Descripcio dels fets e hazanyes del inclyt Rey Don Jaume, primer Rey d'Árago, de Mallorques e de Valencia; feta per lo magnifich en Ramon Muntaner.* A reprint of this edition appeared at Barcelona in 1562. Lanz gave a good edition of the text in 1 vol. 8vo in the publications of the Stuttgart *Literarischer Verein* in 1844, and Bofarull has published at Barcelona the text with a Castilian version. There is a good French translation by Buchon in the *Chroniques étrangères relatives aux Expéditions françaises pendant le XIII*^{e} *Siècle* (Paris, 1841), and a German by Lanz (2 vols., 8vo, Leipsic, 1842).

George P. Marsh.

Mün′ter (Friedrich), b. at Gotha, in the duchy of Saxe-Coburg, Oct. 14, 1761; studied theology and archæology at Copenhagen and Göttingen; travelled for three years in Italy on a stipend from the Danish government; was appointed professor in theology at the University of Copenhagen in 1790, and bishop of Sealand in 1808. D. at Copenhagen Apr. 9, 1830. He published the Coptic translation of the book of Daniel (1786), the statute-book of the Templars (1794), valuable works on the introduction of Christianity into Denmark (1823–32), and of the Reformation (1802), a very learned disquisition on the religion of the Carthaginians (1823), and a work describing the symbols and artistic representations employed by Christians in the first century (1825).—His father, Balthasar Münter, b. at Lubeck Mar. 24, 1735; d. in Copenhagen Oct. 5, 1793; was minister of the German congregation at Copenhagen, and wrote *A Faithful Narrative of the Conversion and Death of Count Struensee*, translated into English by Rev. Mr. Wendeborn (London, 1774).

Munt′jak, the *Cervulus Muntjac* of India, Java, etc., a small deer, but little over two feet high. The males have small horns; the females are hornless. Their venison is excellent. The Chinese muntjak is the *Cervulus Reevesii*, which, like the preceding, is often half domesticated, and is sometimes bred in European parks.

Mün′zer (Thomas), b. at Stolberg, in the Harz Mountains, about 1490; studied at Wittenberg, and became preacher at Zwickau in Saxony in 1520, and in 1523 at Allstedt in Thüringia. At first he worked in unison with the Reformers, though his preaching was always strangely mixed up with mystical and fantastical ideas, but afterwards he turned, according to his own "inner light," against the "halfness" of Luther and Melanchthon, and demanded a radical reform of Church and state, which led to uproar and confusion. He entertained peculiar ideas of infant baptism, similar to those of the Anabaptists, with whom, however, he had no direct connection; his most characteristic ideas were a belief in continuous divine revelation through dreams and visions, and in the community of property, which he promulgated in speech and writings with a somewhat coarse but often very impressive eloquence. Expelled from Allstedt by the government, he went to Nüremberg, and next to Schaffhausen, but returned soon to Thüringia, and settled at Mühlhausen. Here he succeeded in overthrowing the city council and appointing another which was entirely under his control; and when in 1525 the Peasants' war broke out in Southern Germany, he instigated the whole population in and around Mühlhausen and Langensalza to rise in revolt. Murder and plunder ensued, but on May 15, 1525, it came to an encounter between the rebels and the regular troops at Frankenhausen, and after a protracted fight the peasants were totally routed; 7000 of them are said to have been killed in the battle. Münzer was taken prisoner, put to the torture, and beheaded at Mühlhausen a few days afterwards. His *Life* was written by Melanchthon (1525), Strobel (1795), Seidemann (1842), and Heinrich Leo in the *Evangelische Kirchenzeitung* (1856).

Mun′zinger (Werner), b. at Olten in the canton of Soleure in 1832; studied natural science at Berne and Oriental languages at Munich and Paris; went in 1852 to Cairo; engaged in mercantile business in Alexandria; was sent in 1854 to Massowah as chief of a commercial expedition to the Red Sea; explored the land of the Bogos, where he resided for nearly six years; joined in 1861 the German-African expedition under Heuglin, whom he succeeded in 1862 as chief of the expedition: penetrated to Kordofan, and returned to Massowah in 1864; accompanied the English army during the Abyssinian war in 1868, and became governor of Massowah in 1870. Besides various communications to the London Geographical Society and Petermann's *Mittheilungen*, he wrote *Sitten und Recht der Bogos* (1859), *Die deutsche Expedition in Ostafrika* (1865), and *Vocabulaire de la Langue Tigré* (1865). D. Nov., 1875.

Muot′ta Valley, an elevated and secluded valley of Switzerland, in the canton of Schwytz, traversed by the river Muotta, which hence flows down to the Lake of Lucerne, is famous for the sanguinary struggle which took place here in 1799 between the Russians under Suwarow and the French under Lecourbe, Mortier, and Massena. The Russians were totally surrounded and hemmed in on all sides, but by a murderous onset they broke through the French lines and escaped down the valley. The principal place of the valley is the village Muotta, with about 2000 inhabitants, and a handsome parish church containing several valuable pictures.

Mur, a river of Austria, rises in the Mureck Mountains in the district of Salzburg, enters into Styria, where it becomes navigable at Judenburg, and passes by Gratz, flows through Hungary into Croatia, and joins the Drave at Legrad, after a course of 230 miles. It receives about 100 affluents, among which are the Kainach, Lasznitz, Sulm, Pöls, and Mürz, but none of these streams is navigable.

Mur′a, de (Francesco), generally called **Franceschiello** or **Franceschetto,** b. at Naples in the first half of the eighteenth century; studied painting under Solimene, and became a prominent member of the Neapolitan school. In 1730 he went to Turin on the invitation of Charles Emmanuel, king of Sardinia, in whose palace he painted his celebrated frescoes representing the *Olympian Games* and the *Exploits of Achilles*. He returned to Naples, and in the year 1743 was still engaged in painting; the date at which he died is unknown.

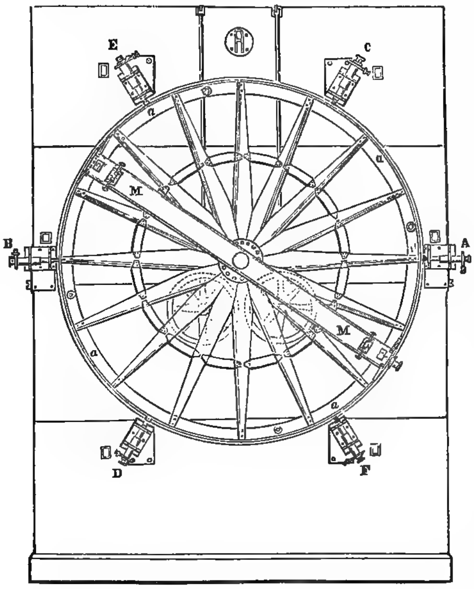
Murad V. (Mehemet Murad Effendi), b. Sept. 21, 1840, the eldest son of the sultan Abd-ul-Medjid; was educated outside the harem, and acquired, among other attainments, that of speaking French. On the dethronement of his uncle, Abd-ul-Aziz (May 29, 1876), he was declared sultan of Turkey, in preference to the sons of the fallen sovereign, but was himself dethroned Aug. 31, 1876, on the ground of insanity, being replaced by his brother, Abdul-Hamid.

Muræ′na [Gr. μύραινα], the typical genus of the eel family of fishes (Murænidæ). It includes the *Muræna helena*, the famous muræna of the ancients, a European salt and fresh water fish, stout, heavy, and often six feet long. Its flesh is white and good, and it was artificially bred by the ancient Romans, who prized it extremely.

Murænesoc′idæ [from *Murænesox*, the chief genus], a family of apodal fishes. The family is anguilliform, and proportioned as in Murænidæ; no scales are developed; the head is moderate, and with the jaws more or less produced; the opercula little developed; the nostrils superior or lateral and entirely external; the mouth with the cleft extending well backward; the tongue not free; the dental series well developed, and generally with a greater or less number of enlarged teeth; branchial apertures lateral, but rather low down, and narrow or moderate clefts; vertical fins moderate or rudimentary, and surrounding the end of the tail; pectoral fins in some present, in others absent; the branchial openings in the pharynx are wide slits. This family is one of the groups of the Murænidæ Platyschistæ of Gunther, but differs in many respects from the typical Murænidæ. It is represented by at least five genera, which are confined to warm and tropical waters—viz. *Murænesox*, tropical seas generally; *Nettastoma*, Mediterranean Sea; *Saurenchelys; Oxyconger*, Japan; and *Hoplunnis*, Central America. As in the case of the Congridæ, the young (at least in *Nettastoma*) exhibits a leptocephalous stage, which was formerly distinguished as a peculiar genus under the name *Hyoprorus*. Theodore Gill.

Muræn′idæ [from *Muræna*, the old Latin name of the best-known genus], a family of fishes of the order Apodes, typified by the celebrated muræna of the ancients. The body is elongated, as in the common eel; the scales absent; the head moderate; the opercular bones generally rudimentary and in part wanting; the mouth with the cleft moderately developed, or very large and extending far backward laterally; the intermaxillaries are rudimentary; the teeth well developed; the branchial apertures developed externally as lateral holes: the dorsal and anal fins variable, sometimes being well developed and sometimes nearly absent; the pectoral fins also either present or absent. The skull exhibits a number of well-marked characters, as shown by Cope; the parietals are largely in contact; the ethmoid very wide; the symplectic, maxillary, pterygoid, basal, branchihyal, and superior and inferior pharyngeal bones all wanting, except the fourth superior pharyngeal; this is jaw-like, and supported by a strong superior branchihyal; other superior branchihyals wanting or cartilaginous. The family has numerous representatives, with generally a considerable similarity to each other in the pattern of coloration, although there is much variation in this respect. This color is formed by the articulation of the lighter hues enclosing darker interspaces, sometimes by blue cross-bands, sometimes by white ocelli, and sometimes the coloration is uniform. The teeth also greatly vary, and on their modifications a number of genera have been based. The most recent authority, however, recognizes but four in the family—viz. *Myroconger*, of which the only known species has been found in the sea at St. Helena; *Muræna*, with nearly 100 species, distributed in various tropical waters; *Gymnomuræna*, chiefly represented in the Indian and Pacific oceans; and *Enchelycore*, whose single species has been found in the Caribbean Sea. The *Muræna helena* is a fish highly celebrated in ancient history, and was greatly esteemed for the table. Classical students will recall numerous anecdotes and references to it in the Latin authors. Theodore Gill.

Mu′ral Cir′cle [Lat. *muralis*], an astronomical instrument consisting of a large graduated circle, to which is attached a telescope moving only in the plane of the meridian, and supported on the perpendicular face of a wall; whence the name. It is mainly used for the determination of the declinations of the heavenly bodies. It has of late years been superseded by the transit circle, because its unsymmetrical construction renders the determination of its instrumental errors difficult. Tycho Brahe first used a mural quadrant, and Flamsteed in 1689 had a quadrant constructed for the Greenwich Observatory. The advantages of a complete circle were so manifest, however, that on June 12, 1812, Troughton placed in the same observatory a mural circle six feet in diameter, shown in the annexed cut, which was probably the first in use. The mural circle of the Washington Observatory is mounted on the E. face of a sandstone pier, and is thus described: It is five feet in diameter, and connected with the central portion by twelve radii, strengthened on their backs by edge-bars, and united midway by a second concentric circle. To secure homogeneity if possible, all the preceding portions constitute parts of the same cast. A band of gold and one of platinum are inlaid upon the rim perpendicular to the plane of the circle. The former band is divided into spaces of 5′, and the latter into spaces of 1°, each of which is numbered. The minute reading is secured by means of six equidistant microscopes secured to the face of the pier, and which are illuminated through apertures in the same from a gas-lamp placed to the W. of it. The instrument has a conical axis three feet long. Under the eastern part of the latter there are friction-rollers connected with rods that pass between the circle and the face of the pier, and thence over the top to counterpoises within a cavity of the pier. Its telescope is a cylinder secured to the circle both at the centre and near the extremities. The object-glass has a diameter of four inches, and was originally of five feet focal length. (For the methods of using see Transit Circle; *Washington Astronomical Observations*, vols. for 1845, 1862, 1865; Pearson's *Pract. Astr.* (London, 1829), vol. ii. p. 472; Loomis's *Pract. Astr.*, p. 84; Chauvenet's *Manual of Spherical Astronomy*, vol. ii. p. 282.) Leonard Waldo.



Mural Circle.

Murat′ (Joachim), b. at La Bastide Fortunière, in the department of Lot, France, Mar. 25, 1771, the son of an innkeeper; was educated at Cahors and Toulouse, where he prepared himself for the Church. Dismissed from the seminary, he entered a regiment of chasseurs, and, cashiered in the regiment, lived for some time as waiter in a café in Paris. On the establishment of the constitutional guard of Louis XVI. he became a member of that body of troops, and was afterwards transferred to a regiment of cavalry. He proved a brilliant soldier in the field; was aide-de-camp to Napoleon in 1795; accompanied him to Egypt in 1798; was made general of division in 1799; married in 1800 a sister of the First Consul, Caroline, and was made marshal of France, imperial prince, and grand admiral in 1804. In most of Napoleon's great battles, Austerlitz, Jena, Eylau, Friedland, he took a distinguished part, and the emperor loaded him with honors. In 1805 he was made grand duke of Berg, and in 1808 king of Naples under the name of Joachim I. Napoleon. But misunderstandings soon arose. Murat wished to govern his kingdom independently of France, and every attempt in this direction Napoleon frustrated with indignation. After the battle of Leipsic, Murat hastened to Italy and opened negotiations with England and Austria, which powers guarantied him, by a treaty on Jan. 11, 1814, the possession of his throne on the condition of his joining the allies against Napoleon. He marched against Prince Eugene, viceroy of Italy, but when he heard that the Bourbons insisted violently at the Congress of Vienna on his expulsion, he stopped, and when Napoleon returned from Elba he at once declared war against Austria (Mar. 31, 1815). Defeated Apr. 12 at Ferrara, and May 2 at Tolentino, he fled to France, where, however, Napoleon refused to receive him. He lived in the vicinity of Toulon, but after the battle of Waterloo he was compelled to leave France. With a few adherents he made a fantastic attempt at invading Naples, but failed utterly, was caught near Pizzo, brought to the castle, tried before a court-martial, and shot Oct. 13, 1815.

Murato′ri (Ludovico Antonio), b. at Vignola, in the duchy of Modena, Oct. 21, 1672; studied theology and history at the University of Modena; took holy orders; became keeper of the Ambrosian Library at Milan in 1694, and of the D'Este Library and the ducal archives at Modena in 1700, and d. Jan. 23, 1750. His contributions to the history of Italy are very valuable: *Rerum Italicarum Scriptores* (25 vols., Milan, 1723–51), *Antiquitates Italicæ Medii Ævi* (6 vols., 1738–42), *Annali d'Italia* (12 vols., 1744–49).

Mur′chison (Sir Roderick Impey), Bart., K. C. B., F. R. S., D. C. L., LL.D., b. at Tarradale, Ross, Scotland, Feb. 19, 1792; studied at the military college, Marlow, and the University of Edinburgh; was an officer in the army 1807–15, serving in the Peninsula and Sicily; was the associate of Davy; became in 1825 a fellow of the Geological Society, and in 1826 F. R. S.; aided Sedgwick and Lyell in British and continental geological studies; was one of the founders of the Royal Geographical Society, and often its president; travelled extensively in Russia, Scandinavia, etc.; was knighted 1846, made K. C. B. 1863, baronet 1866; became in 1855 director-general of the geological survey of the United Kingdom; d. at London Oct. 22, 1871. Among his leading works are the *Silurian System* (1838), enlarged to *Siluria* (1854), *Geology of Russia and the Ural* (1845), *Geological Atlas of Europe* (1856), besides numerous elaborate and valuable monographs, maps, and scientific papers. He was the recipient of numerous honors and distinctions, British and foreign. (See *Memoir of Sir Roderick Murchison*, by Archibald Geikie, LL.D., London, 2 vols., 1874.)

Murchiso′nia, a genus of gasteropod shells occurring fossil in rocks from the Lower Silurian to the St. Cassian beds of the Trias. These shells are placed with the Haliotidæ, or ear-shells, possessing, like Pleurotomaria, a deep notch or fissure in the outer lip. E. C. H. Day.

Mur′cia, province of Spain, part of the old province of the same name, which in 1833 was divided into the present provinces of Murcia and Albacete. Area, 4478 square miles. Pop. 451,946. The surface is mountainous, forming elevated plateaus and large, deep valleys. Where water is abundant the soil is exceedingly fertile, producing wine, oil, silk, hemp, and all kinds of fruits, but in places where water is deficient the country is nearly a desert. Mineral springs abound; copper, lead, iron, and salt are found.

Murcia, town of Spain, capital of the province of the same name, on the left bank of the Segura. It is irregularly built, but its streets are clean and its houses substantial, often elegant. Its cathedral has an immensely high tower, from the top of which a most magnificent view can be had of the surrounding valley, the huerta, the river which waters it, and the lofty though naked mountains which enclose it. Murcia has manufactures of silk, linen, mats, cordage, saltpetre, and powder, and an extensive trade in the products of its immensely fertile huerta. Pop. 91,805.

Mur′der [Lat. *murdrum*]. By the common law, which prevails in this country except so far as superseded or modified by statute, there was only one degree or grade of this crime. The definition given by Lord Coke is universally accepted as accurate—namely: "When a person of sound memory and discretion unlawfully killeth any reasonable creature in being and under the king's peace, with malice aforethought, either express or implied." By examining the separate elements of this definition the various requisites of the crime will fully appear. It must be committed by a person of sound memory and discretion, which excludes idiots, lunatics, and very young children. The killing must be unlawful; that is, neither excusable nor justifiable. The person killed must be a reasonable creature in being; the killing an unborn child was therefore not embraced within the common-law offence, and in order that infanticide might be murder a living child should be fully born. "Under the king's peace" simply refers to a state of war, and prevents the killing of an alien enemy engaged in actual hostilities from being regarded as murder. By far the most important element of the crime is the final one: the killing must be with malice aforethought, express or implied. In its technical legal sense the term *malice* is used to describe any wrongful act done intentionally, without just cause or excuse. (See Malice.) The gist of this signification is the wrongful intention. The division mentioned in the foregoing definition of express and implied malice refers not to two different species of the malice itself, but to the modes of proving its existence as a fact in any given case. The term "express" is appropriate to those cases in which the wrongful intention is inferred as an ordinary deduction of fact—that is, through processes of reasoning unaided by any legal presumptions—from the evidence which is given for the very purpose of establishing its existence, such as lying in wait, former threats, old grudges, careful preparations, and the like. This evidence need not be direct; it may be entirely circumstantial, and yet if the existence of the wrongful intention is deduced from the probative facts by the ordinary methods of ratiocination, the malice is express. The existence of the wrongful intention is also inferred as a necessary conclusion—that is, as a legal presumption—from certain facts, so that if these facts are proved the intention follows as an inevitable consequence, and remains such unless the defendant overcomes and removes it by counter-evidence. In such instances the malice is said to be "implied." As an illustration: at the common law the wrongful intention which constitutes murder was presumed from the mere fact of killing, so that when the prosecution had established that fact, the defendant was obliged to remove the inference of his guilt by evidence showing the absence of a wrongful intent. The clause of the definition, "with malice aforethought, express or implied," as thus explained, was very comprehensive, and included many instances of homicide which have been reduced to crimes of a lower grade by modern legislation. Wherever there was a preconceived design to kill the very person whose life was taken, and the act was not excusable nor justifiable, this was plainly murder. In addition to this common case, if a person should wilfully kill in such a manner as to show him to be an enemy to mankind in general—as, for example, if he should deliberately fire a loaded gun into a crowd and kill an individual—the act would be murder, although there was no design to take the life of that particular one. Also, if while engaged in the commission of, or in the attempt to commit, a felony, the wrongdoer should undesignedly kill a person, the homicide was murder; but if the accompanying act, although unlawful, was not a felony, the unintentional slaying would only be manslaughter. It was a general doctrine of the common law that if the killing was done under great and immediate provocation, upon the spur of the moment, while the passions were inflamed, the crime was reduced to manslaughter; but no matter how great the antecedent provocation, if an interval had elapsed sufficient for the passions to cool and the reason to return, the homicide would then be murder. The foregoing general description and examples sufficiently indicate the severity of the common law and the nature of the particular cases embraced within the offence. The radical vice of this ancient law was that it included in the same grade, and made liable to the same punishment, offences that were really of very different degrees of culpability. In most if not in all of the States of this country the whole subject of homicide is now regulated by statute. The theory of the legislation which prevails most widely throughout the U. S. is the following: The common-law notions are not abrogated, but are taken as a foundation. The various cases which fell within the common-law definition of murder are classified, and are separated into two degrees, those in the first degree being punishable with death, and those in the second by imprisonment for life. Most of the statutes contain both a general definition or description of the murders embraced within the first degree, and also an enumeration of certain particular instances of homicide belonging to the same class. This general description is a substitute for the common-law requisite of "malice aforethought, express or implied;" while the special enumeration takes the place of the common-law doctrine, which declares that unintentional killing done by a person while engaged in the commission of, or the attempt to commit, a felony is murder. The characteristic feature of this general description as found in most of the statutes is the requirement of deliberate, premeditated intention to kill. The following is the statutory language employed in several of the States: "with express malice aforethought" (Maine); "deliberate and premeditated killing" (New Hampshire); "committed with deliberately premeditated malice aforethought" (Massachusetts); "wilful, deliberate, and premeditated killing" (Alabama, Connecticut, Michigan, New Jersey, Pennsylvania, Virginia); "wilful, deliberate, malicious, and premeditated killing" (Tennessee); "purposely, and of deliberate and premeditated malice" (Ohio). In the enumeration of special cases there is more diversity. The most common form includes murders done "by means of poison, or by lying in wait," or "in the perpetration of, or attempt to perpetrate, any arson, rape, robbery, or burglary" (Alabama, Connecticut, Michigan, New Jersey, Ohio, Pennsylvania, Tennessee, and with a slight variation in New Hampshire and Virginia). Another form is, "in perpetrating, or attempting to perpetrate, any crime punishable with death or imprisonment for life" (Maine, Massachusetts). All common-law murders not included within these descriptions are declared to be of the second degree. The latest legislation in New York (1873) separates murders of the first degree into three classes: (1) "when perpetrated from a deliberate and premeditated design to effect the death of the person killed or of any other person;" (2) "when perpetrated by an act eminently dangerous to others and evincing a depraved mind, regardless of human life, although without any premeditated design to effect the death of any particular individual;" (3) "when perpetrated without any design to effect death by a person engaged in the commission of any felony." When the wrongful homicide is "perpetrated intentionally, but without deliberation and premeditation," it is declared to be murder in the second degree. Notwithstanding the requirement of deliberation as well as premeditation, the courts have held almost unanimously that the intent to kill may be formed at the very instant of the killing, and the offence, nevertheless, will be murder in the first degree, although a different construction is given to the statutes in one or two States. John Norton Pomeroy.

Mur'doch (James Edward), b. at Philadelphia, Pa., Jan. 25, 1811; made his first appearance upon the stage in 1829; obtained popularity as an actor both in America and England, and a still wider reputation as an elocutionist. He published *Orthophony, or Culture of the Voice* (1845), aided by William Russell; served on the staff of Gen. Rousseau during the civil war, devoting himself to the care of the sick and wounded, and gave successful popular readings throughout the country in aid of the Sanitary Commission.

Mur'dock (James), D. D., b. at Westbrook, Conn., Feb. 16, 1776; graduated at Yale College 1797; studied theology under Dr. Dwight; was Congregational minister at Princeton, Mass., 1802–15; professor of ancient languages in the University of Vermont 1815–19, and of sacred rhetoric and ecclesiastical history in Andover Theological Seminary 1819–28. In 1829 he removed to New Haven, where he devoted the remainder of his life to literature, publishing, among other works, translations of Mosheim's *Ecclesiastical History* (3 vols., 1832) and *Commentaries* (2 vols., 1852), and of the Peshito-Syriac version of the New Testament (1842), and a volume of original *Sketches of Modern Philosophy* (1842). Dr. Murdock was a frequent contributor to the religious quarterlies, and was a ripe philological scholar. D. Columbus, Miss., Aug. 10, 1856. (See biographical notice in *Brief Memoirs of the Class of 1797 at Yale College* (1848), by Thomas Day and James Murdock.)

Mure (Col. William) of Caldwell, b. at Caldwell, Ayrshire, Scotland, July 9, 1799; was educated at Westminster School and at the University of Edinburgh, and subsequently studied several years in Germany, where he laid the foundations of ripe classical knowledge. He wrote articles for the *Edinburgh Review* upon the literature of modern languages, which were characterized as brilliant by Moore and Jeffrey; published *Brief Remarks on the Chronology of the Egyptian Dynasties* (1829), *A Dissertation upon the Calendar of the Zodiac of Ancient Egypt* (1832); travelled in Greece and the Ionian Islands in 1838, publishing the *Journal* of his tour in 1842; and after many years of research issued his *Critical History of the Language and Literature of Ancient Greece* (5 vols., 1850–57), which was never finished, but of which the several portions upon the epic and lyric poets and the historians may be regarded as separate works. He also edited *The Caldwell Papers* (3 vols.) for the Maitland Club. Col. Mure was an able literary critic, best known as a strenuous defender of the unity of the *Iliad* and *Odyssey*, and the identity of their authorship in the person of Homer. He sat in Parliament for Renfrewshire 1846–55, and was lord rector of the University of Glasgow 1847–48, and for many years colonel of the Renfrewshire militia. D. in London Apr. 1, 1860.

Mure'tus (Marcus Antonius), b. at Muret in the department of Haute Garonne, France, Apr. 12, 1526; attained very early great fame as an accomplished scholar in classical literature; went in 1554 to Rome, where he received employment in the service of Cardinal d'Este, and where he began to lecture publicly on Aristotle in 1563 and on law in 1567; took holy orders in 1576, and d. June 4, 1585. His editions of Latin authors, together with his lectures, exercised great influence on the revival of classical studies, and his *Variæ Lectiones* are still considered valuable. His collected works were edited by C. H. Frotscher (Leipsic, 1834, 3 vols. 8vo).

Mu'rex [Lat.], a large genus of gasteropod mollusks of the family Muricidæ. There are some 180 living species, and nearly as many fossil ones, found in the Eocene and later deposits. The living species are worldwide in distribution. *M. brandaris*, *trunculus*, and others furnished a part of the Tyrian purple dye of the ancients. The animals are all predatory, and many of the shells assume singular forms. One of the most remarkable is the thorny woodcock or Venus's comb of collectors (*M. tribulus*), from the Spice Islands. *M. regius* of the Pacific coast of tropical America is most splendidly colored. (See MURICIDÆ.)

Murex'ide [Lat. *murex*, "purple"], or **Purpurate of Ammonium** ($NH_4C_8H_4N_5O_6$). It is formed by the action of ammonia on alloxantine, and by other reactions. It crystallizes in four-sided prisms, which are garnet-colored by transmitted and rich gold-green by reflected light. In water it forms a splendid purple solution. With mercuric salts it produces fine red and purple colors on silk, wool, cotton, and leather, and with zinc salts orange and yellow colors. These colors are very bright and resist the action of light; they are, however, very sensitive to sulphurous acid, which rapidly discolors them. Hence, they cannot be used in cities where coal-gas is employed. A few years since murexide was extensively used for dyeing and calico-printing. It was made from the uric acid of guano. One factory in Manchester, Eng., turned out 12 cwt. weekly. It was driven out by the aniline colors. (See *Report on Murexide Dyeing*, by E. Kopp (*Rép. Chim. app.* i., 79), and Hofmann's *Report*, 1862, p. 118; also *Jahresbericht* (1857, 649; 1858, 671; 1859, 752), and *Wagner's Jahresb.* for the same years.) C. F. CHANDLER.

Mur'freesboro', Hertford co., N. C. (see map of North Carolina, ref. 2–J, for location of county), 15 miles S. E. of Branchville R. R. Station. It is the seat of a Methodist female college and a Baptist female institute. The Meherrin River is navigable to this point. The town has an active trade. Pop. in 1870, 753; in 1880, 645.

Murfreesborough, cap. of Pike co., Ark. (see map of Arkansas, ref. 4–B, for location of county). Pop. in 1880, 84.

Murfreesborough, cap. of Rutherford co., Tenn. (see map of Tennessee, ref. 6–F, for location of county), on the Nashville Chattanooga and St. Louis R. R., 32 miles S. E. of Nashville, situated in a beautiful and fertile plain, is the seat of Union University, founded by the Baptists in 1841, and Soule Female College. It was the capital of the State 1817–27. (See MURFREESBOROUGH, BATTLE OF.) Pop. in 1870, 3502; in 1880, 3800.

Murfreesborough, Battle of. On July 13, 1862, the place was occupied by a Union force, which was surprised and captured by a Confederate force under Gen. Forrest. Rosecrans, who had assumed command of the army of the Ohio Oct. 30, 1862, had sufficiently reorganized that army, and provided supplies at Nashville, to determine him to advance against Bragg's army, which, returning from its march through Kentucky and East Tennessee, was now posted about Murfreesboro'. Leaving Nashville at daylight on Dec. 26, 1862, in a heavy rain, by night of the 30th, and after constant skirmishing, a position was reached to the W. of Stone River, the left of the army resting on that stream and extending S. some 3 miles, McCook, with three divisions, forming the right, Thomas, with two divisions, the centre, Crittenden, with three divisions, held the left. Of Bragg's army, Hardee had the left, Polk the centre, and Breckenridge the right, and on the E. side of Stone River. Rosecrans's plan contemplated an attack in force on the Confederate right, which was inaugurated early on the morning of Dec. 31, but had not progressed far before intelligence arriving of a furious and successful attack upon his own right, caused Rosecrans to abandon the attack with his left and hasten forward assistance to the right and centre, which were being severely handled. The Confederate success was not stayed until one half the ground occupied in the morning had been lost, besides 28 pieces of artillery. Both sides had suffered severely in killed and wounded, and the next day (Jan. 1, 1863) no serious fighting occurred between the two confronting armies. On the 2d, however, a furious charge was made by the Confederates in the afternoon, with temporary success, but resulting in their being driven in turn with great loss. Darkness ended the fight, a rain setting in, and next day was passed without any general engagement. Friday morning (Jan. 4) revealed the fact that the Confederates had disappeared, and pursuit was not deemed advisable. Murfreesboro' was at once occupied and held. Rosecrans, with a reported force of 43,400, lost 1533 killed, 7245 wounded, and some 3000 prisoners; Bragg reports his strength at 35,000, and loss at 10,000, of which 9000 were killed and wounded. This battle is also commonly known as that of Stone River.

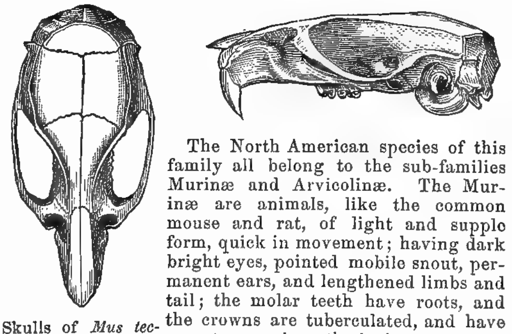
Mur'ger (HENRY), b. at Paris in Feb., 1822; received a very modest education; was clerk to a notary in his fifteenth year; had some kind of employment afterwards with the Russian count Tolstoy; engaged finally in literature and journalism as a "Bohemian," which appellation he invented; established a literary name in 1848 by his *Scènes de la Vie de Bohême*, sketches partly satirical, partly pathetic, striking as well by their realism as by their poetical humor; wrote a number of novels in the *Revue des Deux Mondes*, among which were *Adeline Protat, Pays Latin, Vacances de Camille*, etc.; also a drama in one act, *Le Bonhomme jadis*, and a volume of poems, *Les Nuits d'Hiver*, and d. at Paris Jan. 28, 1861.

Muriatic Acid. See HYDROCHLORIC ACID.

Muric'idæ, or **Muric'inæ** [from the ancient name *Murex*], a family of gasteropod mollusks of the order Pectinobranchiata and sub-order Rachiglossa. The head is small and truncated; the tentacles moderate; the eyes sessile at the outside of the bases of the tentacles; teeth of the lingual ribbon in three longitudinal rows, of which the central (rachidian) tooth is thick and quasi-prismatic, with denticles projecting from the front of the upper surface, and the lateral are simple, hook-like, and versatile; the foot is moderate and entire; the shell varies greatly in the respective genera, but is always provided with a more or less produced anterior canal, and generally has two or more varices or ridges, indicating former thickened margins of the outer lip of the aperture; the columella smooth. Two sub-families are distinguishable by differences of the operculum—Muricinæ and Purpurinæ.

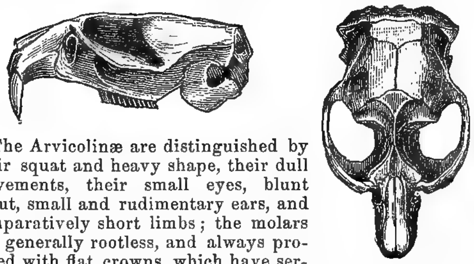
The Muricinæ, the typical sub-family of the Muricidæ, have the operculum ovate and annular, but with the nucleus more or less approximated to the apex. This sub-family is a very large one, embracing numerous species, over 250 living ones being distributed in the various tropical and sub-tropical seas, and a few in the colder ones. They have been differentiated into numerous genera, among the chief of which are *Murex* (which has been subdivided into many genera), *Muricidea, Ocinebra, Eupleura, Trophon, Chorus*, and *Urosalpinx*. The numerous other genera which have been referred to this family have been excluded by Drs. Stimpson and Troschel, and relegated to the Purpuracea, Buccinidæ, etc. The most common forms upon the Northern Atlantic coast of the U. S. are *Eupleura caudata* and *Urosalpinx cinereus*. The purple of the ancients was derived from the animal of species of this family, especially *Murex trunculus*, and, according to Wilde, heaps of broken shells of the species named, and caldron-shaped holes in the rocks in which the animals were treated, still remain on the Tyrian shore. THEO. GILL.

Mur'idæ [from *Mus*, gen. *Muris*, the name of the typical genus], a large family of the rodent order and simplicidentate sub-order. The skull is well developed; the infraorbital foramen large, generally pyriform and contracted into a slit below (which is typically bounded externally by a plate of bone arising from the supramaxillary), and with a portion for the masseter muscle as well as for the infraorbital nerve; the lower jaw with the coronoid and condyloid processes in nearly the same vertical plane with each other and with the descending ramus, the last more or less twisted; molar teeth generally $\frac{3}{3}$ (rarely $\frac{4}{3}$ or $\frac{2}{2}$) × 2; the hind legs are but moderately developed, and the animals normally progress by a running gait approaching to leaping; the tibia and fibula are united below; the metatarsal bones separate from each other; a cæcum is present. This family is by far the most extensive of the order, and contains about 300 species, representing about 50 genera, which have been distributed among six sub-families—viz. Murinæ, to which the Spalacinæ and Georhychinæ are adjuncts, and Arvicolinæ, with which the Sipheneinæ and Ellobiinæ are nearly connected.



Skulls of *Mus tectorum.*

The North American species of this family all belong to the sub-families Murinæ and Arvicolinæ. The Murinæ are animals, like the common mouse and rat, of light and supple form, quick in movement; having dark bright eyes, pointed mobile snout, permanent ears, and lengthened limbs and tail; the molar teeth have roots, and the crowns are tuberculated, and have crenate margins; the incisors are compressed and narrower than deep, and those of the lower jaw have roots which produce a protuberance on the outer side of the mandible, at the inner notch between the condylar and coronoid processes. With these are coincident other anatomical characters. To this sub-family belong, according to Dr. Coues, nineteen U. S. species representing the genus *Mus*, typical of the group Mures, and the genera *Neotoma*, *Sigmodon*, *Ochetodon*, and *Hesperomys*, belonging to the group of Sigmodontes: the former group has no indigenous American species, those found in North America having been introduced from the Old World; the latter is characteristic of the American fauna.



Skulls of *Arvicola Xanthognathus.*

The Arvicolinæ are distinguished by their squat and heavy shape, their dull movements, their small eyes, blunt snout, small and rudimentary ears, and comparatively short limbs; the molars are generally rootless, and always provided with flat crowns, which have serrated margins; the incisors are broader than deep, and the roots of the lower ones lengthened generally into protuberances on the outside of the mandible at the inner notch between the condylar and descending processes; this sub-family is chiefly developed in the temperate and arctic regions, some of the most northern mammals (*Myodes*) belonging to the group. The genera are *Arvicola*, or the field-mice (with four sub-genera), *Evotomys*, *Synaptomys*, *Myodes*, *Cuniculus*, containing the lemmings, and *Fiber*, or the musk-rat. Eleven North American species have been recognized by Dr. Coues. (See also Lemming, Mole-Rat, Mouse, Musk-rat, Rat.) Theodore Gill.

Muri'llo (Bartolomé Estéban), b. at Seville, where he was baptized Jan. 1, 1618; received the first instruction in painting from his uncle, Juan de Castillo, in whose studio he worked with Pedro de Moya. In 1634, Juan de Castillo went to Cadiz, and Murillo was left without guide. He was very busy, however, and his productions found a ready market in the Spanish colonies in America. In 1640, Pedro de Moya returned from England, where he had studied under Van Dyck, and acquired that magical clare-obscure in his coloring by which the unnatural sharpness of the outlines is toned down and a true representation of the living form obtained. Murillo, to whom this method of painting was a new revelation, sat down immediately, painted a shipload of Madonnas, martyrs, street-boys, etc. for the colonies, and with the money thus earned he started for Italy in 1643. Arrived at Madrid he met with Velasquez, who received him in his academy, procured him admission to the galleries of Madrid and the Escurial; and Murillo settled down at Madrid, where for three years he studied, copying the works of Titian, Van Dyck, Ribera, and Velasquez. On his return to Seville the friars of the convent of San Francisco entrusted him with the decoration of their cloister, and the eleven pictures he painted for them at once established his fame. Orders came in multitudes, and his name spread rapidly from Spain, over all Europe. He produced a great number of pictures, which are appreciated still more in our days than in his own time; founded an academy at Seville from which many talented pupils issued; and d. in his native city Apr. 3, 1682, unanimously acknowledged as the greatest painter of his age. Pictures by him are found in all the European galleries, but he is best represented in the Pinakothek of Munich, which contains a number of his genre pictures; in the Louvre of Paris, where is found his celebrated *Madonna;* in the museum of Madrid, which possesses twenty-four excellent pictures by him; and in Seville, which still contains not only the greatest number, but also the most excellent, of his pictures. He often represented scenes of real life, and sometimes he was very bold both in the choice of the subject and in its treatment; but the representation is always very graceful and exquisitely humorous; and although Murillo's humor is something unique in its peculiarity, it seldom fails to charm. His most celebrated pictures, however, treat religious subjects, often of an entirely ideal character, and the glow and purity of the religious enthusiasm they reveal are wonderful, and made still more impressive in the representation by a coloring which, blooming in the brightest tints and melting away in the most delicate shades, seems the very medium for the expression of such ideas. Nevertheless, even his most ideal compositions never contradict his realistic sympathies; his *Madonna* is not the heavenly queen, but the beautiful woman, and everywhere his powerful genius knew how to unite the strongest differences into the most perfect harmony. Clemens Petersen.

Murner (Thomas), b. at Strasburg Dec. 24, 1475, entered the Franciscan order in 1490, and was ordained a priest in 1494. He studied theology, philosophy, and canon law in all the principal universities of Europe, and began to teach logic and jurisprudence by a new method: *Chartiludium logicæ* and *Chartiludium institutes summariæ.* His logical chart, however, did not find much favor; but he also wrote satirical verses, and in that line he had more success. In 1506 he was crowned as *poeta laureatus* by the emperor Maximilian; in 1509 appeared his *Schilmenzunft* and *Norrenbeschwödung*, and in 1514 his *Ein andechtig geistliche Badenfort.* He had his eyes fully open to all the corruption of the Roman Catholic Church, but he was, nevertheless, a decided adversary of the Reformation. After the establishment of the Reformation in Strasburg he was compelled to leave the city, and settled at Oberehnheim; but the Peasants' War drove him away from that place. He sought refuge in Switzerland, and after residing for some years at Lucerne he returned to Oberehnheim, where he d. Aug. 23, 1537. He wrote no less than thirty-five pamphlets against Luther, but only five or six of them have been published (*Von den grossen Lutherischen Norren*, 1522, etc.). His *Life* was written by G. E. Waldau (Nuremberg, 1775).

Mu'ro Luca'no, town of Southern Italy, province of Potenza, situated on the slope of a hill about 40 miles from Melfi. It is surrounded by a wall, contains some good buildings, with a small library and several charitable institutions. In the castle of this town Joanna I. of Naples was suffocated in 1382 by order of her adopted son, Charles, duke of Durazzo. Pop. 7954.

Murom', or **Moorom,** town of European Russia, government of Vladimir, on the Oka. It is an old and picturesque town, with large manufactures of linen and sailcloth, and extensive quarries of gypsum and alabaster in the vicinity. Pop. 10,703.

Mur'phy, cap. of Cherokee co., N. C. (see map of North Carolina, ref. 3–A, for location of county), near the boundary-line between Tennessee and Georgia. Gold and a brown hematite iron ore exist in the vicinity. Pop. in 1870, 175; in 1880, 170.

Murphy (Arthur), b. at Clooniquin, Ireland, Dec. 27, 1727; was educated at the Catholic college of St. Omer, France; was admitted as a student at Lincoln's Inn 1756, and called to the bar 1762, but his life was chiefly devoted to literary pursuits. He was reasonably successful as a dramatist, as an essayist, and as a political writer. He edited several papers of a Tory complexion, and received the office of commissioner of bankrupts and a pension of £200 in his old age. He is now remembered only for his *Life of Garrick* (1801) and his translations of *Tacitus* (4 vols., 1793) and *Sallust* (1807), the latter completed by the poet Moore. D. in London June 18, 1805.

Murphy (Henry Cruse), b. in Brooklyn, N. Y., July 3, 1810; graduated at Columbia College 1830; was admitted to the bar 1833; became city attorney of Brooklyn, mayor 1842, member of Congress 1843–49, member of the State constitutional convention 1846, minister to Holland 1857, subsequently a member of both houses of the State legislature; published translations of De Vries's *Voyages from Holland 1632–44, Broad Advice to the United Netherland Provinces, The Anthology of New Netherland, or Translations from the Early Dutch Poets of New York, with Memoirs* (1865), and *Journal of a Voyage to New York in 1679–80* (1868). He wrote much in the *American Quarterly Review*, the *Historical Magazine*, and elsewhere upon the early Dutch history of New York. D. Dec. 1, 1882.

Murphy (John), b. in South Carolina 1786; graduated at South Carolina College 1808; removed in 1817 to Alabama; was governor of Alabama 1825–29; M. C. 1833–35. D. in Clark co., Ala., Sept. 21, 1841.

Murphy (John McLeod). See Appendix.

Murphy (William Mitchell). See Appendix.

Murphysborough, city and R. R. junction, cap. of Jackson co., Ill. (see map of Illinois, ref. 10–D, for location of county), on the Big Muddy River, 6 miles W. of Carbondale and 15 miles E. of the Mississippi River. Pop. in 1880, 2196.

Mur'rah (Pendleton), b. in Alabama; graduated at Brown University 1848; was governor of Texas 1863–65; d. at Monterey, Mex., Sept. 23, 1865.

Murray, cap. of Calloway co., Ky. (see map of Kentucky, ref. 5–C, for location of county), 42 miles S. S. E. of Paducah. Pop. in 1870, 179; in 1880, 636.

Murray (Com. Alexander), b. at Chestertown, Md., in 1755; in early life a sailor, was commissioned a lieutenant in the Revolutionary navy 1776, but having no vessel, served in the 1st Maryland regiment in the campaign of White Plains and Flatbush, receiving promotion to a captaincy. At the close of 1777 he was given command of a privateer, in which he was captured by a British squadron; was exchanged; volunteered as a lieutenant on board the frigate Trumbull, and was again taken prisoner by British vessels after a sanguinary engagement off the Capes of Delaware, on which occasion he was severely wounded. This experience did not prevent him from again taking service in the Alliance frigate, and at the end of the war he had participated in thirteen engagements in the army or navy. On the organization of the American navy in 1798, Murray was commissioned as captain; served in the West Indies and in the Mediterranean, where he fought a flotilla of seventeen Tripolitan gunboats; was appointed in his old age to the command of the Philadelphia navy-yard, where he remained until his death, Oct. 6, 1821, at which period he was the senior officer of the navy.

Murray (ALEXANDER), D. D., b. at Dunkitterick, Kirkcudbrightshire, Scotland, Oct. 22, 1775, was the son of a shepherd, and displayed from childhood such extraordinary proficiency in the acquisition of languages, and so great a thirst for knowledge, as to attract the notice of several clergymen, by whom he was enabled to enter the University of Edinburgh at the age of nineteen. He took orders in the Church of Scotland, and after serving in several parishes was elected in 1812 professor of Oriental literature at the University of Edinburgh. His remarkable knowledge of Semitic languages procured from the widow of James Bruce a commission to classify the extensive collection of manuscripts formed by that celebrated traveller, and also to bring out a second thoroughly revised and annotated edition of his *Travels in Abyssinia*, which appeared in 1807 (7 vols.), accompanied by a *Life* of the author. In 1811, Dr. Murray was called upon to translate a letter from the king of Abyssinia to the English government, being probably the only British scholar at that time acquainted with the Geez or old literary Ethiopic language. In 1812 he published *Outlines of Oriental Philology, comprehending the Grammatical Principles of the Hebrew, Syriac, Chaldee, Arabic, and Abyssinian Languages*, a manual intended for the use of his students. D. at Edinburgh Apr. 15, 1813. He left in MS. a *History of the European Languages, or Researches into the Affinities of the Teutonic, Greek, Celtic, Sclavonic, and Indian Nations*, published at Edinburgh in 1823 (2 vols.).

Murray (ALEXANDER), U. S. N., b. Jan. 2, 1816, in Pennsylvania; entered the navy as a midshipman Aug. 22, 1835; became a passed midshipman in 1841, a lieutenant in 1847, a commander in 1862, a captain in 1866, a commodore in 1871; served on the E. coast of Mexico during our war with that country, and participated in the capture of Alvarado, Tampico, Tobasco, Tuspan, and Vera Cruz; was engaged in nearly all the brilliant operations of the navy in the sounds of North Carolina in 1862, and was highly distinguished for "coolness and courage." Rear-admiral Apr. 26, 1876; retired Apr. 30, 1878. D. Nov. 10, 1884.

Murray (DAVID), PH. D., LL.D. See APPENDIX.

Murray (Sir GEORGE), K. B., F. R. S., D. C. L., b. in Perthshire Feb. 6, 1772; entered the army 1789; served with great merit in the wars against Napoleon; was governor of Canada 1813–15; was prominent in public life in England, holding positions of distinction; became a full general in the army 1841; d. at London July 28, 1846. He edited the *Marlborough Despatches* (3 vols., 1845).

Murray (HUGH), b. at North Berwick, Scotland, in 1779; became at an early age a clerk in the excise-office at Edinburgh, and devoted his leisure to literature, especially to geography. He edited the *Scot's Magazine*, contributed to the *Edinburgh Gazetteer* and the *Transactions* of the learned societies, and wrote for the Edinburgh *Cabinet Library* 7 volumes of *History of Discoveries and Travels*—namely, *Africa* (2 vols., 1817), *Asia* (3 vols., 1820), and *North America* (2 vols., 1829), and 10 volumes of descriptive geography—namely, *British India* (3 vols.), *China* (3 vols.), *U. S. of America* (3 vols.), and *Marco Polo's Travels* (1 vol., 1839). His principal work was the *Encyclopædia of Geography* (1834). D. at London Mar. 4, 1846.

Murray, or **Moray** (JAMES **Stuart**), EARL OF, known in Scotch history as the "good regent," b. about 1533, was a natural son of James V. by Lady Margaret Erskine, who afterwards married Sir Robert Douglas of Lochleven; was made by his father commendator of the priory of St. Andrew's in 1538, and subsequently acquired the priory of Pittenweem and that of Maçon in France, with a dispensation to hold three benefices, and took in 1544 an oath of fealty to Pope Paul III. In 1547 he accompanied his half-sister Mary (afterwards the celebrated "queen of Scots") to France, and in the following year repelled a descent upon the island of St. Monan, on the coast of Fifeshire, made by Lord Clinton, and drove the invaders back to their ships. In 1556 he joined the Scottish Reformers, and almost immediately assumed the political leadership of the Protestant party. He was one of the Scottish commissioners to witness Mary's marriage to the dauphin of France (1558); was appointed member of the council for civil affairs Dec., 1559, and one of the lords of the Articles June, 1560; was sent as envoy to France Apr., 1561, to invite his sister Mary to return to Scotland as queen, and on her arrival in August became her prime minister and chief adviser, protecting the Protestants in the enjoyment of their religious privileges, while he insisted upon the queen's right to worship according to her Catholic antecedents. In Feb., 1562, he was created earl of Mar, and soon afterward married Lady Agnes Keith, daughter of the earl marischal, but in the same year resigned the title of Mar in favor of his uncle, Lord Erskine, who claimed it by right, and received in its stead the earldom of Murray; defeated the rebel earl of Huntly at Corrichie, and governed Scotland with prudence, though incurring the displeasure of Knox and the extreme Protestants by his studied neutrality in the religious conflict then beginning. In 1565 he lost power by opposing Mary's marriage with Darnley, which he took up arms to prevent, but was defeated and forced to escape into England. He was recalled the following year, and arrived at Edinburgh in March, the day after the assassination of Rizzio, to which he was supposed to have been accessory, as also to the murder of Darnley in the following year, though his complicity in the latter crime is much less certain. He left Edinburgh the day before that event, and proceeded to France, also visiting Queen Elizabeth in England; returned to Scotland in July; found Mary after her marriage with Bothwell a prisoner in Lochleven Castle, where he visited her and induced her to abdicate, July 22. He was proclaimed regent Aug. 22; maintained himself by arms against his sister after her escape, defeated her forces at Langside May 13, 1568, and firmly established his authority; attended the same year at the trial of Mary at York for the murder of Darnley; gave his testimony against her, and produced as evidence the famous "casket letters," the authenticity of which has ever since been so warmly debated. Murray returned to his government, which he administered with skill, vigor, and success until he was assassinated in the streets of Linlithgow by a bullet fired from a window by James Hamilton of Bothwellhaugh, Jan. 23, 1570. PORTER C. BLISS.

Murray (JOHN), b. at Alton, Hants, England, Dec. 10, 1741; removed in youth to Cork; became an occasional preacher among the Wesleyans; adopted Universalist opinions in England somewhat later; came in 1770 to America, and travelled extensively, preaching his new doctrine, and was from time to time subjected to violence; held Universalist pastorates in Gloucester, Oxford, and Boston, Mass.; was for a time chaplain in the Revolutionary army; published several volumes, including an *Autobiography*; is regarded as the father of American Universalism. (See UNIVERSALISTS.) D. at Boston, Mass., Sept. 3, 1815.

Murray (JOHN), F. S. A., b. in London Nov. 27, 1778, son of a Scotchman named John McMurray (b. in Edinburgh 1745; d. in London Nov. 16, 1793), who founded a prosperous bookselling shop in London. Succeeding at the age of fifteen to his father's business, young Murray ultimately became the friend and liberal patron of a famous circle of literary men, most of whose works he published. Among them were Byron, Moore, Campbell, Crabbe, Irving, and Gifford, the latter of whom edited for many years Murray's *Quarterly Review*, founded in 1809 as a Tory organ in opposition to the *Edinburgh Review*. In 1812, Murray removed his business from Fleet street to Albemarle street, where it still remains. D. at London June 27, 1843.—His son, bearing the same name, b. in 1808 and educated at the University of Edinburgh, has since conducted the business, maintaining the high reputation of the house. He has edited an excellent series entitled the *Home and Colonial Library*, personally superintended the preparation of the well-known *Murray's Handbooks of Travel*, and has brought out, among others, the works of Hallam, Grote, Milman, Layard, Wilkinson, Rawlinson, William Smith, Lyell, Murchison, Livingstone, and Darwin. In 1869 he established the *Academy*, the most scholarly literary and critical weekly paper ever published in England.

Murray (LINDLEY), b. in 1745 at Swatara, near Lancaster, Pa.; removed in 1753 to New York with his father, a Quaker merchant; was admitted to the bar in 1776; became a successful merchant of New York, and in 1784 retired from business; settled at Holdgate, near York, England, and devoted himself to literary pursuits; best known by his *English Grammar* (1795), which was for many years regarded as the best authority on the subject, and had a prodigious currency, particularly in Great Britain; published also an *English Reader*, a spelling book, and other educational works, an *Autobiography*, and some religious works, which were popular. D. at Holdgate Feb. 16, 1826.

Murray (NICHOLAS), D. D., b. at Ballynasloe, Ireland, Dec. 25, 1803; came in 1818 to the U. S., and was apprenticed to Harper & Bros. to learn printing; graduated at Williams College 1826; studied theology without graduating at Princeton; assumed a Presbyterian pastorate at Wilkesbarre, Pa.; pastor of the First church, Elizabethtown. N. J., 1853–61. His "Kirwan" letters to Archbishop Hughes gave him fame as a polemic. Also author of an historical work regarding Elizabethtown, N. J. (1844), a volume of European sketches, *Romanism at Home* (1852), *Parish and other Pencillings* (1854), *Happy Home* (1859), and other works. D. at Elizabethtown, N. J., Feb. 4, 1861.

Murray (ROBERT), b. in Maryland in 1822, graduated at the Jefferson Medical College, in Philadelphia; was appointed assistant-surgeon in U. S. army in 1846; became captain in 1851, and major in 1860. He served ably during the civil war, and was made assistant medical purveyor, with the rank of lieutenant-colonel, July 28, 1866, having previously, on Mar. 13, 1865, received the title of brevet-colonel. He became colonel June 26, 1876, and surgeon-general of U. S. army, with the rank of brigadier-general, Nov. 23, 1883.

Murray (WILLIAM). See MANSFIELD, EARL OF.

Murray (WILLIAM HENRY HARRISON), b. at Guilford, Conn., Apr. 26, 1840; graduated at Yale in 1862; held pastorates in Connecticut, and in 1868 became minister of the Park street Congregational church, Boston, Mass.; attained a wide popularity as a preacher and lecturer; author of *Camp Life in the Adirondac Mountains* (1868), *Music-Hall Sermons* (1870), *The Perfect Horse* (1873), etc.

Murray (WILLIAM VANS), b. in Maryland in 1762; received a classical education; went to London after the peace of 1783, and studied law in the Temple for three years; was elected a member of the Maryland legislature on his return, and sat in Congress 1791–97; took a very prominent part in the infant legislation of the U. S., and had few superiors either in erudition, eloquence, wit, judgment, or skill in debate. He was appointed by Washington minister to the Netherlands 1797, and by Pres. Adams envoy to France 1799. Oliver Ellsworth and Gov. William R. Davie were afterwards associated with him as plenipotentiaries in France, but the convention signed at Paris Sept. 30, 1800, which put an end to the serious difficulties between the U. S. and France, was mainly the work of Murray. He returned to his post at the Hague, where he remained until Dec., 1801, and d. at Cambridge, Md., Dec. 11, 1803. He was the author of a treatise on *The Constitutions and Laws of the U. S.*

Murray (WILLIAM WILKINSON), M. D., b. in Southampton co., Va., July 20, 1845; graduated in Queen's College University, Dublin, Ireland; in obstetrics in the Lying-in Hospital of the same city 1868; and is now professor of materia medica and therapeutics in the College of Physicians and Surgeons, Baltimore, Md. PAUL F. EVE.

Murray River, the principal river of Australia, rises on the western slope of the Australian Alps, and falls into Encounter Bay in lat. 35° 26′ S., after a long and tortuous course. Its mouth is too shallow to be entered by large vessels, but its whole lower part is navigable.

Murshedabad′, or **Moorshedabad,** town of British India, presidency of Calcutta, on the Bhagratti. It was formerly the capital of Bengal, and is a large and straggling town, extending along the river for a distance of nearly 8 miles, but, with exception of the palace and some mosques, it is meanly built, its houses being mostly mud huts. Situated on the main road between Calcutta and the North-west Provinces, it has an important trade. Pop. 150,000, of whom 60,000 are Mohammedans and the rest Hindoos.

Murvie′dro, town of Spain, province of Valencia, on the Palancia. It occupies the site of the old SAGUNTUM (which see), and contains many interesting remains, among which is a remarkably well-preserved theatre. Pop. 6916.

Musa′ceæ [from *Musa*, the principal genus], a small natural order of endogenous herbs of very large size, all tropical. The most important products of the order are the plantain, banana, and the fibre called manila hemp.

Musä′us (JOHANN KARL AUGUST), b. at Jena 1735; studied divinity; became in 1763 governor of the court pages at Weimar, and in 1770 became a professor in the gymnasium. D. at Weimar Oct. 28, 1787. Is remembered as "the good Musäus," and as the author of *Volksmärchen der Deutschen* (1782), a collection of pleasing tales, still very popular; wrote also *Grandison der Zweite* (1760), *Physiognomische Reisen* (1778–89), against Lavater; *Freund Heins Erscheinungen* (1785), *Straussfedern* (1787–97).

Musca. See FLY.

Mus′cadine Grape (*Vitis vulpina*, Linn.), a Southern species known by the name of Bullace or Bullitt grape, not growing farther N. than North Carolina. The white scuppernong, one of its varieties, is much esteemed in the Southern States, but is not worth cultivating at the North.

Mus′cæ volitan′tes [Lat. for "flitting flies"], a name given to the black, or more rarely very bright, floating objects which sometimes seem to appear before the eyes. If fixed and permanent black spots appear, moving with one or both of the eyes, there is reason to suspect organic disease of the eye, and an expert oculist should be consulted. If the spots fall or swarm upward, it is believed that they are caused by small and unimportant opacities floating in the humors of the eyes.

Mus′cardine, one of the destructive diseases which have of late years committed such ravages among silkworms. It is characterized by a parasitic vegetation, the growth of a microscopic plant called *Botrytis Bassiana*, a fungus resembling the vegetation of mould and mildew.

Muscat′, or **Maskat,** a powerful and extensive Arabic state or imamat, which originally consisted both of African and Asiatic territories, but which in 1856, at the death of the imam Said Seid, was divided between his two sons, one receiving the African territories, extending along the eastern coast of Africa from the equator to Cape Delgado, with Zanzibar for its capital, and the other the Asiatic territory, situated in Oman, Arabia, and extending along the Persian Gulf and the Strait of Ormuz from lat. 22° 23′ to 26° 23′ N., with Muscat for its capital. The Arabian territory, or Muscat proper, to which belongs a tract of land on the opposite side of the Persian Gulf in the Persian province of Laristan, consists of a low, hot, but, if well watered, very fertile coast-land, producing cotton, sugar, rice, maize, watermelons, and bananas. Behind this coast-land rises a mountainous region consisting of bare and naked ranges enclosing beautiful and fertile valleys, where the coffee tree grows, and figs, almonds, grapes, oranges, lemons, walnuts, and apples. On the inner slope of these mountains lies a row of oases, mostly inhabited by Bedouins, and behind the oases stretch the Arabian deserts. But both the high mountain-valleys and the low coast-regions produce, when a sufficient supply of water can be procured, vegetables and fruits of the most exquisite aroma. The area and number of inhabitants of this state are unknown, though its commercial relations both with Europe and America have become very important during the last half century.

Muscat, or **Maskat,** capital of the imamat of Muscat, in a fertile plain in lat. 23° 38′ N., lon. 58° 40′ E., surrounded by gardens and plantations of date-palms, on the border of an inlet of the ocean which forms a spacious and safe harbor. The city is fortified, but rather poorly built, and its climate is extremely hot and unhealthy to Europeans. Its inhabitants, numbering about 60,000, consist of Arabs, Hindoos, negroes, and Jews, and carry on a very important trade in coffee, pearls, salt fish, dyestuffs, and other Persian and Arabian goods.

Muscatel′, Muscadel′, or **Mus′cat,** a name applied to a large class of fragrant sweet and heady wines. The name comes remotely from the Arabic *maskat*, "musky." The principal varieties are Cape muscat, the red and white wines of Roussillon in France, and the lachryma christi of Italy. The name is given to certain varieties of grape.

Muscatine, city and R. R. centre, cap. of Muscatine co., Ia. (see map of Iowa, ref. 6–K, for location of county), 317 miles above St. Louis, on the Mississippi River, has large saw-mills, wagon and plough factory, etc. Pop. in 1870, 6718; in 1880, 8295; in 1885, 10,389.

Musch′elkalk [Ger. for "shell-lime"], in Germany, the great Middle Triassic limestone, resting, typically, upon the Bunter sandstein, and covered by the Keuper or red marl beds. It is named for its abundant fossils, and supplies lime, marl, rock-salt, gypsum, and building-stone.

Musci, plural of *Muscus*, a natural order of plants. See MOSSES, by COE F. AUSTIN.

Muscle. See HISTOLOGY, by Col. JOSEPH J. WOODWARD, M. D., M. N. A. S.

Muscle Shoals, a series of rapids in the Tennessee River, in Northern Alabama. The river falls 100 feet in 20 miles. Though navigable above and below, steamboats never attempt the shoals, except in the very highest freshets and at great risk. A canal of imperfect construction was once used on the N. side, but has been long abandoned. The name is given from the vast number of freshwater mussels here found. It is intended to construct a serviceable canal around these obstructions.

Muscogees. See Creek Indians.

Mus'covite, the most common species of mica, otherwise known as biaxial or potash mica. Muscovite occurs crystallized in hexagonal prisms, belonging to the orthorhombic system; also in scales and plates, which are sometimes aggregated into stellate and plumose groups. It is remarkable for its eminent cleavage parallel to the base of the prism, the thin folia being separated easily by the thumb nail. Its hardness on the cleavage planes is from 2 to 2.5, and its specific gravity from 2.75 to 3.1; its lustre varies from pearly to metallic, and its color from white to gray, pale green, greenish-yellow, and brown. It is remarkably elastic. In composition muscovite is a silicate of alumina, potash, and iron (silica 43 to 50 per cent., alumina 31 to 39 per cent., potash 5 to 12 per cent., ferric oxide 1 to 8 per cent.). The name muscovite is from Muscovy glass, in allusion to its use in Russia as a substitute for glass in windows. With us it is largely used, under the misnomer of "isinglass," for the same purpose in stoves. It is one of the more abundant minerals, occurring in plutonic and metamorphic rocks, and also in broken flakes in many unaltered sandstones and clays, which are hence described as "micaceous." Edward C. H. Day.

Mus'covy Duck, the *Anas* or *Cairina moschata*, Linn. The term is a corruption of musk-duck, a name applicable to the bird on account of the strong odor of the skin. The species, which has been extensively domesticated, was originally brought from tropical South America, where it is indigenous. Edward C. H. Day.

Musculus is the name of two German theologians of note during the period of the Reformation. Andreas Musculus (*Meusel*), b. at Schneeberg, Saxony, in 1514, studied at Leipzig and Wittenberg, and was professor of theology in Frankfort-on-the-Oder, where he d. Sept. 21, 1581. He was one of the most irate controversialists on the Lutheran side, published forty-six books, and took part in the drawing up of the Torgau book and the *Concordia Formulæ*.—Wolfgang Musculus (*Meuslin*), b. at Dienze, in Lorraine, Sept. 8, 1497, was educated in a Benedictine monastery near Lixheim, but left it in order to study under Capito and Butzer in Strasburg, and was in 1549 appointed professor at Bern, where he d. Aug. 30, 1563. He was an ardent champion of Calvin and published *Loci Communes*, commentaries on the New Testament, historical and polemical treatises, etc. His *Life* was written by Grote (Hamburg, 1855).

Mu'ses [Μοῦσαι], in Greek mythology, the divine inspirers of song. They are generally given as nine in number, daughters of Zeus and Mnemosyne. Their names are most commonly as follows: Calliope, the epic Muse; Clio, the Muse of history; Euterpe, of lyric verse; Melpomene, of tragedy; Terpsichore, of dance and song; Erato, of amatory verse; Polymnia, or Polyhymnia, of the hymn; Urania, of astronomy; Thalia, of comedy and the idyl.

Muse'um [Lat. from Gr. Μουσεῖον], a temple dedicated to the Muses, applied also by the Greeks to music-halls and philosophical schools or colleges, the most renowned of which in antiquity was that at Alexandria, founded by the Ptolemies b. c. 296, and enriched with the most celebrated library of the period, presided over by learned librarians. In modern times the term is applied to a building containing collections of works of art, ancient or modern, or those of natural products, mineralogy, geology, and zoology. After the revival of learning the first museum contained principally coins, gems, and sculptures, and Cosmo de' Medici in the beginning of the sixteenth century founded that at Florence, now in the Palazzo Vecchio; subsequently, Pope Leo X. collected that in the Vatican, which was followed at Rome by those of the Capitol, the Lateran, and others, the galleries of which are the richest in Roman sculpture in the world, and have the Apollo Belvedere, the rival of the Venus called De' Medici at Florence. Another, the Museo Borbonico at Naples, eighteenth century, consists chiefly of the objects found at Pompeii and Herculaneum and the Græco-Italian vases of Southern Italy. The museum of Turin, comprising principally Egyptian antiquities and remarkable for valuable papyri, especially for one with a list of Egyptian kings, was founded in 1832. In France the principal museum, that of the Louvre, founded during the French Directory (1793), comprising Egyptian, Assyrian, Phœnician, Greek, Roman, and Mexican antiquities, is one of the richest in Europe for sculpture of all periods. Amongst its treasures may be cited the Venus of Milo, the so-called Fighting Gladiator, the Egyptian monuments from the Serapeum at Memphis, and Assyrian sculptures from Khorsabad. Besides the Louvre there are many other museums in France of recent foundation—that of mediæval objects in the Hôtel de Cluny at Paris, one at Lyons of various antiquities, chiefly local, of the Roman period, found in the vicinity, and another at Boulogne of miscellaneous objects, besides several others in the principal towns of France. Germany also abounds in museums. That of Berlin, founded in 1828, comprises Egyptian antiquities acquired from Passalacqua and valuable monuments transported from Egypt by Lepsius, many valuable sculptures, and Greco-Italian vases. The museum at Dresden, called the Augusteum, founded by Augustus the Strong (1560), has also some fine Roman sculptures, a head of Caligula and a Venus; while two museums of Munich, called the Glyptothek and Pinacothek, contain fine specimens of ancient sculpture and pictures. These collections are comparatively of recent period. Museums of minor importance also exist at Bonn, Prague, Breslau, and Frankfort, while those of Vienna, from collections commenced by Rodolph II. (1576), are celebrated for their large and magnificent Roman camei and cabinet of medals. In Russia there are museums containing sculptures and pictures at St. Petersburg, Moscow, Dorpat, and Mithau. The progress of civilization has also caused museums to be established at Constantinople, and at Cairo exceedingly rich in Egyptian antiquities of all periods and of recent foundation. In England the first formed was that of Tradescant, a merchant in the reign of Charles I.; it was followed by that of Elias Ashmole in 1679, built at Oxford in 1683, and named the Ashmolean Collection, after him. Small in extent, it contains some remarkable objects—an Egyptian bas-relief of the second dynasty, and the jewel of King Alfred (a. d. 872). Other private collections, as that of the duchess of Portland, sold in 1786, and that of Lever in 1779, were formed in the eighteenth century. The largest public collection is the British Museum, founded in 1753, and originally placed in Montagu House, its present site, and opened in 1759. This was gradually replaced by the present edifice, constructed 1828–45. It is in the Ionic style, with a peristyle of forty-four columns with sculptured pediment. The whole covers several acres, and the collections comprise Egyptian, Assyrian, Oriental, Greek, Roman, pre-historic, and mediæval antiquities, and coins, mineralogy, geology, and zoology, and an extensive library of above 1,000,000 books, pictures, and prints. Of these it is not possible to more than mention its remarkable Oriental collection, the Greek marbles of Athens, the celebrated Portland Vase of glass cameo, the Rosetta Stone, and the Deluge Tablets. A spacious reading-room, capable of holding 300 daily students, is in the centre of the building, and the whole is open to students or the general public daily. It has cost since its foundation £3,452,863, and is maintained by an annual parliamentary grant of £100,000. There are also in London the South Kensington Museum of mediæval and other works of art, with a library and school of design and a museum of practical geology; one of the College of Surgeons, and others in the provinces. S. Birch.

Mus'grave (Anthony), C. M. G., b. in 1828, was the son of Anthony Musgrave, M. D., treasurer of Antigua. Mr. Musgrave became secretary of Antigua; was administrator of Nevis 1860–61; lieutenant-governor of St. Vincent 1861–64; was governor of Newfoundland 1864–69, of British Columbia 1869–71; lieutenant-governor of Natal 1871–73; became in 1873 governor of South Australia, and in 1883 governor-general of Queensland.

Musgrave (George Washington), D. D., LL.D., of North Irish and German parentage, b. in Philadelphia Oct. 19, 1804; studied in the College of New Jersey and the Theological Seminary at Princeton, but on account of ill-health did not graduate at either: was licensed to preach in 1828; was pastor of the Third Presbyterian church in Baltimore 1830–52, and of the North Tenth Street church in Philadelphia 1862–68; was corresponding secretary of the Presbyterian board of publication 1852–53, and of the board of domestic missions 1853–61, and again from 1868 to 1870; was a director of Princeton Seminary from 1837, and a trustee of the college from 1859; received the title of D. D. from Princeton in 1845, and of LL.D. from the University of Indiana in 1862; was a staunch Calvinist, a zealous Presbyterian, an able debater, and took a prominent part in healing the schism of 1837–70. D. Aug. 24, 1882. R. D. Hitchcock.

Mush'rooms. The terms *mushroom* and *toadstool* are employed to designate the more conspicuous members of the group of Fungi which have an umbrella-like shape. They belong to the order Hymenomycetes, and principally to the sub-order Agaricini. Mushrooms are popularly supposed to be edible, and toadstools poisonous. This is not, however, true. Strictly speaking, the term "mushroom" should be applied only to *Agaricus campestris*. In this country all other umbrella-shaped Fungi are known under the name of toadstools, and although some are poisonous, many are edible and quite as good as the mushroom, and a very large proportion are certainly harmless. In England a number of species are eaten under the name of mushrooms —*e. g.* St. George's mushroom, horse mushroom—but such of these species as occur in the U. S. are here classed as toadstools from their falsely being supposed to be poisonous.

At the base of the plant, and hidden from sight by the soil, is always to be found an entangled mass of fine threads termed the *mycelium* or "spawn" (Fig. 1, *a*), which is the vegetative portion of the plant. Under favorable circumstances of warmth and moisture this mycelium aggregates at certain centres, and sends up above the ground small roundish bodies called in popular language "buttons" (*b, b*), which rapidly increase in size and assume the shape of an expanded umbrella. The expanded portion has received the name of *pileus* or "cap" (*c*), and the upright stem is designated by the term *stipe* (*d*). When young, the outer edge of the pileus is united with the stipe, but as maturity is approached it breaks away, leaving a thin fibrous connection resembling a cobweb, which takes the name of *veil*. Often a portion of the pileus at its place of attachment with the stipe is left adhering in the form of a ring, termed the *annulus* (*e*). At the base of the stipe is the remains of an old covering, the *volva* (*f*), out of which the upper portion of the plant has grown. On the under side of the pileus are the *lamellæ* or "gills" (*g*), over which is spread the *hymenium* or fructifying surface. The gills are replaced in some toadstools by *pores*, in others by small *teeth*, while still others have the surface *smooth*. Under the compound microscope the hymenium is found to consist of projecting *basidial cells* (*a, a*), upon which are borne the sterigmata (*b, b*), generally to the number of four. At the tip of each of the sterigma is formed a single reproductive body (*c, c*), called a *spore*. By means of the gills, pores, or teeth the hymenium is vastly increased, so that the number of spores produced by a single toadstool is truly immense. How the spores just described are produced has long been a subject of inquiry among botanists, and it is not until the recent researches of Rees* of Erlangen and Van Tieghem† of Paris that any light has been thrown on the subject. According to these observers, the antheridia and oögonia, corresponding to the stamens and pistils of higher plants, are produced on, or in, the ground from the threads of the mycelium. As the result of impregnation, the stipe and pileus, and finally the hymenium, are produced.

FIG. 1.

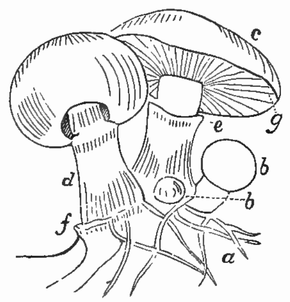
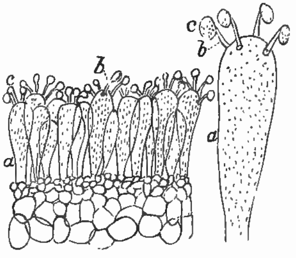


FIG. 2.



The mushroom, *Agaricus campestris*, is a common species of the Agaricini, the first group of the Hymenomycetes (see FUNGI), growing almost everywhere, from the chilling atmosphere of Lapland to the hot climate of the tropics, the Japan islands on the E. to California on the W. It is the famous *champignon* of the French, *pratiola* of the Italians, and was known to the ancients by upwards of a score of synonyms. The fleshy pileus is white in the young state, becoming of a yellowish-brown when mature. It usually grows in clusters and never attains a great size. The ring is present and conspicuous. Though subject to many variations, it is easily recognized by its fleshy pileus, solid stipe, and pink-colored gills, often becoming purple with age. It is the most generally eaten of esculent Fungi, though in Rome and other Italian cities it is condemned as poisonous, and its place is filled by a toadstool which the French people deem unfit for food. The mushroom is used to a great extent as an article of food in France, and especially in Paris, around which city it is largely cultivated; old deserted mining-caves have been appropriated for the purpose, and many miles of mushroom-beds are reached by the aid of ladders and lanterns. They are usually found in the wild state scattered over a rich meadow or pasture in early morning after a warm shower in the night. The mushroom is only one of over a thousand well-defined species of the genus *Agaricus*, at least one-fourth of which are not only harmless, but well worthy the time and care of the market-gardener. Closely related to the mushroom is *A. arvensis*, popularly called "meadow mushroom," from its place of growth. It is larger than *A. campestris*, stronger in flavor, and less esteemed. From its size and coarseness it has in England received the name of "horse mushroom." Specimens are mentioned weighing 14 pounds. It also shares with *Agaricus gambosus* the honorable title of "St. George's mushroom," supposed by the Hungarians, who named it thus, to be a gift of that noble saint. The two species are, however, quite distinct, as *A. gambosus* is stout and fleshy, grows in rings in early spring, with the pileus becoming cracked and giving out a strong and offensive odor. It has gained a good reputation in some parts of France, but its being an early species is the leading element of popularity. The "nail fungus," *A. esculentus*, is the smallest species used for food. The pileus does not exceed an inch in diameter, and is flat and clay-colored. It is found in fir woods, and is used largely in Vienna as a flavor for sauces under the name of *Nagelschwamm*. One of the most poisonous species of the genus is the "fly agaric," *A. muscarius*, so named because the fungus is often steeped and the solution used for the destruction of the house-fly. The pileus is raised upon a long stipe, reaching a diameter of four to six inches, having its bright red surface studded with large white protuberances. It is attractive, and as poisonous as it is beautiful. In Kamtchatka it is highly prized for its poisonous properties, producing as it does in the eater a peculiar intoxication. The fungus is gathered and dried, and when a native wishes to engage in a debauch he has but to swallow a piece, when in a few hours he will be in his glory. Very closely allied to the fly agaric is *A. cæsareus*, though not poisonous and very excellent for food. It can always be distinguished by having yellow gills, while *A. muscarius* has them of a pure dead white. The genus *Coprinus* differs from *Agaricus* mainly in the deliquescent character of the gills. *C. comatus* is the leading esculent species, and commands attention by its singular and graceful form. The whole surface is delicate and silky, the cap tinged with brown at the top and grayish at the base, soon becoming covered with scales. The gills are very close together, and pass in color from pink to brown. These plants should always be gathered before they begin to deliquesce. In the genus *Cortinarius* the veil is composed of arachnoid threads and the spores are rusty. The edible species are few in number. In *Hygrophorus* the main feature is the waxy character of the hymenium. There are three species of culinary importance, the best being the small pure white *H. virgineus*. It is common, and, like the brown *H. pratensis*, is found in open pastures. The members of the genus *Lactarius* are distinguished by the milky juice which exudes from them when bruised. *L. deliciosus* has the orange-colored pileus marked with zones of a darker color. The milk is at first yellow, soon turning green. This species deserves the name *delicious*, as it is sought for and highly prized by all lovers of edible Fungi. *Russula emetica*, as its name would indicate, acts as an emetic to most persons, though a few can eat it with impunity. It should be avoided, and may be distinguished by its rosy pileus, brittle gills, and white stipe dotted with red spots. The genus *Cantharallus* has thick branched gills, with edges blunt and roundish. *C. cibarius* is the beautiful little yellow chanterelle so highly esteemed by the French. It is easily distinguished by its bright golden-yellow color, and odor much resembling ripe apricots. In *Marasmius* the species are characterized by having a dry hymenium, folds thick and tough and acute at the edge. The species are generally quite small. *M. oreades*, from its peculiarity of growing in circles, and the early superstitious belief that these rings had some connection with elfs and goblins, has long been known as the "fairy-ring fungus." These rings are now known to be formed by the spreading out in all directions of a cluster of these plants, the result of the exhaustion of the nourishment directly beneath. It is a very small and common species, and has gained a good reputation among mushroom-eaters as furnishing a delicate dish.

In the second group of the Hymenomycetes, Polyporei, the gills of the Agaricini are replaced by *pores* or tubes. The genus *Boletus* has the pores easily separated, and furnishes a number of esculent species, of which *B. edulis* is the most important. The pileus is smooth and brown, with the tubes at first yellow, becoming green by age. The reticulation of the stem is one of the leading characteristics of the species. It is an inhabitant of the woods, and often attains the dimensions of from six to ten inches across the pileus. The Italians string and dry it for winter use. Some prefer to this the *B. æstivalis*, which is an early summer species. *B. bovinus* is a gregarious species, growing in fir woods, and much sought for as an article of food. The pileus is reddish-gray, sometimes tinged with purple, and the angular tubes are of a grayish-yellow, becoming rusty-brown. *B. luridus* is sometimes eaten without harm, but should not rank among the foremost esculent species. It is common in woods in summer, with a pileus three to six inches broad, and varying in color from a brick-red to brown. The flesh is at first yellow, changing to blue. The genus as a whole is a dangerous one, and the species should be well understood before being used for food. In the genus *Polyporus* the pores are not easily separated, and many of them are without stems. A few species are of worth as articles of diet. *P. giganteus* and *P. intybaceous* are of very large size, sometimes a single individual weighing 40 pounds. They both, like many other species of the genus, grow upon the trunks of trees. In gathering them for food it is best to select the younger species, and use only the inner portion. *P. fomentarius* is touch-wood or "punk," and grows to a great extent on the trunks of dead and decaying trees. The property of its being luminous in the dark has long been known, and is often the subject of much wonder to the young. Amadon or German tinder is a commercial product from this and several other species of *Polyporus*. It consists of slices of the plant beaten out in thin strips and saturated with a solution of nitrate of potash. It is used as a rapid and easy means of starting a fire. The last genus of Polyporei is *Fistulina*, characterized by having the hymenium inferior and a papellated surface when young, which changes into tubes bearing the spores. *F. hepatica*, so named from its resemblance to the liver, is fleshy and juicy, and very appropriately bears the common name of beefsteak fungus. It assumes a great variety of forms, from that of a strawberry to that of a tongue. When cut it resembles a beet-root. It grows upon trunks of trees throughout the summer, and is eagerly sought for and greatly relished by all who know its fine qualities.

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* *Inaugural Dissertation* (Erlangen, Dec., 1874).

† *Sur la Fécondation des Basidioycetes* (*Comptes Rendus*, Feb. 8, 1875).

The third group of the Hymenomycetes is termed Hydnei, in which the leading characteristic is the numerous projecting spines or teeth, over the surface of which the hymenium is spread. The most common edible species is *Hydnum repandum*, found in woods and shady places. The pileus is fleshy, regular, and red-lobed or undulated, spines pale-yellow, stem two inches long. When raw it has a peppery taste and the odor of horse-radish. Less common, *H. coralloides* in its young state much resembles a cauliflower, because of its peculiar branching. It is a tree-inhabiting plant, and esculent, though quite rare. *H. caput-Medusæ*, as its name would suggest, has the branching top of the one just mentioned. Among others used for food are *H. subsquamosum* and *H. rufescens*. The members of the group Clavariei are easily recognized by being club-shaped, fleshy, and branching. Among these are found a number of edible species. The most beautiful colored species is *Clavaria amethystina*. It is of a fine violet color, and is seldom found in large quantities. Dr. Curtis enumerates thirteen species of *Clavaria* eaten in Carolina, but they are generally little known. In the group Tremellini, or the gelatinous Fungi, only one species has received much attention as an article of food—viz. the curious "Jew's ear," *Hirneola auricula-Judæ*. It gets its name from its strong resemblance to the human ear. This species is collected in large quantities in Tahiti and shipped in a dried state to China, where it is used for soup.

It is to be expected that in an article on mushrooms rules will be laid down for distinguishing esculent from poisonous species. There are no short and simple rules that may be taken as infallible guides here, any more than in the higher plants. If any rules are given, they can only be of a general character, having some exceptions. By a careful survey of the whole ground it might be said in a general way: 1st, *avoid bright colors:* this would throw out the highly-prized chanterelle of the French and several other species; 2d, *avoid those that change color when cut or broken;* 3d, *avoid those with a milky juice* (*Lactarius deliciosus* has a milky juice, and is still delicious); 4th, those that *deliquesce should be avoided;* the *Coprinus comatus* is a grand exception to this rule. The safest of all rules is, never to use a fungus about which there is any doubt; this will require a thorough acquaintance with at least a few of the edible species, which will take no more time than to become familiar with the same number of shrubs or trees. Care should also be exercised to gather only the fresh plants, and they should not be allowed to remain a long time before being eaten. Climate and the seasons seem to exert an influence over Fungi as regards their edible qualities. A much larger per cent. of the spring species are edible than those of autumn.

Most Fungi require for their best development a moist atmosphere, with the exclusion of bright sunlight. The common and most successful method of cultivating the mushroom and edible toadstools is to mix fresh horsedung with loam in such proportions as to prevent too violent fermentation, when it is put in long narrow beds of a foot or eighteen inches in height in the centre, into which the mycelium or spawn is placed, and the whole coated over with a layer of loam. These beds are usually protected from the light and drying influence of the sun by low sheds, having the roofs thatched to prevent too rapid evaporation of moisture. A covering of hay or straw is often placed directly upon the beds. (For extended information on this subject the reader can consult Robinson *On Mushroom-Culture* (London, 1870); Cuthill *On the Culture of the Mushroom* (1861). A few of the more important works are: *Abbildungen und Beschreibungen der Schwämme*, Krombholz (Prag, 1831); *Traité sur les Champignons comestibles*, C. H. Persoon (Paris, 1818); *Hist. et Descr. des Champignons alimentaires et venéneux*, F. S. Cordier (Paris, 1836); *Treatise on the Esculent Funguses of England*, Dr. Badham (London, 1863); *British Fungi*, M. C. Cooke; *Illustrations of British Mycology*, Mrs. T. J. Hussey (London, 1855); *Iconographie des Champignons*, J. J. Paulet (Paris, 1855).)

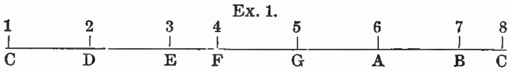
W. G. FARLOW.

Mu'sic [Lat. *musica ;* Fr. *musique*], a succession or combination of sounds arranged with such connection and mutual relation as to express to the ear some distinct form or train of thought, and awaken certain corresponding emotions. Sounds when thus regulated affect the mind through the *ear*, as painting and sculpture under similar conditions affect it through the *eye*. The latter, however, deal with tangible objects, or with ideas formed from material types and their attributes, while the agency of music is limited to certain relations existing between sounds, variously ordered and combined, and the inward springs of emotion. In all time past, and even among the rudest tribes and nations, we find traces of effort to make both the eye and the ear subservient to the stirring up of pleasurable or other feelings. To some such impulse it is most natural to refer not only the production of the rough drawings, chiselings, and carvings often found among tribes and nations of barbarians, but also the varied and persevering attempts of the same untutored races to find gratification for the ear amid the din and clang of their imperfect musical instruments. The results in both cases could not be otherwise than strange in their conception and often marvellous in their ugliness. From this state of primitive rudeness the progress of the finer arts to higher stages of cultivation was not equally rapid. All historical records, and the still existing monuments and relics of antiquity, bear evidence that architecture, painting, and sculpture gradually rose to perfection, while music still remained a subject of dark and confused speculation. For long ages, and even through the most brilliant periods of ancient civilization and intellectual splendor, it was the fate of music to be an enigma defying all solution; and we read of no master-minds springing up to reveal its long-hidden beauties or to discover and systematize its real principles till near the close of the Middle Ages. The music of the present day, both as a science and an art, is therefore a growth of the last three or four centuries; and (with a rapidity equalled only by the rise and advance of Gothic architecture) it has already reached so high a stage of development as seemingly to leave little room for further discovery, either in its scientific, creative, or practical and mechanical departments.

In the present article it is purposed to give in a brief and simple manner a general view or outline of the musical system as now ordinarily understood and received; and as it is presumed that the reader already possesses some elementary knowledge of music, it will be the less necessary to enter into details on NOTATION, SCALE, MODE, and other preliminary matters, concerning which full information will be found under their respective heads in the present work. To several other articles the reader will at times be referred as supplementary to points necessarily stated with brevity in the present article.

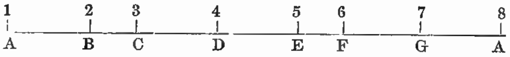
Sounds may conveniently be regarded as either musical or unmusical. This distinction is irrespective of their several qualities as loud or soft, harsh or smooth, etc.; for certain sounds which are essentially musical may nevertheless be painful to the ear, while, on the contrary, others which are strictly *un*musical may have no such unpleasant effect. The radical peculiarity or mark of a musical sound is that it possesses a definite *pitch* (or intelligible grade of acuteness), arising from the number, equality, and permanance of the vibrations given forth by the body from which the sound proceeds. The pitch (*i. e.* the degree of acuteness or gravity) of any such sound is dependent on the rapidity of the vibrations excited by the sonorous body. It is estimated that a string or the column of air in a pipe giving the sound represented by C C C C will make 32 vibrations in a second of time; for the octave above—viz. C C C—the vibrations will be 64, or double the original number; for C C the vibrations are quadrupled in rapidity, being 128 in a second; and so on for the still higher octaves. These various octave sounds differ from each other only in their relative acuteness, just as the letters A, A, A differ only in point of size. The intermediate sounds passed over in rising from one C to another have also their proportionate rates of vibration; and when theoretically considered such intermediate sounds may be almost infinite in number. But for practical purposes the system of music is founded on a select number of these possible musical sounds, forming a scale or series; and it is found, both by experiment and by a certain demand of the human ear, that the degrees or intervals thus selected must follow each other in a certain order, number, and inequality of distance to fit them for musical use. These intervals, counting upward from a root or starting-point, are known as the second, third, fourth, fifth, sixth, and seventh, and they are commonly ascertained by dividing a sounding string into one-half, one-third, one-fourth, etc. of its length, thus gaining all the sounds necessary for the filling up of the octave. (In the article MONOCHORD this process is described at some length, with observations on a few difficulties which arise in the formation of the scale by this method.) The notes or sounds thus obtained are named after the first seven letters of the alphabet, the letters being repeated for each successive octave. In Ex. 1 an octave of this scale (called the *diatonic* scale) is represented according to the order in which the large and small intervals stand to each other:

Ex. 1.



Here it will be seen that in the compass of the octave there are five *whole* degrees or "tones," and two *half* degrees or "semitones," and that in a series commencing on C these two semitones fall between the third and fourth and the seventh and eighth dègrees. It will also be noticed that in the space from the first to the third degree two whole tones are comprised, making a "major" or greater third. All music written on a scale thus constructed is said to be in the *major mode;* and no similar scale can be formed from the notes in their common order by commencing elsewhere than on C. But another series of notes equally well fitted for the expression of musical ideas may be obtained by commencing on A instead of C. In this the positions of the tones and semitones are widely different, as shown in Ex. 2:

Ex. 2.

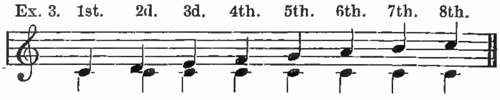


Here the semitones are from the second to the third and from the fifth to the sixth. This kind of scale constitutes the *minor mode,* and in the natural order of the notes it can commence only on A. The minor mode is less perfect than the major, as the whole tone between the seventh and eighth in the *ascending* scale is offensive to the ear, and needs to be raised one semitone higher. But in doing this it becomes necessary to elevate the sixth also. This subject of the modes, with special reference to these peculiarities of the minor, is illustrated in the article MODE, to which we refer the reader.

Thus far we have noticed only the *diatonic* scale, which consists of a mixture of tones and semitones in the order described. But as each whole tone in this scale admits of division into two semitones, we obtain by such a division another form of scale (called the *chromatic*), consisting of a complete series of twelve semitonic intervals in the compass of the octave. The chromatic scale may be variously written, either by the use of flats or sharps. These two scales (the diatonic and chromatic) furnish all the material from which modern music is constructed. However varied, discursive, or even capricious, a composition may be, either in melody or harmony, all its tonal degrees are derived from the simple elements of one or other of these scales. It remains here to be noted that before the rise of the modern system of music several other "modes," different from the major and minor, were in common use. The ancient Greeks recognized three genera of scales and intervals—viz. the diatonic, the chromatic, and the enharmonic, the last consisting of quarter tones. Of these genera, however, the diatonic alone appears to have formed the basis of all the music in actual use, or which was capable of being conceived and performed with any approach to accuracy of intonation. (For a more extended view of the formation and characteristics of the ancient scales the curious reader is referred to the article MODES, ECCLESIASTICAL.)

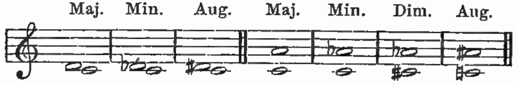
The term "interval" is used to denote the distance of one sound or note from another as reckoned by the degrees of the diatonic scale. Counting upward from any given degree, the intervals and their names are as represented in Ex. 3:

Ex. 3.



Simple intervals are those which lie within the compass of one octave, as those in the example. *Compound* intervals are those which reach beyond the limits of an octave, as the ninth, tenth, eleventh, etc. On the diatonic-chromatic scale the interval of a semitone admits of the distinction of major or diatonic, and minor or chromatic. The *major* semitone is that which involves two different degrees of the scale, as B, C or E, F; but the *minor* semitone has both of its terms on the same degree, as C, C♯, or B, B♭. Each of the other intervals may be various in the number of tones and semitones comprised in it. Thus, a second may be either major, minor, or augmented, and a sixth may be similarly varied, and also diminished, though the notes representing them remain on the same degrees. These differences are created by the elevation or depression of the terms of those intervals by the occurrence of sharps or flats. In illustration of this see at *a* in Ex. 4 the major, minor, and augmented second; and at *b*, the major, minor, diminished, and augmented sixth:

Ex. 4.—*a* *b*

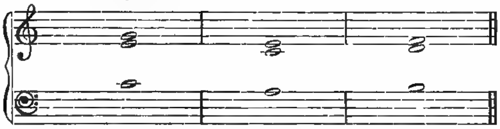


On examining the *contents* of these several intervals it will be found that the minor is one semitone less than the major, the diminished one semitone less than the minor, and the augmented one semitone greater than the major; in other words, the major sixth contains nine semitones, the minor contains eight, the diminished only seven, and the augmented ten. Though all the intervals may thus be subject to modification, and may be viewed in several aspects, yet the unison, octave, fifth (and the fourth as the inversion or complement of the fifth) are those alone which are called "perfect," because they are producible on the scale in only one form, as C C, D D, etc., or C — G, D — A, etc. The only exception is the imperfect fifth, B — F, which, however, is treated as perfect in the progressions of the *minor* scale, as will be seen hereafter. In the article INTERVAL, at Ex. 3, all the intervals of the octave (including also the ninth), as now in use, with their several names, are given in their proper order and relations; a reference to which will save repetition.

Certain names are also given to the intervals within the octave, to indicate their relations to the root, prime, or keynote. Thus, the keynote itself is called the *tonic;* the fifth above is the *dominant;* and the third midway between these is the *mediant.* Similarly, the fifth below the tonic is the *subdominant,* and the third between it and the tonic is the *submediant;* the note immediately above the tonic is called the *super-tonic,* and the interval directly below the tonic is the *sub-tonic* or *leading-note.* Intervals are also classified as consonant and dissonant, fundamental and inverted, etc.; these distinctions will also be found explained in the article INTERVAL.

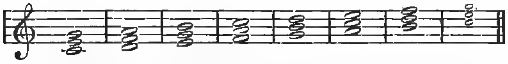
The intervals just enumerated are the elements of all musical compositions. When arranged in a continuous series of single sounds, selected and properly linked together, the composition so made is called a *melody,* and the union of two or more melodies in simultaneous utterance is called *harmony.* The subject of MELODY the reader will find already discussed in this work under its appropriate head, and attention will now be given to that far more intricate and extensive branch of the science which relates to *harmony.* The great primal maxim which forms the basis of the modern structure of harmony is thus expressed by an able writer of the German school: "All musical harmony arises from *two chords,* called the *fundamental concord* and the *fundamental discord,* and from the different uses that can be made of them by *inversion, suspension, anticipation,* and *transition.* And all musical harmony, even the most complicated, if only regular, is reducible to the said *two chords,* the fundamental note of which is called the *fundamental bass.*" These two chords are the *triad* and the *chord of the seventh,* of each of which there are several varieties. From these also spring certain accidental and "anomalous" chords, easily remembered, of which due notice will be taken in their proper places. Any of these chords may be used in a complete or an incomplete form; *i. e.* with *all* their terms or intervals expressed, or with one or more omitted. The *triad,* which we are now to consider, is the first and simplest of the two fundamental chords. It consists of a bass, with its third and fifth, and may be major, minor, or diminished; the first having a major third, the second a minor third, and the last a minor third with a diminished fifth. These three triads are shown in Ex. 5:

Ex. 5.



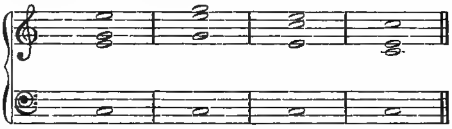
A triad may be built on each of the natural degrees of the scale; and on experiment it will be seen that three of these triads are major, three are minor, and the remaining one is the diminished triad. (See Ex. 6.)

Ex. 6.



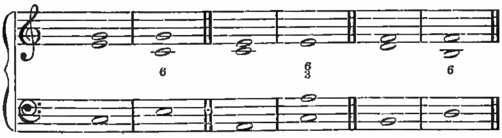
In this normal or original form of the triad the lowest note or term is the root or "fundamental bass;" and so long as this lowest term remains unchanged it is a matter of indifference whether the other terms (the third and fifth) stand in close or dispersed relation to it. One or more of the intervals of a triad may also be *doubled* (either on the unison or the octave), or in certain cases one of the terms may be omitted, as already stated. An illustration of all this, taken from Kollmann, may be seen in Ex. 7, where at *a* the octave of the root is omitted and the third doubled; at *b* the octave is omitted and the fifth doubled; at *c* the fifth is omitted and the third doubled; and at *d* the fifth is omitted and the octave doubled:

Ex. 7.



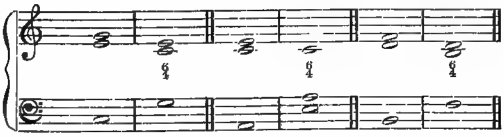
It is not to be understood that in composition all these forms are equally good; and they are here adduced merely to show what changes may take place among the *upper* intervals of the triad while the fundamental bass remains the same. When the root or fundamental bass is no longer the *lowest* term of a chord, but one of the higher terms is substituted for it, the chord is said to be *inverted;* and there can be as many inversions of a chord as there are intervals to change places with the bass. As a triad consists of two such intervals besides the root—viz. a third and a fifth—it follows that it is capable of two inversions. (See INVERSION.) The first inversion of the major, minor, and diminished triads (in which the original third becomes the bass) may be seen at *b, b, b* in Ex. 8, with their respective fundamental forms prefixed at *a, a, a:*

Ex. 8.



As the triad originally consisted of a bass, third, and fifth, it assumes in this inversion the form of a bass, third, and sixth. Hence it is represented by the figures $^{6}_{3}$ or 6. In the second inversion, the original fifth becomes the bass, while the former third makes the interval of a sixth, and the octave of the fundamental stands between them as a fourth, as in Ex. 9, at *b, b, b:*

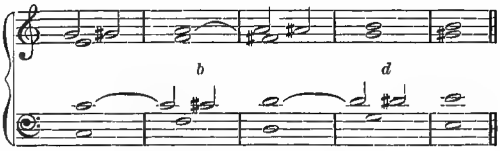
Ex. 9.



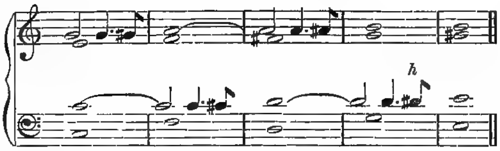
The triad thus inverted is indicated by the figures $^{6}_{4}$. Inversions are not to be confounded, as we have said, with mere "changes of position" among the *upper* parts of a chord. These changes, however various, do not affect the real nature and quality of a chord, or its standing in relation to its fundamental bass. But an *inversion* involves a radical change of that relation, and is productive of new and often far richer effects than those ordinarily attending the uninverted chord. Hence, the large number of inverted chords in all compositions which rise above the rank of the simple choral or the plain ecclesiastical chant. Inverted *triads* have also a property—somewhat analogous to that of the chord of the seventh—of suggesting to the mind an idea of *progress* or continuance; and this oftentimes with such definiteness as to lead the hearer to anticipate, in a measure, the course of the ensuing progression, and to keep his thoughts in a sort of protracted suspense till the harmony brings the ear into repose on some expected turn or cadence. Impressions of this kind are not usually excited by triads in their original form, as each *such* triad has in itself a certain element of finality or conclusiveness, which either disappears or is not sensibly felt when the chord is inverted.

Besides the three *fundamental* triads, there are several others which are termed "anomalous," of which mention has already been made. Among these is the *augmented* triad, which has a major third and an augmented fifth. This augmentation is effected by an accidental sharp or its equivalent; and therefore, as *this* term of the chord is foreign to the diatonic scale, the real origin and nature of the augmented triad admit of a ready explanation. "This triad," says a writer, "is nothing else than the real *perfect major triad,* with a transient semitone added by anticipation to the perfect fifth to render its progression to the note above it more conspicuous." On this theory the augmented triads at *a, b, c,* and *d* in Ex. 10 will appear as mere prolongations of the transient semitones added to the fifths, as shown at *e, f, g,* and *h:*

Ex. 10.

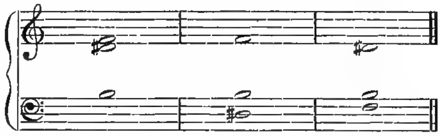


Explanation.



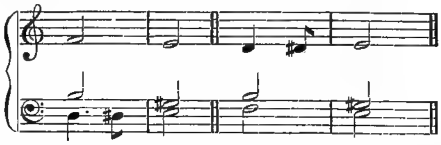
In this triad the elevated fifth becomes a "leading-note" to the succeeding chord, and therefore always *ascends,* as in the example. (See LEADING-NOTE.) The second of the anomalous triads is that which consists of a bass with a major third and diminished fifth. This is a modification of the imperfect or diminished triad, by the accidental elevation of its third from minor to major. (See this chord with its two inversions at *a, b, c* in Ex. 11.)

Ex. 11.



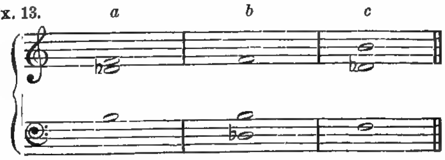
The progression of this altered third is always *upward,* and it is evidently nothing more than a transient "help-note," as shown in Ex. 12:

Ex. 12.



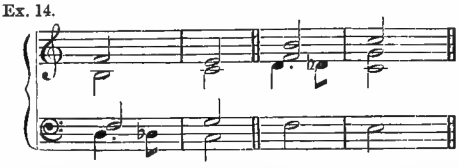
The same explanation will apply to another anomalous triad, formed by the contrary process of *depressing* or flattening the third in the diminished triad. This chord (like the above) belongs to the minor mode, and its inversions resemble the "extreme sharp sixth" both in appearance and progression. Its original form and two inversions are given at *a, b, c* in Ex. 13:

Ex. 13.



The derivation of this chord from mere transient or passing notes will appear from an inspection of Ex. 14:

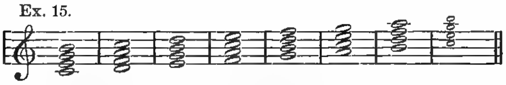
Ex. 14.



In all these "anomalous" triads the altered notes (which constitute their peculiarities) may be restored to their original form by omitting the accidentals, without producing any essential change of the harmony.

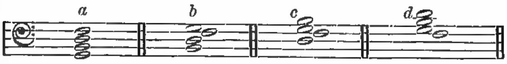
From this review of the triad we now proceed to the *chord of the seventh.* This is formed by adding a third to the triad, thus making it a chord of four parts or terms—viz. a bass, third, fifth, and seventh. As each degree of the diatonic scale may be the basis of a triad (see Ex. 6), so by the addition of a third to each triad we obtain an equal number of chords of the seventh, as will appear from Ex. 15:

Ex. 15.



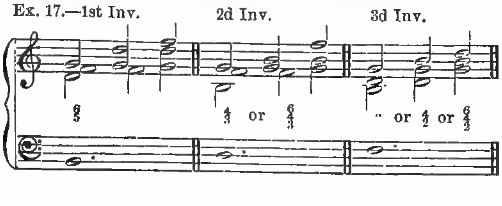
As all these are composed of major and minor thirds variously combined—several of them also being identical in structure—we may classify them thus: (1) that with a major triad and minor seventh—viz. G; (2) those with a minor triad and minor seventh—viz. D, E, and A; (3) that with a diminished triad and minor seventh—viz. B; and (4) those with a major triad and major seventh—viz. C and F. From the ordinary degrees of the scale we have thus four different forms of this chord, which for convenience' sake may be referred to as the sevenths on G, A, B, and C. These four kinds of sevenths are called *fundamental,* but the most important is that founded on the dominant of the key or tonic, as it is not only the most pleasing to the ear, but also the chief agency in the formation of cadences and in digressions from one key to another. All the fundamental sevenths are, for the most part, subject to the same rules and are capable of the same inversions, which are three in number. (The *diminished* seventh has not here been mentioned, as from its very peculiar form and character it is reserved for treatment elsewhere.) In the three *inversions* of the chord of the seventh, the third, fifth, and seventh become successively the bass, and the other parts (including the octave of the root) will stand to the new bass in the order (1st) of a third, fifth, and sixth; (2d) a third, fourth, and sixth; and (3d) a second, fourth, and sixth, as in Ex. 16, where *a* is the fundamental position of the chord, *b* the first inversion, *c* the second, and *d* the third:

Ex. 16.



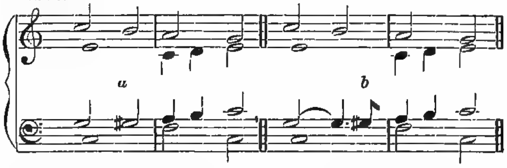
When represented by figures, the first inversion is known as the "chord of the fifth and sixth:" the second, the "chord of the third and fourth;" and the third, the "chord of the second;" these names being derived from the new positions assumed by the intervals of the chord under its several inversions. (See Figured Bass.) The above example is given in "close" harmony to show more clearly the nature of the changes made by inversion. But in each inversion the upper parts may be "dispersed," or taken at greater distances from the bass, without in any way affecting the nature of the inversion itself. (See Ex. 17.)

Ex. 17.—1st Inv. 2d Inv. 3d Inv.



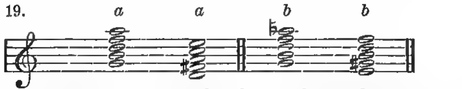
The "anomalous" chords of the seventh are (1st) that consisting of a major third and seventh, with an augmented fifth; for instance, C, E, G♯, and B. By referring to what has already been said of the augmented *triad,* the origin of this chord will be perceived. It is simply one of the four fundamental sevenths, with the fifth transiently raised as a passing note. (See the chord itself at *a* in Ex. 18, and its explanation at *b.*)

Ex. 18.



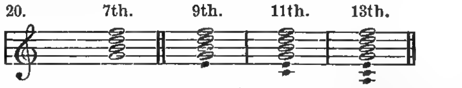
(2d) Sevenths may also be added to the two other irregular triads noted in Exs. 11 and 13; and the elevation or depression of the fifths in such chords by an accidental is to be viewed as a transient change not affecting the fundamental and permanent elements of the chord.—Besides the triads and the chords of the seventh there are three other combinations yet to be noticed, on account of their frequent occurrence and the different theories adopted for their explanation. These are the chords of the ninth, eleventh, and thirteenth. The chord of the ninth differs from the seventh by the addition of a third above. The ninth itself may be either major, as at *a, a* in Ex. 19, or minor, as at *b, b:*

Ex. 19.



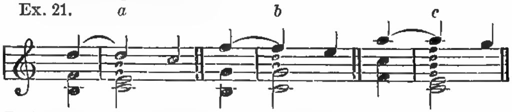
Like the triads and sevenths, the ninth may be inverted, but several of its inversions are harsh, except in rapid movements, and therefore little used. Ordinarily, one (or more) of the middle intervals is omitted, and the effect of the chord is generally more pleasing when thus incomplete. The "chord of the *eleventh*" exceeds the ninth by the addition of another third, and the "chord of the *thirteenth*" extends beyond the eleventh by the addition of still another third. Respecting the origin of these three chords there are two principal theories: first, that of Rameau, under which they are called "chords by *supposition,*" or chords formed by *supposing* one, two, or three thirds added *below* a chord of the seventh. Thus, by supposing a third to be placed below such a chord, the *ninth* is formed; by adding to this another third, we obtain the *eleventh;* and by yet another, the chord of the *thirteenth.* This process is exhibited in Ex. 20, where the thirds thus supposed are marked by black dots:

Ex. 20.



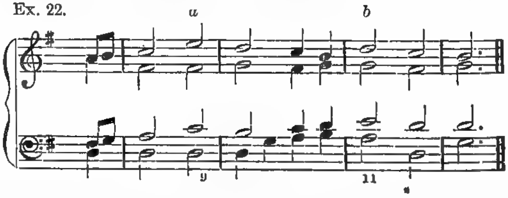
To this system it is objected (1) that there is no apparent reason why those thirds should be supposed at all; (2) that such a theory ignores the natural bearings of the *sound* of the chords in question, and their possible relation to other sounds into which they may be resolved, and offers instead of this a mere mathematical calculation. On the other theory, that of Kirnberger, these chords are not considered as fundamental, but having their origin in *suspensions;* and when so regarded their explanation is rendered both easy and satisfactory. To illustrate this as briefly as possible, we give at *a* in Ex. 21 the ninth as suspension of the octave; at *b* the eleventh as suspension of the tenth; and at *c* the thirteenth as suspension of the twelfth; the dots are merely explanatory:

Ex. 21.



It is to be observed, however, that though these chords have thus their *origin* in suspensions, yet they often occur independently—*i. e.* unconnected with actual or apparent suspensions. (See Ex. 22 at *a* and *b.*)

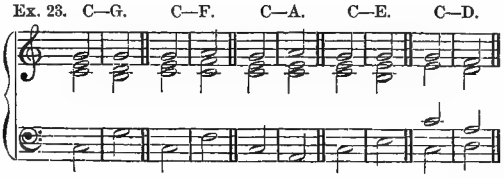
Ex. 22.



In this respect they resemble many other harmonic combinations, which are traceable only to the numerous forms generated by anticipations, transitions, etc.

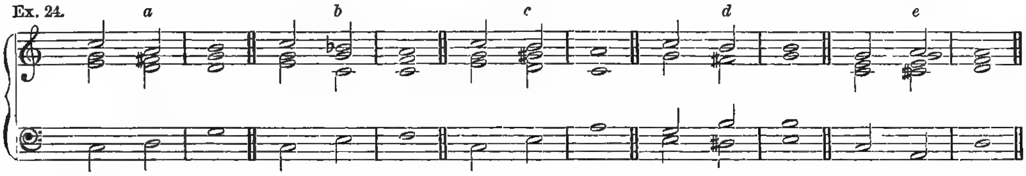
The *progressions* of the fundamental triads and chords of the seventh are next to be noted. "Progression" is the movement from one chord to another more or less related to it. We shall first consider the ordinary progressions of the *triads*. From a major triad (that of C, for example) we may proceed to the triads and inversions of the dominant (G), the subdominant (F), the relative minor (A), the mediant (E), and the super-tonic (D), these being the most nearly-related triads to that of C. (See Ex. 23.)

Ex. 23.



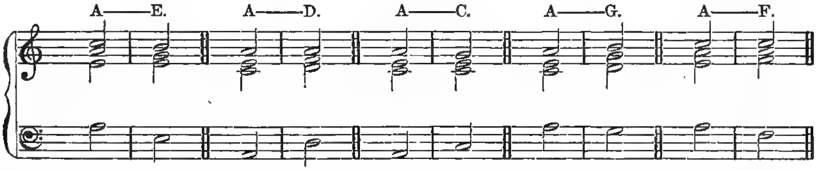
Also to the *leading chords* of these related triads, with or without the seventh, as at *a*, *b*, *c*, etc. in Ex. 24:

Ex. 24.

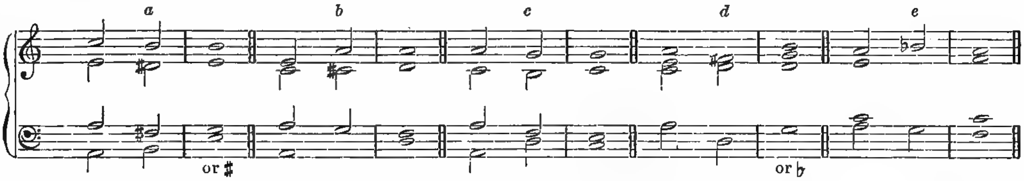


From a *minor* triad we may proceed in like manner, the *order* of the related keys being slightly different. (See Ex. 25.)

Ex. 25.

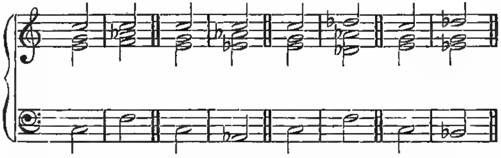


Or thus with leading chords:



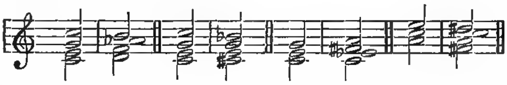
Besides these *natural* progressions, there is another class called the *abrupt*, in which the triad proceeds to chords more or less unrelated or remote. These progressions generally imply the omission of some intermediate chord; and sometimes the first chord is assumed to be not the tonic, but the dominant of its scale. (See Ex. 26.)

Ex. 26.



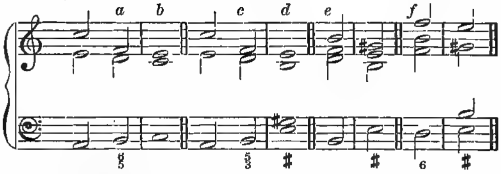
From a triad, either major or minor, we may proceed directly to any chord of the diminished seventh or its inversions, as in Ex. 27:

Ex. 27.



The progressions of the *diminished* (or imperfect) *triad* are peculiar, and require special notice, as the resemblance of that chord to an incomplete chord of the seventh often leads to mistakes. This triad consists of a bass, with a minor third and imperfect fifth. It has its place or seat on the second degree of the minor scale and the seventh of the major. The bass or root is therefore the leading-note in the major scale, and a triad so placed consists of precisely the same notes or intervals as the first inversion of the seventh on the dominant with the root omitted. Hence, such a chord is ambiguous, and its real nature can only be determined by its connection and the harmony immediately following it. This will be apparent from Ex. 28, where the notes at *a* and *c*, though the same, are shown by their progressions at *b* and *d* to be essentially different chords, the first being an incomplete inversion of the seventh, and the other the real diminished triad:

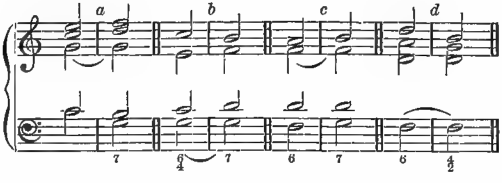
Ex. 28.



The difference between these two chords is evident, as the bass and fifth at *a* in the example cannot be doubled (the one being the leading-note and the other the essential seventh), though either of these intervals may be doubled in the case of the diminished triad, as shown at *e* and *f*. The diminished triad is simply the supertonic harmony in the *minor* scale, and its treatment is in most respects similar to that of the supertonic of the *major* scale.

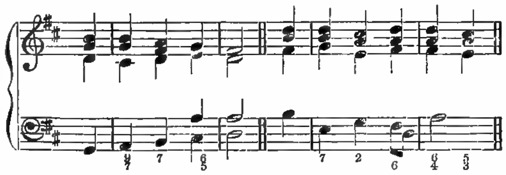
In the progressions of the *chord of the seventh* and all dissonances two points are to be noted—viz. *preparation* and *resolution*. Any such chord is said to be "prepared" when one of its terms (usually the fundamental bass or the dissonant interval) forms a component part of the chord immediately preceding. For illustration under this head and that of resolution we shall take the principal chord of the seventh (G, B, D, F) and its inversions, of which G is the lower term or root, and F the higher. In Ex. 29 the chord of the seventh is thus prepared in the *lower* term at *a* and *b*, and in the *higher* term at *c* and *d*, as indicated by strokes:

Ex. 29.



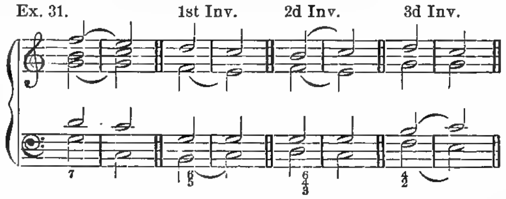
In the strict style of composition this rule was held to be obligatory, except in a very few cases, but in the free style numerous instances of unprepared dissonances occur in the writings of the best composers. Like several other rules which have been modified or abrogated under the advances of modern harmony, that of preparation has lost much of its stringency, and is frequently overlooked in cases where it can add nothing to the clearness or compactness of the harmony. Such instances of unprepared sevenths as the following (Ex. 30) are frequent, and are approved by Albrechtsberger and other theorists:

Ex. 30.



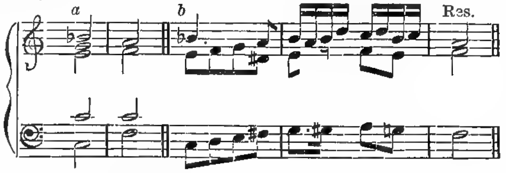
In the *resolution* of the chord of the seventh the general rule is that the third (from the root) moves one degree upward, and the seventh one degree downward, the fifth being unlimited. The fundamental bass also usually rises a fourth or descends a fifth. (See Ex. 31.)

Ex. 31.



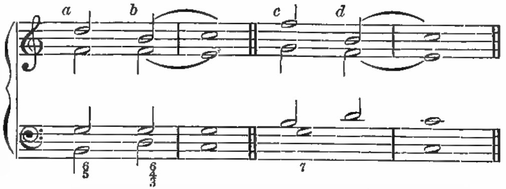
The resolution does not always take place on the very next note, but may be delayed by the intervention of several notes and even extraneous harmonies. (Compare *a* and *b* in Ex. 32.)

Ex. 32.



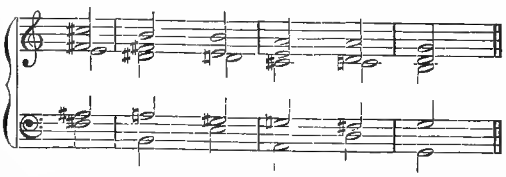
It is not necessary that the resolution should always occur in the *same part* which makes the dissonance, for any part may move from its own to another term of the chord by an exchange of place with some other part; but in all cases the resolution must finally take place. Thus, in Ex. 33 at *a*, the third (or leading note) is in the bass, and the fifth in the treble; but at *b* these two parts make an exchange, and the resolution proceeds accordingly. At *c* the seventh in the treble is transferred to the alto at *d*, and the treble takes the leading-note, which before was in the tenor:

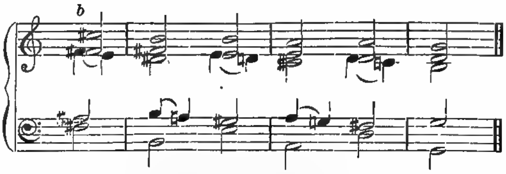
Ex. 33.



A seventh, instead of resolving into the perfect triad, may be succeeded by another seventh, and this also by another, thus forming a train ending with the usual resolution, as at *a*, in Ex. 34. Theorists explain this kind of progression by supposing that the ear perceives a transient resolution after each seventh, which immediately passes into the next dissonance. This is shown by the crotchets at *b* in the example, which make each chord first a triad and then a seventh:

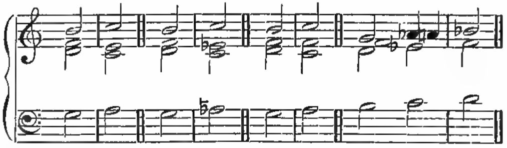
Ex. 34.—*a*





On the same theory of the skipping or omission of some intermediate note numerous other progressions of the seventh are to be explained. Several of these are given in Ex. 35:

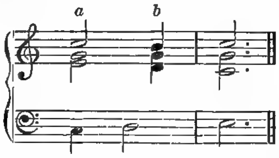
Ex. 35.



That the sevenths may proceed at once, like the triads, to any chord of the diminished seventh, will need no demonstration.

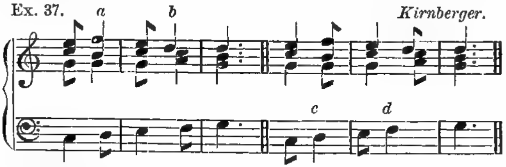
To the chords already described must be added those accidental combinations called *anticipations* and *suspensions*. An "anticipation" is the premature advance of one of the terms of a chord by which it intrudes (as it were) upon the next chord. An instance of this may be seen at *a* in Ex. 36, where the second note of the bass, by moving one crotchet too soon, comes in collision with the triad of C in the upper parts, and *anticipates* the harmony at *b* to which it properly belongs:

Ex. 36.



In Ex. 37, at *a* and *b*, the upper parts make anticipations by moving one quaver in advance of the bass; and at *c* and *d* the bass moves similarly in advance of the upper parts:

Ex. 37.

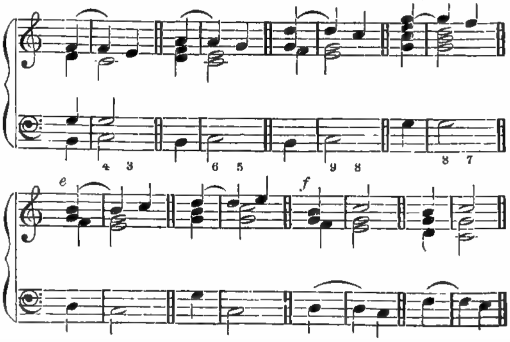


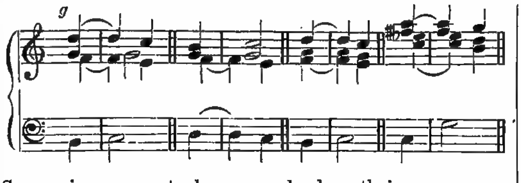
Kirnberger.

Anticipations are for the most part discordant, as they bring a foreign element into the harmony, but in some cases they contribute to the smoothness and elegance of a movement.

Suspensions are the reverse of anticipations. They occur "when one or more notes of a *preceding* chord are carried into a *succeeding* one to which they do not belong." Any one of the intervals of a triad or chord of the seventh (or two or more together) may be suspended. These suspensions are always on the accented part of a bar or note, and are resolved on the unaccented. A note may be suspended either from above or below. Illustrations are given in Ex. 38, where at *a* the third in the upper part is suspended from above by the fourth; at *b* the fifth is suspended by the sixth; at *c*, the octave by the ninth; and at *d*, the seventh by the octave. At *e* the suspensions are from below, and at *f* they occur in the bass. Instances of double, triple, and quadruple suspensions are added at *g*:

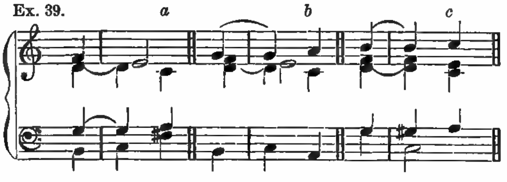
Ex. 38.—*a*





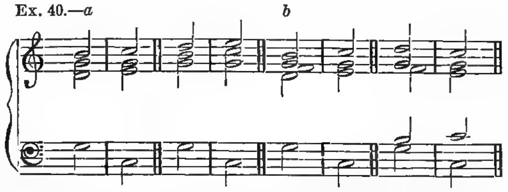
Suspensions are not always resolved on their own proper triads, but another fundamental harmony is substituted, as in Ex. 39 at *a*, *b*, and *c*:

Ex. 39.



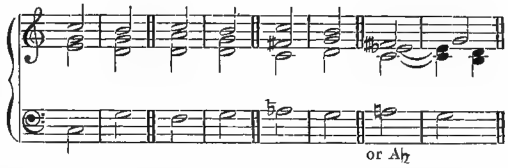
Cadences are terminations, closes, or boundaries of musical ideas. In their simple or radical form they consist of a leading chord and a major or minor triad. Cadences are perfect, imperfect, interrupted, and extended; also medial or final. The *perfect* cadence consists of the triads of the dominant and tonic, or the principal seventh and the triad of the tonic. (See both forms at *a* and *b* in Ex. 40.)

Ex. 40.—*a*



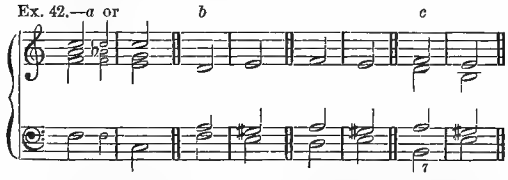
Almost all compositions end with this cadence, as its effect on the ear is final and satisfactory. That it admits of numerous inversions will be understood without examples; but as these inversions are not conclusive, they are seldom used as terminations where there are more than two parts or voices. The *half* or *imperfect* cadence has various forms, all ending not with the tonic but the dominant harmony. They are suitable only for such closes as are not final. (See several forms of the half-cadence in Ex. 41.)

Ex. 41.



The first of the two cadences in Ex. 42 is variously known as the "real imperfect," the plagal, and the ecclesiastical; the second (at *b*), called the "Phrygian," is merely an incomplete form of the ordinary minor progression at *c*, with the fundamental note omitted:

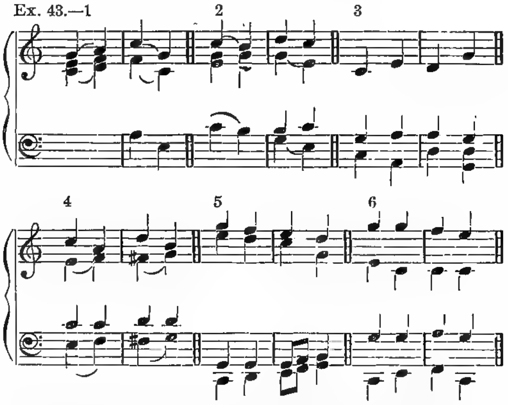
Ex. 42.—*a* or



Interrupted cadences are those in which the leading chord is not followed by that which it naturally suggests, but another more or less foreign to the ear. (See Ex. 35, in which each progression is essentially a cadence of this kind. For examples of the *extended* cadence see the articles FUGUE and ORGAN-POINT.)

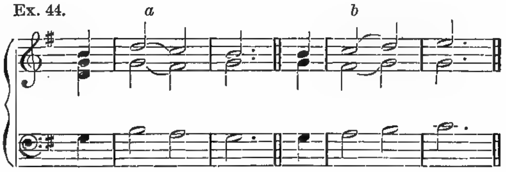
After this general view of chords and their inversions, suspensions, and cadences, we come to their use and treatment in composition, concerning which we here refer the reader to some introductory and historical remarks in the article HARMONY. Preliminary to all study of the use of chords is that of their *duration*, and the mode by which the time of any series of musical sounds is regulated and expressed. On this subject, however, some elementary details have been offered in the article MEASURE, and a more particular exposition will be found under the head of TIME. On the kindred subject of RHYTHM also, of which only a brief notice could here be taken for want of room, a more extended treatment is given under its proper caption. *Counterpoint*, or the harmonizing of a given melody, is the setting of note against note, formerly written in points. *Simple* counterpoint comprises all those compositions, whether plain or florid, in which the parts are not invertible, but fixed. In *double* counterpoint the parts are so constructed by special rules that two or more of them may be inverted, the higher part changing place with the lower. (See the latter part of the article INVERSION.) In simple counterpoint the following general rules are to be observed: (1) Two perfect *fifths* in direct motion and succession, and in the same parts, are usually of bad effect, and should be avoided. (2) Two or more successive *octaves* in the same parts are inadmissible, except in special cases where it is desirable to strengthen the bass or make some idea particularly prominent. (3) As the third is the only discriminating term or element in triads by which we know whether they are major or minor, it should rarely be omitted. (4) Where two or more successive chords contain doubled intervals, care should be taken not to double the *third* when it is leading-note to the next chord, as the result would be consecutive octaves. (5) The two higher and two lower parts in a composition should not be placed at an excessive or disproportionate distance from each other. (6) The same rule applies to passages in dispersed harmony, as the effect is thin and unsatisfactory when the parts are widely separated. Instances of violation of these rules are severally given in Ex. 43:

Ex. 43.—1



The rule respecting consecutive fifths is not violated when the first fifth is perfect and the second imperfect, as at *a* in Ex. 44. In modern music the contrary order frequently occurs, in which the imperfect fifth precedes the perfect, as at *b* in the example:

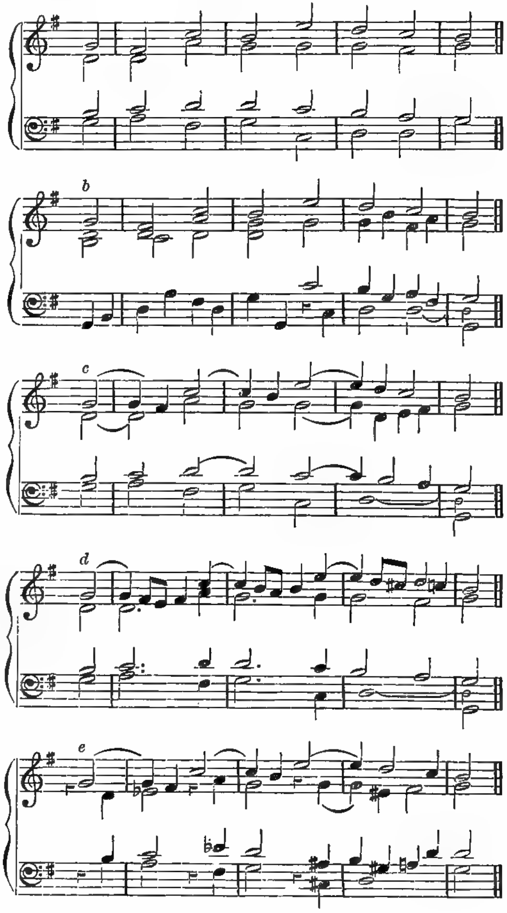
Ex. 44.



Successive fifths are not prohibited when the parts are in *contrary* motion, provided that the texture of the harmony is so woven as not to render them too prominent. Some hints concerning implied or concealed fifths will be found in the article HIDDEN. In free composition the rule of the fifth is so far modified as to admit of numerous exceptions. (See LICENSE.)

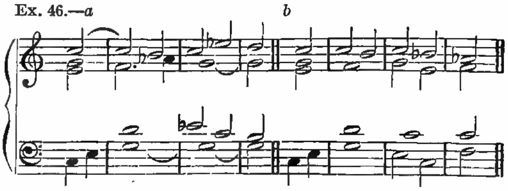
In two-part exercises every triad and chord of the seventh must necessarily be incomplete through the omission of one or more of their intervals or terms. In triads the third (or its inversion, the sixth) should be most frequently used, the fifth less freely, and the octave and unison only occasionally. In chords of the seventh, the seventh itself should rarely be omitted, as the chord would thereby be reduced to a triad. When there are three parts each *triad*, as a general rule, should be complete; and of the *seventh*, the omitted interval may be the fifth, or less frequently the third or the root. In four parts each chord may appear complete in all its intervals. In triads one term will necessarily be *doubled*, either in the unison or the octave, and one of the terms may even be tripled or omitted, as shown already in Ex. 10 and its context. The third and seventh in the chord of the seventh, being its characteristic intervals, should not be doubled unless in exercises of five, six, or more parts, but the doublings should occur on the fundamental bass or the fifth. In harmonizing a plain theme in four parts each part should as much as possible have its own distinct quality, and more or less of a melodious progression. The simplest practical exercises are those having notes of equal length, confined to a single key, and consisting chiefly of triads and the principal chord of the seventh, with their inversions. A short theme thus treated is given at *a* in Ex. 45. (The example is merely elementary, for from such plain forms "simple counterpoint" extends to an area of almost unlimited expansion, freedom, and variety, including compositions oftentimes far more complex and ornate than ordinary exercises in *double counterpoint*.) The first step in the elaboration of the theme in the example is shown at *b*, by the introduction of two notes against one; at *c* and *d* a further advance is made by suspensions and other devices; and at *e* the theme receives additional ornament from chromatic harmony, syncopations, and variations of the time and movement of the parts:

Ex. 45.—*a*



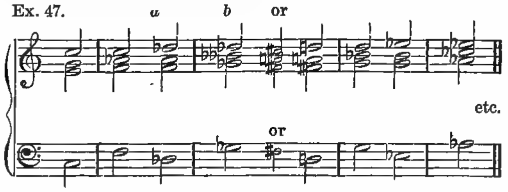
Though a piece of some length may be written in a single key, yet digressions into other keys, near or remote, are ordinarily essential to the beauty and interest of a composition. This passing from one key to another constitutes *modulation;* and it is generally effected by the introduction of the leading-note or the minor seventh of the new key, the former generally requiring an accidental ♮, ♯, or ×, and the latter a ♮, ♭, or 𝄫. Instances of such changes of key or mode may be seen in Exs. 24 and 25. More strictly, however, a modulation occurs only when a regular cadence in some new key is made at the close of a phrase or period. Modulation is of three kinds—viz. *natural, abrupt,* and *enharmonic.* The first of these is illustrated in Ex. 45, and has already been considered in the article MODULATION, which the reader should here consult. *Abrupt* modulations are so called because they proceed to foreign or unrelated keys or modes, and not on account of anything rough or strange in their effect. The simplest kind of abrupt modulation is that consisting of a mere change of *mode,* as from major to minor, or *vice versâ,* while the keynote remains the same. In Ex. 46, at *a,* see a modulation from C major to C minor, and at *b* a change from C major to F minor, where both mode and key are relinquished:

Ex. 46.—*a*



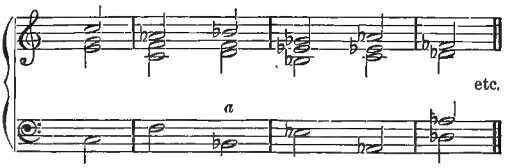
The latter modulation will be found on analysis to consist essentially of the triads of C major and F minor, the first and last notes; and the progression is one which furnishes the key to many developments both curious and important in abrupt modulation. Some of these we shall briefly notice. For instance, the C major triad is the leading chord to the F minor triad, the bass rising a fourth. From the latter triad we may then proceed by ordinary rule to the major triad of D♭, as at *a* in Ex. 47; which triad being treated as a leading chord (like the former C) is followed at *b* by the minor triad of its fourth—viz. G♭ minor (otherwise F♯ minor); and by *repeating* this process continually we may proceed through the whole circle of the keys, as partly shown in the example:

Ex. 47.



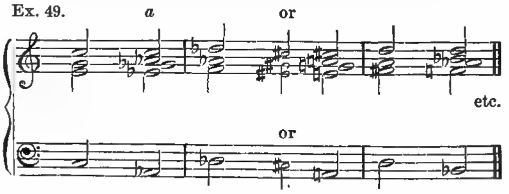
But the progression from the second chord (F minor) may also be to the major triad of B♭, the bass descending a perfect fifth, as at *a* in Ex. 48, on which another chain of harmonies may be formed, thus:

Ex. 48.



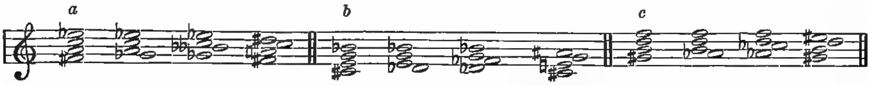
From these suggestions the student will be able to construct many other circular progressions or chains of cadences. In some cases the modulation seems to imply the omission of an intermediate note, instances of which are given in Ex. 26. In this class may be placed the very abrupt but useful progression at *a* in Ex. 49, where the upper note of the tonic harmony (octave of the root) is taken as a *new leading-note* (with or without the seventh), and resolved in the usual manner. Of course, the process may be repeated indefinitely, as in the former examples:

Ex. 49.



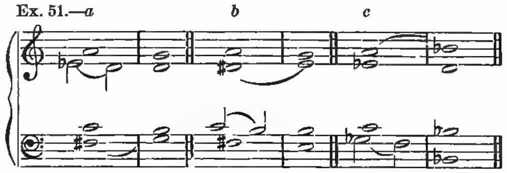
Modulation by *enharmonic changes* is chiefly effected by means of the chord of the diminished seventh. This chord consists of three minor thirds—*i. e.* a minor third, an imperfect fifth, and a diminished seventh. And as a minor third contains only three semitones, it follows that only three different diminished sevenths are possible, for, after building the chord on three successive grades of the chromatic scale, a fourth grade would produce simply a replication or inversion of the first. The peculiarity of this chord lies in a certain mysterious, dreamy, and equivocal quality which for the time so entrances the ear as to involve all sense of key and mode in a sort of bewildering obscurity. Hence the use of this chord in rendering digressions into remote keys both easy and graceful. Its enharmonic quality arises from the circumstance that each of its elements may be regarded and treated as two entirely different notes or intervals—viz. as sharp of the note below, or flat of the note above, or in both cases as natural instead of sharp or flat. Consequently, each of the three diminished sevenths may be written in four or more different ways, according to the key or scale to which they belong. This will be evident on an inspection of Ex. 50, where four various forms of each seventh are given at *a*, *b*, and *c*, respectively:

Ex. 50.



Two other points also are to be observed: 1st, that each of these forms contains a *leading-note* into some particular key; and 2d, that any such form may become the principal (or dominant) *seventh of that key* by dropping another of its terms a semitone lower. (In illustration of this see Ex. 51, which is an exercise on the first of the above sevenths, with the parts distributed.) At *a* the lower term (F♯) is the leading-note, and by dropping the E♭ of the alto to D the chord becomes at once an inversion of the ordinary seventh on D, and resolves into the key of G (either major or minor). At *b* the alto, now written D♯, is the leading-note, and the tenor being lowered a semitone, we have an inversion of the minor seventh on B, which resolves into the key of E. At *c* the upper part is leading-note, and the F♯ of the bass (now become G♭ by enharmonic change) descends a semitone, forming the minor seventh on F, which resolves into the triad of B♭:

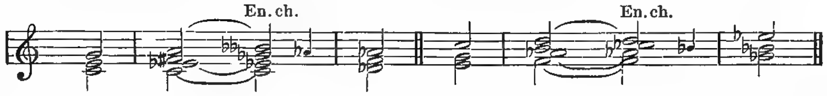
Ex. 51.—*a*



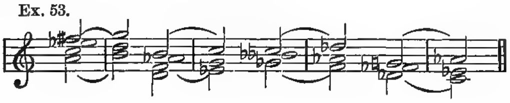
By this simple process we may readily pass from any key to any other (major or minor) without going through a tedious succession of intermediate chords or annoying the ear by a sudden plunge into a foreign scale. To become familiar with this species of modulation it is necessary to keep in mind the distinction between F♯ and G♭, C♯ and D♭, F and E♯, etc., as these two names or forms of expression indicate relations to two different keys. The actual *sound*, however, remains the same, and is in most cases equivocal till the progression decides its character. If, then, we wish to proceed from C major, for instance, to some other key, we select that particular diminished seventh which contains the *leading-note* of such other key; and this will form the link connecting the two keys. Suppose the new key to be D♭ major or E♭ minor: of these, the leading-notes will of course be C and D, and we accordingly select the diminished sevenths in which they are found. By interposing these between the tonic harmony of C and that of the new keys, the modulation is effected at once, because the middle term in each case is on one side related to C, and on the other (by enharmonic change) to D♭ or E♭. (See Ex. 52.)

Though in the examples already given one of the intervals of the diminished seventh is dropped a semitone to make the ordinary minor seventh of the new key, yet this is not really necessary, as this chord often proceeds *directly* to its resolution, as in Ex. 53:

Ex. 52.



Ex. 53.



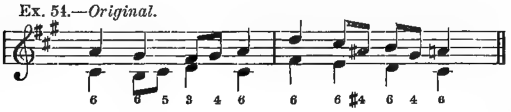
Frequently, also, two or more diminished sevenths occur in succession before the modulation is effected. (For other points more or less pertaining to simple counterpoint see the articles Imitation, Mixed Modes, Mode, Scale, Sequence, Transposition, and Variation.)

Double counterpoint is that species of composition in which the parts or voices are susceptible of *inversion*, the higher part thus becoming the lower, and *vice versâ*. Of such counterpoints there are several varieties—viz. that of the *octave*, when one of the parts is moved an octave higher or lower than its original place, while the other part retains its position; and those of the *tenth*, *twelfth*, etc., in which the inversion takes place at those distances respectively. Each of these varieties has special rules in addition to those of "simple" counterpoint. The intervals of the original composition become thus different by reason of their inversion. For instance, in "counterpoint of the *octave*" the octave becomes a unison, the second a seventh, the third a sixth, etc., as shown in the following scheme:

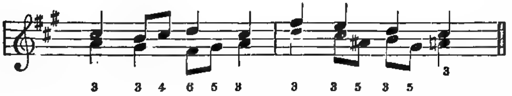
Original, 8 7 6 5 4 3 2 1.
Inversion, 1 2 3 4 5 6 7 8.

This will also be evident on observing the notes and figures in Ex. 54, where the lower part becomes the higher by inversion:

Ex. 54.—*Original.*

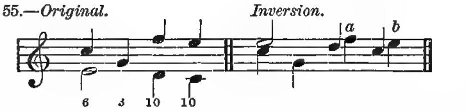


Inversion.



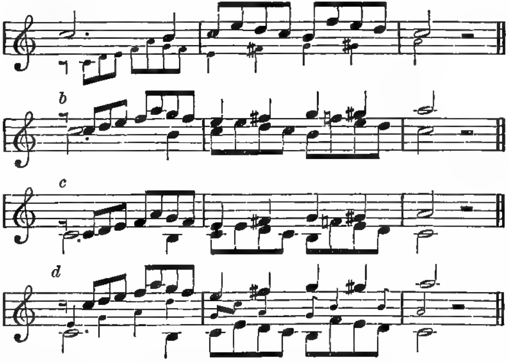
In counterpoint of the *octave* no greater interval than an octave is admissible between the two parts, as every note that exceeds an octave will remain uninverted. This fault will be noticed at *a* and *b* in Ex. 55, where two notes are unchanged in the inversion because they violate the rule:

Ex. 55.—*Original.* *Inversion.*



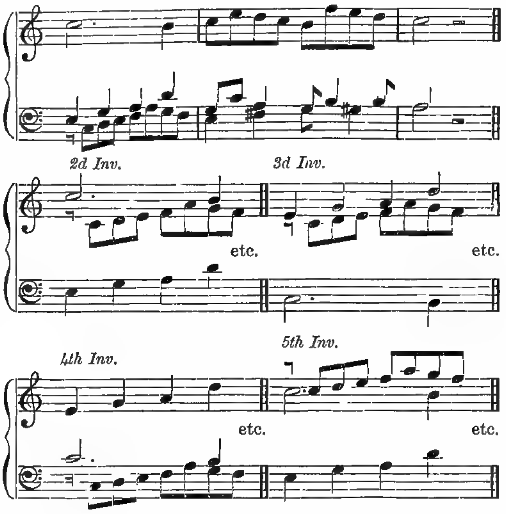
Two perfect fourths in succession are to be avoided, because in the inversion they become two fifths; but two fourths, of which the last is augmented, may be admitted. The two parts should also be various in quality of notes for the sake of distinction. By observing these rules many new and striking effects may be produced from a subject apparently insignificant. To illustrate this very briefly we shall take the following simple theme, and treat it in counterpoint of the octave. In Ex. 56 see the theme at *a*, with an under part in small notes; at *b* is the first inversion, in which the lower part is moved an octave *upward*, thereby becoming the higher; at *c* and *d* are two other inversions, though the first is the only *real* one:

Ex. 56.—*a*



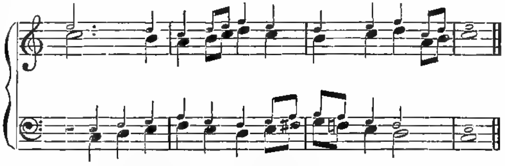
In the latter case, however, the effect is thin and unpleasant, owing to the great distance between the parts. And this very fault suggests another feature—viz. the introduction of a *third* part to fill up the vacant space; which new part we have inserted in small notes. This middle part is also constructed in such a manner as to be capable of inversion like the other parts, and thus several new and beautiful changes may be produced by carrying out the inversions. These inversions are five in number, of which we give the first entire, and the others with only a few notes to indicate the positions which the several parts will assume. (See Ex. 57.)

Ex. 57.—*1st Inversion.*



To afford room for inner parts the inverted part may be set at the distance of *two* octaves, as in the above example and also in the next following.—To a two-part counterpoint of the octave two other parts, consisting *entirely of thirds*, may be added by observing the following rules: (1) The original parts should always proceed by contrary or oblique motion; (2) only thirds, sixths, and octaves should be used on the essential or strong parts of the harmony; (3) if a leading-note occurs in the lower part, and its third above in the higher, the latter must be resolved downward. We may then form two new parts by writing thirds *above* all the notes of the original parts, as in Ex. 58, where the added parts are given in small notes:

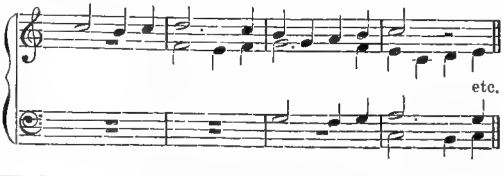
Ex. 58.



The rules for the other counterpoints are in like manner deduced, for the most part, from a comparison of the intervals in the composition before and after inversion. Thus, in counterpoint of the *tenth*, as thirds, fourths, sixths, and tenths become by inversion octaves, sevenths, fifths, and unisons, two of them in succession are not allowable, except in certain cases when such sevenths or fifths are not of the same quality. In counterpoint of the *twelfth*, successive fourths and sixths are forbidden except under similar limitations, as they produce ninths and sevenths in the inversion. To all these counterpoints two middle parts may be added, either as "free" or as parts capable of inversion. And when a composition has four parts of the latter construction, it may be inverted *twenty-three times* by merely arranging the four parts in correspondence with the changes which can be made with the numbers 1, 2, 3, 4—viz. 1, 3, 2, 4—2, 1, 3, 4, etc. Double counterpoint thus throws open a rich field of ideas which would never occur to a composer whose studies had been confined to the simpler departments of harmony.

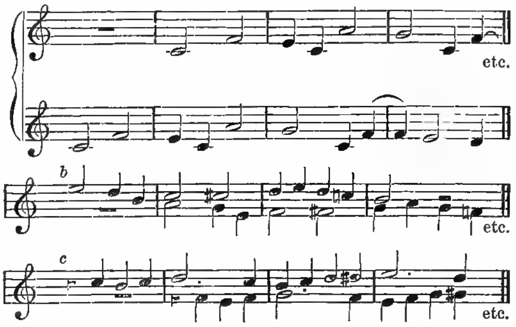
The subject of FUGUE, which comes next in order, has already received attention under its own proper head, and we shall close the present article with a few lines on the nature and structure of *canon*. A canon is a composition in which the several parts are substantially one and the same train of notes, one part commencing, and the others falling in successively at certain prescribed distances, as in Ex. 59:

Ex. 59.



The parts thus formed by mere imitation of the first may be exact repetitions in unison, or less exact by answering in the second, third, fifth, etc. of the original. But in all cases the answer should conform to the theme in motion and in length of notes. "The truest, easiest, and at the same time strictest canons," says Albrechtsberger, "are those in the unison and in the octave; for only on these intervals can the answers correspond exactly as to all the half and whole tones, although those on the fifth and fourth may be made to correspond sufficiently well." In Ex. 60 see the openings of three two-part canons, in which at *a* the answer is in the unison, and *b* in the third below, and at *c* in the fifth below:

Ex. 60.—*a* *Kirnberger.*



Canons are said to be *finite* when provided with a proper termination or ordinary ending. On the contrary, an *infinite* canon is one in which there is no such conclusion, but a constant circular repetition, which is usually terminated by a signal agreed upon by the performers.

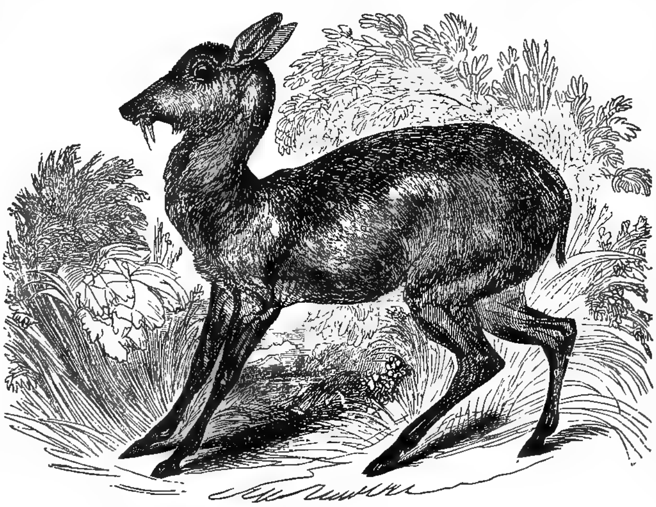
Among the works extant on musical science, embracing both the strict and free schools, the following may here be mentioned: Kirnberger's *Die wahren Grundsätze zum Gebrauch der Harmonie;* Albrechtsberger's *Collected Writings on Thorough-bass, Harmony, and Counterpoint;* Cherubini's *Cours de Contrepoint* and *Marches d'Harmonie;* Reicha's *Traité de Haute Composition* and *Traité d'Harmonie;* Fétis's *Traité du Contrepoint;* Vernevil's *Grammar of Harmony, Counterpoint, etc.;* Coussemaker's *Histoire de l'Harmonie;* Beethoven's *Studien im Generalbass, Contrapunkt, etc.;* Weber's *Theory of Musical Composition;* Mozart's *Succinct Thorough-bass School;* Kollmann's *Essay on Musical Harmony;* and Marx's *Universal School of Music.* WILLIAM STAUNTON.

Mu'sical Boxes, mechanical contrivances for playing tunes automatically, are constructed on the same principle as barrel or hand organs and chimes of bells. The chief parts of the mechanism are the comb, whose metal tongues of different length and thickness give out, when put in vibration, different tones, and a cylinder of brass provided with small steel pins fixed in a certain order, which, when the cylinder revolves, strike the tongues of the comb in a certain succession, and thereby produce a tune. The pins are so arranged that by moving the cylinder forward or backward the same cylinder is able to produce several different tunes; and by changing cylinders modern musical boxes are made to play more than 100 melodies. Automatic musical instruments were produced soon after the construction of clocks, but the invention of musical boxes, properly so called, and their general introduction, belong to the latter part of the eighteenth century. Their construction has since been much improved; the number of melodies which one box can play has been much increased, and bells, drums, castanets, and other accompaniments are often attached to the box. Geneva in Switzerland is one of the principal centres of this branch of manufacturing industry.

Musi'cian, one who understands and devotes himself to the study and practice of music; more particularly, one who has adopted music as his profession or avocation. This term is applicable to three classes of persons—viz. (1) *theorists*, or those conversant with musical science; (2) *composers*, or musical authors, who originate and write music; and (3) *performers*, or practical musicians, who execute, either by instrument or voice, music already written, or that which results from extemporaneous suggestion. There is no necessary connection between the theoretical, the creative, and the practical departments of music. It is quite probable that several of the profoundest theorists, men familiar with the most abstruse and intricate questions relating to canon, fugue, and double counterpoint, were of very limited ability either as composers or performers. On the contrary, it is not uncommon to find performers of very high rank who are so imperfectly acquainted with musical science as to be unable to detect grammatical faults, or even typographical errors, in the music they execute. Composers also of considerable merit and learning are often entirely unskilled in the use of instruments, and are thus in many cases incapable of playing even their own compositions. There are also *un*learned composers—men of strong imaginative powers, refined in taste, and not wanting in invention—who can readily originate musical ideas, which for want of scientific knowledge they are unable to express correctly or even intelligibly in writing. The thorough musician is one who unites in himself the several qualities of the theorist, the composer, and the performer; and it is the union of these in their perfection which constitutes the distinction of those illustrious men familiarly known as great masters. WILLIAM STAUNTON.

Musk [Lat. *moschus*], a concrete, strong-smelling, brownish, inflammable substance extensively employed in medicine and in perfumery. It is brought to market from China, Russia, and Calcutta, and is obtained from a sac beneath the abdomen of the MUSK-DEER, *Moschus moschatus* (which see). The musk-deer ranges from Siberia to Tonquin, but the musk of the warmer regions is by far the best. The musk is produced in a glandular pouch; and when the animal is killed for the sake of this treasure, the musk-bag is carefully removed, so as to defend its precious contents from exposure to the air. When recently taken from the animal, the musk is of so powerful an odor as to cause headache to those who inhale its overpowering fragrance. The affluence of perfume that resides in the musk is almost incredible, for a small piece of this wonderful secretion may remain in a room for a number of years, and at the end of the period will give forth an odor which is apparently not the least diminished by time. The price of musk is very high, and it is in consequence excessively adulterated. Some similarly-smelling animal products (as the perfume of the desman, etc.) are sold for it. The volatile oils of some musky plants, such as *Malva moschata* (Malvaceæ) and *Mimulus moschatus* (Scrophulariaceæ), are found to possess its odor and its medicinal qualities, which are strongly antispasmodic and stimulant. Artificial musk is a yellow resinous substance having the smell and the general properties of real musk. It is obtained by treating rectified oil of amber with strong nitric acid. It is superior to much of the sophiscated musk of commerce, but not equal to the genuine article. It has a limited use in medicine. The drug sambul or sumbul is also a good musk-substitute.

Musk-Deer, the *Moschus moschatus*, a small deer of Central Asia, inhabiting lofty mountain-ranges. It is a timid, active creature without horns, but with tusks, and is much hunted for its yield of MUSK (which see). This is obtained from a postomphalic sac on the male alone. The flesh is esteemed, though that of the male is very rank and musky. According to the natives, the principal use which the musk-deer makes of its tusks is in digging up the kastooree plant, a kind of subterranean bulb on which the musk-deer feeds, and which imparts the peculiar perfume to the odorous secretion. On account of the value of the musk, the animal which furnishes the precious substance is subjected to great persecution on the part of the hunters, who annually destroy great numbers of these active little animals. The native hunters await the season of migration, when the deer are forced to pass into more clement latitudes in search of subsistence, and beset their path with various traps; besides destroying them by missiles. Another member of this group is the kanchil or pigmy musk, which is found in the Asiatic islands, and which is as celebrated for its cunning as is the fox among ourselves. When taken in a noose or a trap, it will feign death; but as soon as it is released from the retaining cord it leaps upon its feet, and darts away before the hunter has recovered from his surprise. (See also MOSCHINÆ.)



The Musk-Deer.

Muskegon, city and R. R. centre, cap. of Muskegon co., Mich. (see map of Michigan, ref. 6–H, for location of county). It has an opera-house, gasworks, 30 large saw-mills, several foundries and machine-shops, planing-mills and dry-kilns, lime-kilns, saw-factory, and a large number of mechanical shops. Lumbering is the chief stimulus to industry. Pop. in 1880, 11,262; in 1884, 17,845.

Mus'ket [Fr. *mousquet*], now known as the arm of the infantry soldier, whether smooth-bored or rifled. (See SMALL-ARMS.) P. V. HAGNER.

Musketoon' [Fr. *mousqueton*], a short-barrelled musket formerly carried by foot-artillery and engineer soldiers; not now made. (See SMALL-ARMS.) P. V. HAGNER.

Muskingum River, the longest stream wholly in Ohio, is formed at Coshocton by the confluence of the Tuscarawas and the Walhonding rivers. Thence it flows, generally S. E., 112 miles to the Ohio at Marietta. Zanesville is on its banks. The river is navigable by slackwater improvements 90 miles to Dresden. It is 225 yards wide at its mouth. Its valley is fertile and beautiful. Its whole course is above the level of Lake Erie. From Dresden to its mouth it falls 130 feet. It flows through a coal-country.

Musk-Ox. See OVIBOS.

Musk-Rat, a name applied in different countries to several small rat-like mammals distinguished by musky exhalations. (1) In North America it is conferred on the *Fiber zibethicus* (by some called also musquash), a rodent of the family Muridæ and the group which contains the field-mice. It is larger than most of the family, being some fifteen inches in length, with a tail of ten inches. It is aquatic, sometimes building houses like those of the beaver, and oftener burrowing in river-banks. It is abundant in many parts of North America. Its fur (the "river sable" of commerce) is extensively sold in Europe. The creature has a strong smell of musk. (2) In India the name is given to the *Crocidura myosurus*, a large rat-like shrew, which possesses and communicates to whatever it touches an intolerable and nearly indelible musk-like smell. (3) It is also applied to the European *Myogale moschata*, or desman, a representative of the family of Talpidæ or moles.

Musk-Wood, the wood of *Guarea grandifolia* and *Moschoxylon Schwartzii*, meliaceous trees of the West Indies whose wood is finely redolent of musk. The name is also given to *Aster* (*Haxtonia*) *argophyllus*, a composite-flowered shrub of Tasmania, sometimes cultivated.

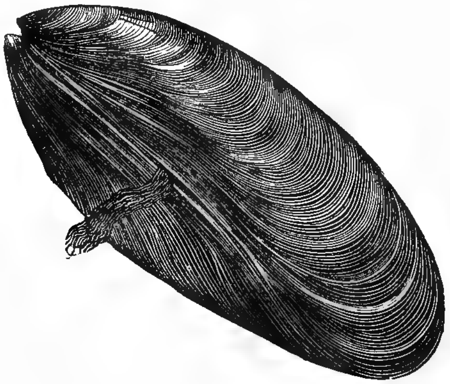
Muslin. See MOUSSELINE.

Musophag'idæ [from *Musophaga*], or **Plantain-Eaters,** a family of coccygomorph birds. The bill is moderately broad at the base, much compressed towards the tip, with the culmen curved, and the tomia or cutting margin of the upper mandible emarginate behind the tip; the nostrils are near the middle of the upper mandible, oval, and exposed; the wings more or less rounded; the tail long, with the feathers broad; the tarsi covered in front with broad transverse scales; the toes four in number, and the fourth versatile or capable of being turned backward, like the first. The family is not distantly related to the Cucculidæ or cuckoos. It is a characteristic African form, a number of species being found in that continent. They are of considerable size, being all more or less larger than the cuckoos. Most of them have crests. Green is a predominant color, and the primaries of the wings have usually a brilliant spot, often of a red color. Fruits are their principal food, and the name of the typical genus is derived from its love for the plantain (*Musa*, the plaintain tree, and φαγεῖν, to "eat"). G. R. Gray has recognized in the family three genera—viz. (1) *Musophaga*, with two species: (2) *Turacus* (= *Corythrix*), with eleven species; and (3) *Schizorhis*, with five species. (See a large folio monograph by Schlegel and Westermann (*De Törakos*) with figures of all the species.) THEODORE GILL.

Mus′pratt (James Sheridan), Ph. D., M. D., F. R. S. E., b. at Dublin Mar. 8, 1821; was educated in Liverpool, where his father established a large manufactory of chemicals; travelled in Germany and France; studied chemistry at Andersonian Univ., Glasgow, in laboratory of Prof. Graham, whom he afterward accompanied to London; became when sixteen years old chemist for a large manufactory of chemicals in Manchester; tried mercantile life in the U. S. without success; studied chemistry under Liebig 1843–45, graduating as Ph. D. at Giessen; made numerous discoveries, chiefly in organic chemistry, more especially concerning the remarkable bodies produced from the sulphocyanides of ethyl and methyl; in 1848 married Miss Susan Cushman, an American actress; founded the Liverpool College of Chemistry, and became a professor there. Among his works are a valuable translation of Plattner on the blow-pipe (1844), *Outlines of Qualitative Analysis* (1849), and a *Dictionary of Chemistry* (1854 *seq.*), which found a wide circulation in both England and America, and was translated into German and French. D. at West Derby Feb. 3, 1871.

Musquash. See Musk-Rat.

Mus′sel, or **Muscle** [Lat. *musculus;* Ger. *Muschel*], a popular name for many conchiferous mollusks. (1) The marine species are chiefly of the family Mytilidæ and genus *Mytilus*, of which there are numerous species of worldwide distribution. The edible mussel of Europe and America, *Mytilus edulis*, is extensively used as food, but is sometimes very poisonous. It is also used as fish-bait. The mussels often contain small pearls. The horse-mussels (genus *Modiola*) are also numerous in species. Like the former, they attach themselves by a byssus. *Modiola modiolus* is a common and valuable bait-fish on our Atlantic coast.



The Mytilidæ, a family of conchiferous mollusks, to which allusion is made above, have the posterior muscle well developed, the anterior small and far forward, and the pedal muscles large; the foot is small, grooved, and byssiferous; the gills two on each side, elongated, and behind united with each other and to the mantle, and the dorsal margins of the outer and innermost laminæ are free; the mantle has its opposite margins free, except behind, where they more or less unite; the labial palpi are elongated, pointed, and free. The shell is variable in form, but the apex is generally more or less approximated to the anterior end, and it has a thickness and often filamentous epidermis; the ligament is internal and sub-marginal; the hinge edentulous. The family includes a large number of genera, with numerous species variously distributed in all the salt waters of the globe, and many are found in the cold and arctic seas. The most familiar genera are *Mytilus* and *Modiola*, including the common salt-water mussels. The Lithodomus (which see), also belonging to this family, is remarkable for its property of boring into stone, and there making its home.

(2) The fresh-water mussels of North America belong to the family Unionidæ, and are extremely numerous. Several species produce fine pearls, and many afford fish-bait. In 1857 a pearl was found in a fresh-water mussel at Paterson, N. J., which was sold for $2200. They are not often if ever eaten. (See Unionidæ.) Theodore Gill.

Mus′selburgh, town of Scotland, county of Edinburgh, at the mouth of the Esk. It has manufactures of sailcloth and leather, and exports much coal. Pop. 7866.

Musset′, de (Louis Charles Alfred), b. at Paris Nov. 11, 1810, and educated in the Collége Henri Quatre; studied first medicine, then law, finally art; was for some time engaged in a banking-office, but devoted himself after 1830 exclusively to literature; was appointed librarian in the ministry of the interior by Louis Philippe and reader to the empress by Napoleon III., and d. in Paris May 1, 1857. His *Œuvres Complètes*, published at Paris in 10 vols. (1865), contain poems, lyrical and narrative, of which *Les Nuits*, first published in the *Revue des Deux Mondes* (1835–37), *Lettre à Lamartine*, and his answer to Becker's German war-song in 1840 ("Nous l'avons eu, votre Rhin Allemand") are the most celebrated; dramas and proverbs, of which *Un Caprice* (1847), *Il faut qu'une porte soit ouverte ou fermée* (1851), and *On ne badine pas avec l'Amour* (1861) belong to the gems of the French dramatic literature; and novels, the most remarkable of which are *Fréderic et Bernerette* (1840) and *Confessions d'un Enfant du Siècle*, which latter called forth the novel by George Sand, *Elle et Lui*, and caused some scandal. Musset made a sensation at his very first appearance in literature in his *Les Contes d'Espagne et d'Italie* (1830) and *Le Spectacle dans un Fauteuil* (1833), but in the beginning he also gave offence. Afterwards he became one of the chief representatives of the romantic school in the French literature, and by his countrymen he was of all living poets the most beloved. He occupied a position in the French civilization similar to that Byron held in the English and Heine in the German. The same passionate though somewhat feverish enthusiasm for the ideal, for all that is great and good, burnt in his genius as in theirs, but he, like them, lacked strength of character to govern the passions and follow the ideals. Hence arose with him, as with them, a skepticism not with respect to the ideals themselves, but with respect to the part they have played and will play in the history of mankind; and thus his enthusiasm for the ideals often turned into satire on the reality. He is nobler than Heine, but he has not Heine's wit; he is more tender and sincere than Byron, but he has not Byron's lofty intellect. With respect to the artistic character of his works, he is much more refined and exquisite than Byron, and he has none of the artificiality and affectation of Heine. His *Œuvres Posthumes*, containing much of interest, were published in 1867.

Mussey (Reuben Dimond), M. D., LL.D., b. at Pelham, N. H., June 23, 1780; graduated at Dartmouth in 1803, at Philadelphia Medical school 1809; practised at Salem 1809–14; professor of physic at Dartmouth 1814–19, of anatomy and surgery 1819–38; professor of surgery in Ohio Medical College 1838–52; held the same chair in Miami Medical College 1852–60, and afterwards resided in Boston, Mass., where he d. June 28, 1866. Dr. Mussey was a bold and remarkably successful operative surgeon. He was the first to tie both common carotids, which he did with success; he also removed with the happiest results (in 1837) an entire scapula and clavicle together, probably the first operation of the kind ever performed. He was a man of remarkable benevolence and of abstemious habits—habits which he followed from principle, and which he strove to have others imitate. He published, besides addresses, *Experiments and Observations on Cutaneous Absorption* (1809), and *Health: Its Friends and its Foes* (1862).

Mussome′li, town of Sicily, province of Caltanessetta. About a mile from the town there is a grand old castle, and in the neighboring fields are found curious remains of ancient dwellings. Pop. in 1874, 8675.

Mus′tang, a name applied to the small wild horses of Texas and to the ponies of the Indian tribes of the S. W. of the U. S., which are of one and the same stock. They are hardy and spirited, but often very fractious unless carefully handled. The mustang is the descendant of horses of Spanish importation. Mustangs associate in large troops, are caught for use by the riata or lasso, and are easily broken to the saddle, though it is often done in a very imperfect fashion.

Mus′tard [Fr. *moutarde*]. There are two principal kinds of mustard, white and black, so designated from the color of the seeds. Black mustard is the seed of *Sinapis nigra*, and white that of *S. alba*, both annual plants of the natural order Cruciferæ, native in all parts of Europe and cultivated in our gardens. Black-mustard seeds are small, globular, of a deep-brown color externally and yellow within. The white are larger, and of a light color externally. Flour of mustard consists of a mixture of the two kinds of seeds, ground and sifted. As sold in the shops, it is generally adulterated with wheat flour and turmeric. Such adulteration is infallibly detected by finding the presence of starch-grains, which are absent in pure mustard. Mustard-seeds are very complex in composition. Both contain a bland fixed oil and a substance called *myrosine*, which, when the mustard flour is moistened with water, determines the decomposition of another principle contained in the seeds, whereby the peculiar pungent, irritant principle is developed which gives mustard its value as a food and medicine. In the case of black mustard this new product is a volatile oil;

with the white, a non-volatile but equally acrid, oily liquid. Mustard flour is a popular condiment, and was known to the ancients. It has also medicinal uses. The moistened flour applied to the skin is a powerful irritant and vesicant, and is much used as a counter-irritant application to relieve internal pains and spasms. Swallowed in any quantity, as a tablespoonful diffused in a tumbler of water, it acts as a prompt non-nauseating emetic, valuable in cases of poisoning from its always being at hand. EDWARD CURTIS.

Mustard, Oil of. See MUSTARD, by E. CURTIS.

Mustel′idæ [from *Mustela*, the name of the typical genus], a family of mammals of the order Feræ or Carnivora, comprising many species, such as the weasels, skunks, badgers, otters, etc. The form is very variable according to the genus, in some, such as the small weasels, the trunk being very much elongated, and in others, such as the gluttons and badgers, being comparatively concentrated and robust; the teeth are adapted to a purely carnivorous diet, the molars of the upper jaw and the last premolar of the upper jaw being typically sectorial, or adapted for cutting. The true molars are reduced in number to one above and two (or, as in *Mellivora*, one) below. The skull exhibits many characters in common; the paroccipital process is closely applied to the auditory bulla; the mastoid process prominent, and projecting outward or backward behind the external auditory meatus; the carotid canal is distinct, and more or less in advance of the foramen lacerum posticum; the condyloid foramen is distinct from the latter; the glenoid foramen is generally well defined; the intestinal canal has no cæcum; the prostate gland is not salient, being contained in the thickened walls of the urethra; Cowper's glands are not developed; the os penis is large. The family in most of the characters thus referred to exhibits affinity decidedly with the bears, raccoons, and allied forms, and not at all with the cats and dogs, agreeing with the last simply in adaptation for carnivorous diet. It contains numerous species, which have been distributed among eight sub-families—viz. (1) Mustelinæ, including the genera *Mustela*—*i. e.* the large weasels; *Putorius*—*i. e.* the small weasels; *Galictus*—*i. e.* the weasels of tropical America; and *Gulo*—*i. e.* the gluttons or carcajou; (2) Melinæ, with the genera *Meles* and *Arctonyx* or Old-World badgers; *Mydous*, or African teledu, and Taxidæ, or American badgers; (3) Mellivorinæ, with its single genus, *Mellivora*—*i. e.* the African and Indian ratels or honey-badgers; (4) Mephitinæ, or the American skunks, including the genera *Mephitis*, *Conepatus*, and *Spilogale;* (5) Ictonychinæ, with the South African genus *Ictonyx* or *Zorilla;* (6) Helictidinæ, with the Asiatic genus *Helictis;* (7) Lutrinæ, with the various genera of fresh-water otters of all parts of the world; and (8) Enhydrinæ, with the genus *Enhydris*, or the sea-otters of the North Pacific. THEODORE GILL.

Mus′ter [remotely from the Lat. *monstrare*, to "show"], in the army and navy, the assembly of officers and men for special purposes, especially for the inspection and payment of the forces and the verification of the returns, called muster-rolls. The muster-in and the muster-out of officers or forces (into or out of the service) are under the direction of special staff officers called commissaries of musters.

Mute, a consonant formed by closer organs than the liquids require, such as *p, f, v, b, m* (a nasal *b*), *t, th, d, n* (a nasal *d*), *s, z, sh, zh, k, gay, ng* (a nasal *gay*). (See LIQUID.)

Mu′tiny was formerly used in a much more comprehensive sense, both in England and in America, than that which is now given to it; thus, in England, it formerly comprised even the so-called crime of speaking disrespectfully of the king and the royal family. At present it is confined to certain offences committed by sailors and soldiers, and subversive of discipline and duly-established authority. The offence is defined by act of Congress of Mar. 3, 1835, and punishment provided for by acts of Congress of Apr. 10, 1806, and Apr. 23, 1800.

Mutis (JOSÉ CELESTINO), M. D., b. at Cadiz, Spain, in 1732; professor of anatomy at Madrid 1757; accompanied the viceroy of Peru to South America as his physician 1760; was the first to distinguish between the varieties of cinchona; became director of the Academy of Natural History at Bogotá, 1790, and d. there in 1808, leaving unfinished a vast work on the *Flora of New Granada.*

Mütter (THOMAS DENT), M. D. See APPENDIX.

Mut′tra, town of British India, in the North-western Provinces, on the banks of the Jumna, in lat. 27° 30′ N. It is built on high and hilly ground, with magnificent flights of steps, adorned with temples, leading down to the river, which is kept sacred by the Hindoos, and annually attracts vast numbers of pilgrims. But the enormous riches which the town formerly contained have been carried away by various conquerors, its fortifications have fallen into ruins, and nothing is left but the steep, narrow, dirty streets, which swarm with sacred apes, parrots, peacocks, and bulls. Pop. 51,540.

Muys′cas, or **Chibchas,** a nation of Indians within the limits of the republic of Colombia, S. A., who at the time of the Spanish conquest numbered between one and two millions, and occupied a rank immediately after the Aztecs and Peruvians in point of civilization. They consisted of three independent nations, whose capitals were respectively Funza, Tunja, and Sogamoso, the latter nation being governed by a high priest. Like the Aztecs and Peruvians, they worshipped the sun in common with many other divinities, and sometimes, though rarely, offered human sacrifices to the solar god, their principal temples being at Suamoz and Leiva. Corresponding in their mythology to the Manco Capac of the Incas was a legendary ancestor named Nemterequeteba, who was regarded as the author of their civilization. They were skilful agriculturists, workers in metal, weavers of cotton, and artificers in bone, wood, and stone; built wooden houses with conical roofs, surrounded by palisades; had a rude commercial currency; buried their dead in caves, and had a week of three days, a month of ten weeks, a year of twenty months, and an age of twenty years. Succession to the chieftainship was in the female line. The Muyscas formerly occupied the whole table-land of Bogotá and Tunja, and held many tribes in subjection. They readily accepted Christianity, and were rapidly fused with the whites, losing their national language about the middle of the last century, though it is still spoken by some tribes on the river Meta. The language had no *d, l,* or *r*, and was of extremely simple structure. (See the grammars of Lugo (1619) and Uricochea (Paris, 1871).)

Muzarabic Liturgy. See MOZARABIC LITURGY.

Muz′zey (ARTEMAS BOWERS), b. at Lexington, Mass., Sept. 21, 1802; graduated at Harvard College 1824, at Cambridge Divinity School 1828; became pastor of Unitarian churches at Framingham 1830, Cambridgeport 1834, Cambridge 1846, Concord, N. H., 1854, and Newburyport 1857, retiring from the latter post 1865. He has written tracts, sermons, essays, Sunday-school volumes, etc.

Myacites, a name originally employed for supposed fossil *Myas*, but subsequently adopted (by Munster in 1840) for a genus of extinct species of the family Anatinidæ. The species are numerous. The genus, according to Week, "probably first appeared during the Triassic epoch, though we are not sure that some of the species usually referred to *Allorisma* from the older rocks are really generically distinct. It seems to have reached its maximum development during the deposition of the Jurassic rocks, and continued to exist until after the commencement of the Cretaceous epoch."

Myc′ale [Gr. Μυκάλη, now *Samsum*], the westernmost branch of Mount Mesogis in Lydia, Asia Minor, terminating in the promontory called Trogylium (now Cape Santo Maria). In the narrow channel between this promontory and the island of Samos the Persian fleet was defeated and destroyed by the Greeks in 479 B. C. It seems probable that at the time of the battle there was a town—Mycale or Mycallessus—at the foot of the promontory, but no certain account of it is extant.

Mycene, or **-næ** [Gr. Μυκήνη, or *κῆναι*], one of the oldest cities of Greece, was situated on a rocky eminence in the plain of Argos, in the Peloponnesus. It was the residence of the Pelopidæ, and at the time of Agamemnon it was the principal city of Greece. In 468 B. C. it was totally destroyed, and it was never rebuilt, but the remains of it, the cyclopean walls, the "gate of lions," and the "treasury of Atreus," are among the grandest and most interesting antiquities in Greece. The ruins are near the little village of *Charvati*, 1 hour and 20 minutes from Argos. (See Leake's *Travels in the Morea* (1830), ch. xx.)

Mycet′inæ [from *Mycetes*—μυκήτης, a "bellower or howler"—the only known genus], a sub-family of South American monkeys of the family Cebidæ, and including the largest species of that group. The distinctive characters are as follows: The cerebrum is contracted backward, the posterior lobes being abbreviated, and scarcely covering the hindmost parts of the cerebellum; the hyoid bone and thyroid cartilage are greatly developed; the former is extended into a sub-globular drum with thin osseous walls, and the larger cornua of the apparatus project backward, the lesser being obsolete; the incisors are vertical. With the modification of the thyrohyal apparatus is connected the power of producing the loud and resonant cries for which the species of the genus are celebrated, and which have obtained for them the name of "howlers." The species are not yet satisfactorily determined, but ten species have been recognized by the latest writer on the group—

John Edward Gray—of which eight have been attributed to Brazil, one to Colombia, and one to Caracas. A species of the genus also extends up into Central America.

THEODORE GILL.

Myeli'tis [Gr. μυελός, "marrow"], inflammation of the substance of the spinal cord. At the beginning of this century nearly all affections of the spinal marrow were classified under the title *myelitis*, but some progress has been made in separating these various diseases. Our knowledge is, however, as yet very imperfect, and in the classification offered below there are doubtless some errors. Forms of myelitis may be best classified, according to the product of the inflammatory process, into softening myelitis, purulent myelitis, hyperplastic myelitis, and degenerative myelitis. The first of these forms, softening myelitis, is closely allied to non-inflammatory softening (from thrombosis, embolism, etc.), and it is probable that future researches will reduce the frequency of its recurrences. After death a small part of the spinal cord, usually a segment involving all its columns and the gray matter, is found softer than usual, or even in a semi-fluid state, reddish or reddish-yellow in color, sometimes white or yellowish. The substance of the spinal marrow is disintegrated, and a microscopic examination shows the presence of altered nerve-fibres and cells, granular bodies, fatty detritus. The symptoms during the life of the patient consist in impairment or loss of the power of motion and of sensibility in all parts of the body below the softened spot. For example, a focus of myelitis in the middle dorsal region will cause paralysis of the lower limbs (paraplegia), and of the bladder and lower bowel; a focus in the upper cervical region will produce palsy of the entire body except the diaphragm. The symptoms may be developed rapidly, with pain and spasm, loss of function being complete in a few days, or during many months the patient complains of increasing numbness, loss of sensibility and power. The prognosis is worse in proportion to the acuteness and to the higher location of the focus. Treatment occasionally arrests the disease, but probably never cures it. (*b.*) Suppurative myelitis is exceedingly rare, and we do not know any symptoms which can serve to distinguish it from any acute myelitis. The purulent matter is collected in the shape of small abscesses, or purulent elements are found diffused among the nervous fibres and cells. (*c.*) Hyperplastic myelitis is relatively common, and is that which gives rise to the various forms of "sclerosis." The initial lesion in these cases is increased activity and volume of the neuroglia or framework of the spinal cord, with consequent wasting of the nervous anatomical elements. Later, products of degeneration appear in the shape of granular and amyloid bodies. The affected portion of the spinal cord is found hardened, like boiled white of egg or soft cartilage; it is grayish or yellowish in color, and presents a translucent instead of the normal dead-white appearance. The microscope shows increased neuroglia, disintegrating nerve-fibres and cells, granular bodies (especially around the blood-vessels), and amyloid bodies. Sclerosis of the spinal cord may be classified, according to its distribution in the organ, into (1) striped sclerosis, which may extend upward and downward in any of the columns—in the posterior columns producing the disease clinically known as locomotor ataxia; in the anterior or antero-lateral columns produce paraplegia, with loss of motion alone or chiefly; in the lateral part of the antero-lateral columns giving rise to contracture of the limbs. There may be (2) a limited sclerosis, involving the several columns and the gray matter at any part of the spinal cord, producing a chronic paraplegia; and (3) nodular (or insular) sclerosis, *sclérose en plaques*, in which the disease affects a number of spots upon or in the spinal cord (and brain), the nodules being distributed in a wholly irregular manner. The symptoms produced by nodular sclerosis are very irregular, depending upon the location of the first and of the largest nodules; there are observed loss of power and sensibility (rare) in the limbs, mental and sensorial symptoms. (*d.*) Degenerative myelitis includes two principal forms: (1) a parenchymatous inflammatory (?) change in nerve-fibres or ganglion-cells; and (2) the changes which occur in the spinal cord in consequence of a lesion in the brain or in the spinal cord. Under the first head are to be classed those changes in the anterior horns of the spinal cord which give rise to paralysis accompanied by wasting of the affected muscles, or to wasting of the muscles primarily; acute, sub-acute, and chronic spinal paralysis (infantile spinal paralysis, spinal paralysis with atrophy in the adult), progressive muscular atrophy, labio-glosso-pharyngeal palsy. The lesion consists in a clouding and granular disintegration of the ganglion-cells of the anterior horns, with some as yet ill-understood change in the substance in which they are imbedded. Occasionally this lesion involves the greater part of the anterior horns in a longitudinal way, and soon leads to death by asphyxia (acute ascending palsy). In some of these forms sensibility is relatively little impaired, in others not at all. The degenerative myelitis which is caused by some other lesion of the nervous centres, consists in wasting of the nerve-fibres and the deposit of numerous amyloid and granular bodies, and some thickening of the neuroglia; it is always in the white columns of the cord, is symmetrically arranged, and is found in the lateral columns when caused by a brain-lesion; when produced by a spinal lesion it extends above the lesion in the posterior columns—below it in the lateral columns. The forms of myelitis last described are closely allied to non-inflammatory degeneration. Any classification of forms of myelitis is at the present day necessarily a provisional one. The treatment of myelitis is exceedingly unsatisfactory; at best a checking or limiting of the disease can be looked for. The fatal issue is brought about by exhaustion (from bed-sores), inflammation of the urinary tract, pulmonary phthisis, or asphyxia. E. C. SEGUIN.

Myensk, town of European Russia, in the government of Orel, on the Zusha. Its thirteen churches, with their many towers, give it a very picturesque appearance; has a lively trade in spirits, soap, hemp, and dried fruits. Pop. 14,159.

My'er (ALBERT J.), b. at Newburg, N. Y., Sept. 20, 1828; graduated at Geneva College 1847; M. D. in the University of Buffalo 1851, and in 1854 was appointed assistant surgeon U. S. army; in 1860 chief signal-officer with the rank of major, serving as such throughout the war (with the rank of colonel Mar., 1863, to July, 1864), and gaining the brevets of lieutenant-colonel, colonel, and brigadier-general. In July, 1866, he was again placed at the head of the signal-office, with the rank of colonel, and in 1870 charged with taking meteorological observations at the military stations and other points in the interior of the continent, and giving notice by telegraph or signals on the northern lakes and seaboard of the approach and force of storms; and in 1873 was authorized to extend his posts of observation to such lighthouses and life-saving stations as suitable. Author of *Manual of Signals for the U. S. Army and Navy* (1868). D. at Buffalo, N. Y., Aug. 24, 1880.

Myers (EDWARD HOWELL), D. D., b. in Orange co., N. Y., June 9, 1816; taken to Florida before it was transferred from Spain to the U. S.; graduated at Randolph-Macon College, Va., in 1838, under Dr. Garland; in 1839 was elected tutor in the Georgia Conference Manual-labor School, and in 1840 tutor of mathematics in Emory College, Ga.; joined the Georgia Methodist Episcopal conference in 1841; in 1845 was elected to the chair of natural science in Wesleyan Female College, Macon, and president in 1851; in 1854 was elected editor of the *Southern Christian Advocate;* in 1871 resumed the presidency of Wesleyan Female College, but resigned in 1874 to take charge of Trinity church, Savannah; was an efficient member of the General Conferences of 1858, 1866, 1870; has published some valuable pamphlets, etc., and *The Disruption of the M. E. Church, 1844-46.* T. O. SUMMERS.

Myers (Rev. LEWIS), b. in South Carolina May 7, 1775; entered the ministry in the South Carolina Methodist Episcopal conference in 1799. At his death (in Georgia Nov. 16, 1851) he was an honored patriarch of the Georgia conference. He was in the front rank of the heroic pioneers of Methodism in the South. T. O. SUMMERS.

Myers (MORDECAI), b. at Schenectady, N. Y., May 1, 1776, was educated in New York, and resided for some years in Richmond, Va. In 1812 he joined Gen. Wilkinson's expedition to Canada, and was severely wounded in the battle of Chryslar's Field, but recovered, and fought with distinction to the end of the war. He represented New York for six years in the State legislature and was twice mayor of Schenectady, where he d. Jan. 20, 1871.

Myers (PETER HAMILTON), b. at Herkimer, N. Y., in Aug., 1812; is author of several successful novels upon American subjects, among which are *The First of the Knickerbockers* (1848), *The Young Patroon* (1849), *The King of the Hurons* (1850), *The Prisoner of the Border* (1857), and a volume of poems, *Ensenore, a Romance of Owasco Lake.* He was for some years a lawyer at Brooklyn, and subsequently settled at Auburn, N. Y.

Myia [Μυῖα], daughter of the celebrated Pythagoras and Theano, and wife of Milo of Crotona, was, like her mother, distinguished in philosophy. There is extant a letter ascribed to Myia, addressed to one Phyllis, on the choice of a nurse; it is printed in the *Fragmenta Mulierum Græcarum* of J. C. Wolf (Göttingen, 1739). (See Ménage, *Hist. Mul. Philos.*, § 86.) H. DRISLER.

Myliobat'idæ [from the generic name, *Myliobatis*], a family of the class of selachians and order Raiæ, or rays. The disk formed by the union of the pectoral fins with the body is very broad, by reason of the lateral extension of the latter, and the tail is very long and attenuated; the dorsal fin is developed near its root, and behind it is one or a pair of spines serrated at their lateral edges; the pectoral fins are atrophied at the sides of the head, but at the extremity of the snout are developed as a pair of detached cephalic fins; the skin is smooth and destitute of spines; the head quite deep; the mouth inferior and tranverse; the teeth have flat grinding surfaces, and are quadrangular or hexangular, and in one or several interlocking longitudinal rows. The family is divisible into two sub-families—viz. (1) Myliobatinæ, in which, besides a median row of teeth, there are several lateral rows, which alternate and interlock with the adjoining ones, to which belong the genera *Myliobatis, Rhinoptera, Mylorhina*, and *Mylomesus;* and (2) Ætobatinæ, whose teeth are broad and in a single row, answering to the median row in Myliobatinæ, embracing but one genus, *Ætobatis.* On the coast of the U. S. are found several species; on the eastern coast, *Myliobatis Fremenvillei*, *Rhinoptera quadriloba*, and *Ætobatis narinari*, and on the western coast *Myliobatis Californicus.* The *Rhinoptera quadriloba* is sometimes called "clam-cracker," "the stingray," and "cow-nose ray;" the *Myliobatis Fremenvillei*, "sharp-nosed ray," and the *Myliobatis aquila* is in England known as "eagle ray."

THEODORE GILL.

Mylit'ta, the Greek name for BELTIS or BILIT, a goddess worshipped in Babylon, Assyria, and Persia, and corresponding to the Greek Aphrodite.

My'lodon [Gr. *μύλη*, "mill," and ὀδούς, "tooth"], a genus of extinct Quaternary mammals from North and South America, allied to the sloths. (See MEGATHERIIDÆ.)

Mynpuri, town of British India, in the presidency of Agra, on the Esun, an affluent of the Ganges, contains several temples and has 20,891 inhabitants.

Myocon'cha, a genus of fossil shells found in Secondary and Tertiary rocks, and variously assigned to the Cyprinidæ or to the Astartidæ. E. C. H. DAY.

Myopia, mi-o'pe-a [Gr. *μύω*, to "close," and ὤψ, the "eye"], short-sightedness due to excessive convexity of the cornea or to convergence of the visual axes of the eyes. (See SIGHT, DEFECTS OF, in APPENDIX.)

Myox'idæ [from *Myoxus*, the classical name of the genus], a family of the order Rodentia and sub-order Simplicidentati. The skull resembles that of the rat; the infraorbital foramen is moderate, vertically fusiform, and without any external maxillary laminar boundary; the lower jaw has the coronoid and condyloid processes in nearly the same plane with each other and with the descending ramus, which last is scarcely twisted; molar teeth $\frac{4}{4} \times 2$; the hind limbs are moderately elongated; the tibia and fibula united below; the metatarsal bones separate from each other; no cæcum is developed. The species considerably resemble the squirrels in physiognomy, and, as in them, the tail is provided with more or less elongated distichous or laterally spreading hairs, but generally to a less extent than in the typical squirrels. The family is confined to the Old World—Europe, Asia, and Africa—and contains about twelve species, which have been grouped under four sections—viz. *Glis, Muscardinus, Eliomys*, and *Graphiurus*—which by some are regarded as distinct genera, and by others as sub-genera of *Myoxus.* The common dormouse of Europe (*Myoxus avellanarius*) is the best-known species, and is noticeable on account of its hibernating or winter sleep.

THEODORE GILL.

Myria [Gr. *μύριοι*, "ten thousand"], a prefix used in the French metric system to denote ten thousand times the measure indicated by the word to which it is prefixed; as, MYRIAGRAMME, ten thousand grammes, is equal to 22.0462 pounds avoirdupois; MYRIALITRE, ten thousand litres, is equal to 2641.8635 gallons; MYRIAMÈTRE, ten thousand mètres, is equal to 6.2138 miles. (See METRIC SYSTEM.)

Myr'iapods [Gr. *μύριοι*, "ten thousand," and *πούς*, "foot"]. The myriapods, of which the centipedes and thousand-legs are familiar examples, may be recognized by the long, worm-like body, consisting of many segments or rings, each bearing a pair of legs. Though they are true insects, breathing by tracheæ, with a distinct head comparable with that of the winged insects, one genus even (*Cermatia*) having compound eyes, yet the body behind the head is not divided into distinct thoracic and abdominal regions, thus resembling caterpillars and the larvæ of other insects; for this and other reasons they are regarded by some as forming a distinct class of articulated animals, equivalent to the insects. But we shall, for the reasons above given, regard them as forming a subdivision of the class of insects—a sub-class or order, as the reader pleases. This view is borne out by the fact that when hatched the body of the chilognathic myriapods is short, has but few segments, no more than nine (in *Pauropus* only five), besides the head, and but three pairs of legs. On this account they may also be regarded as a subdivision of the true insects, though in *Geophilus*, a chilopod, the young are hatched with nearly the full number of feet. The body is composed of from 9 to 200 segments, the number varying greatly in the different genera; for example, in *Pauropus*, a minute form, the body consists of 9 segments besides the head; in *Lithobius*, the so-called earwig, there are 15, while in *Geophilus* there are 200. How closely the myriapods are related to the winged insects may be seen by a glance at the head of *Cermatia*, the most highly organized myriapod known. The head is larger than usual in the centipedes, and there is a pair of compound eyes, while in all other myriapods they are either scattered and simple or collected into irregular patches, scarcely coming under the head of compound eyes. The antennæ are also longer than usual, and the palpi are well developed, being like those of insects. The head and antennæ of *Scolopendrella* are almost exactly like those of some *Thysanura* (Campodea), while the young *Pauropus* is remarkably like *Podura.* The head is, as in insects, normally composed of four segments, and the appendages of the head have much the same form as in the larvæ of many insects, such as the beetles. The mandibles are of the usual form, the accessory jaws (maxillæ) are provided with palpi, and the second maxillæ (labium) are united and provided with palpi. The legs are, like those of the larvæ of the winged insects, composed of five joints.

The English anatomist Newport has shown that in their internal anatomy—*i. e.* the nervous, digestive, respiratory, and reproductive systems—the myriapods closely resemble the larvæ of many insects. Beginning with the nervous system, the first to be developed of all the systems, Newport states that it approaches in its simplicity that of the higher worms (annelids), rather than that of the larvæ of insects. "In the Chilopoda (centipedes) it has the form of a double cord connected by large ganglia in each segment, as in most of the Annelida, Crustacea, and Insecta; but in the vermiform Chilognatha (thousand legs, etc.), which former researches have proved to me are most nearly connected to the Annelida, the two parts of this double cord are so closely united laterally as to appear like a single cord, that gives off a multitude of small nervous trunks at its sides throughout its whole length, but without distinct ganglionic enlargements at their origin." The brain is composed of at least four pairs of ganglia. (*Newport.*) Our account of the alimentary canal is condensed from Leidy's account of that of *Julus marginatus*, a common American thousand-legs. There are four long tubular salivary glands and two short pyriform conglomerated glands placed on each side of the œsophagus. This latter is pyriform and capacious; the crop (proventriculus) forms nearly half the length of the alimentary canal, its lower extremity constricted into six rings; just beyond, at the extreme end of the crop, open two biliary tubes. The beginning of the stomach is surrounded by a broad fatty band, apparently representing the *rete adiposa* of insects. The stomach forms about one-sixth the length of the whole alimentary canal, and is simple and narrower than the crop. The large intestine begins abruptly, being at first nearly twice the breadth of the ventriculus and narrowing posteriorly. The rectum is short and elliptical.

The circulatory system consists of a dorsal vessel, the so-called heart, with very numerous chambers, nearly corresponding to the segments of the body, and connecting with another system of vessels lying on the under side of the body, between the alimentary canal and the nervous cord, forming "a vascular collar around the anterior part of the alimentary canal." This disposition of the vessels reminds one rather of the circulatory system of the higher worms than of the larvæ of insects, as Newport states. The tracheæ are arranged much as in the winged insects, and the stigmata have the same relative position, but are placed on alternate segments of the body. In the centipedes (Chilopoda) the sexual organs are much as in the six-footed insects, and the orifices are placed at the end of the body. The ovary is a long single tube, which opens in the last ring of the body. In the lower group of Chilognatha (thousand-legs) there is only a single long ovarian tube, provided with two short oviducts, which open on the third segment of the body from the head. The male organs in the centipedes and allies are much more complicated than in the other myriapods, and the two or three, or even the single testicular tube, open on the end of the body, while in the chilognaths, such as *Julus*, there are two testes, which lead out by a *vas deferens* to the orifice situated on the third thoracic ring.

Our *Cermatia forceps*, found in the Middle and Southern States, is poisonous, though its bite is not dangerous. The bite of the centipede is very dangerous—more so, perhaps, than that of the scorpion. The poison is secreted from two glands in the throat, and flows into the wound along a canal in the jaws.

The eggs of *Julus* are laid in the earth about an inch below the surface. The egg undergoes total segmentation, and the primitive band rests on one side of the egg. The first maxillæ do not develop, these organs wanting in the adult. The embryo *Julus* would easily be mistaken for a young *Poduran*, so much alike are the two animals before hatching. It is a curious fact, first observed by Newport, that the egg-shell splits asunder, while the embryo, encased in its embryonal membrane, is retort-shaped, and remains thus for seventeen days before running about. Before this membrane is thrown off the embryo moults, and six new segments appear between the penultimate and last segment. While the *Julus* is at first but six-legged, with but seven body-rings, and passes through a true metamorphosis, the centipede, as observed in *Geophilus* by Metschnikoff, after passing through the early embryonic stages, as in the chilopods, acquires over forty pairs of legs, and is nearly of the form of the adult before hatching. The mouth-parts are much as in the winged insects. The body, cylindrical in the embryo, becomes flattened later in life. Dr. Wood has observed that the female of *Scolopocryptops*, a centipede-like genus, guards her young by lying on her side, and, coiling her body, passes them along by a "rapid cilia-like action of her feet," thus arranging them satisfactorily to herself. Wood also describes the mode of moulting in the same genus of centipedes: "The skin had been crowded back so as to cover only the last two or three rings. The cast skin contains the skin of the head and all its appendages, even to the maxillæ and maxillary palpi. The anterior portion of the skin was so torn as to show that the process of shedding probably began by the creature's withdrawing its head from its case, and then thrusting it out between some of the anterior sterna, completing the process by pushing the skin back with its legs, and aiding them by a peculiar wriggling motion. The exuvia had most of the posterior segments entire, showing that the occupant had been withdrawn from it like a hand from a glove."

The Myriapoda are among the oldest insects known, occurring in the coal formation of Europe and this country. A species of *Julus* occurs in the coal formation of Germany. In Nova Scotia, Dr. J. W. Dawson discovered the remains of a galley-worm, allied to *Julus*, in a stump of Sigillaria, which he described under the name of *Xylobius sigillariæ*. On subjecting the fragments collected by Dr. Dawson to further examination, Mr. S. H. Scudder has found, besides the original species, three other species of *Xylobius*, and the type of a new family which he terms Archiulidæ, the species itself being termed *Archiulus xylobioides*. A very singular myriapod was discovered by Messrs. Meek and Worthen in the Carboniferous formation of Illinois, and described under the name of *Euphorberia armigera*. It is apparently related to the centipedes. Another species of this genus was afterwards found in the coal-measures of Scotland, and named by Mr. H. Woodward *Euphorberia Brownii*. While several of the myriapods are known to be blind, a few blind species are peculiar to caverns in this country; a blind, hairy form, *Spirostrephon Copei* Pack., occurs in the Mammoth Cave; on the other hand, another form, *Scoterpes cavernarum* Cope, found in caverns in Virginia and Tennessee and Wyandotte Cave, Ind., is said to have well-developed eyes. Other eyeless forms are found among the sucking forms (Siphonantia). In these myriapods the head is very small, and concealed beneath the segment behind. The parts of the mouth are fused and united into a sucking-tube for the imbibition of fluids. The most remarkable as well as smallest form is the genus *Pauropus*. Lubbock regards it as a connecting link between the chilopods and chilognaths, and also as bridging over to a certain extent the great chasm which separates them from other Articulata. Our American species is *Pauropus Lubbockii* Pack.

The following is a tabular view of the sub-orders and families of the myriapods, in ascending order:

SUB-ORDER CHILOGNATHA.

Body consisting of double segments, bearing two pairs of legs; antennæ short, with few joints.

1. Head small; mouth-parts forming a sucking-tube: *Siphonantia*.
2. Body cylindrical; sterna very small: *Julidæ* (thousand-legs).
3. Like Julidæ, but body tapering more towards each end; fossil: *Archiulidæ*.
4. Body flattened; sterna overarching the scuta: *Polydesmidæ*.
5. Body very short, half cylindrical, of twelve to thirteen rings: *Glomeridæ*.

SUB-ORDER CHILOPODA.

Each ring simply flat, bearing a single pair of feet; head divided into two regions, one placed before, the other behind the mouth; sexual outlet situated at the end of the body.

1. Body minute, consisting of 9 segments besides the head; antennæ five-jointed: *Pauropodidæ*.
2. Body very long, with from 30–200 segments; no ocelli: *Geophilidæ*.
3. Body with 21–23 feet-bearing segments: *Scolopendridæ* (centipedes).
4. Body with 15 feet-bearing segments: *Lithobiidæ*.
5. Head large, with compound eyes; 15 feet-bearing rings: *Cermatiidæ*.

A. S. PACKARD, JR.

Myrmecobi'idæ [from the generic name, *Myrmecobius*, *μύρμηξ*, "ant," and *βιός*, "life"], a family of marsupial mammals represented in Australia, and distinguished especially by the numerous teeth. The skull has rather slender bones; the auditory bullæ are large; the palatine vacuities are almost obliterated; the intermaxillaries are not united at their symphysis; the lower jaw has very slender and straight rami, and the descending rami points backward. The teeth are very small, and there are I. $\frac{4}{3}$, C. $\frac{1}{1}$, M. $\frac{8}{9} \times 2 = 52$; the molar teeth have slight prickly points or cusps. The animal somewhat recalls by its form that of the rosses and genets (Viverridæ), having a long body and comparatively short legs, and with a long hairy tail; the muzzle is quite elongated, the muffle naked, and the nostrils lateral; the ears are moderately pointed; the tongue is very long and slender; the fore feet have five toes, the hind ones four; the nails are compressed and curved. The female has no pouch; the mammæ (apparently eight in number) are arranged in a circle. A single species is known (*Myrmecobius fasciatus*), which inhabits Western and Southern Australia. Its gait reminds one of the squirrel; when running on the ground it progresses by successive leaps, and carries its tail slightly elevated, and every once in a while raises its body and rests on its hind legs. It is supposed to feed upon ants, and hence the generic name has been conferred upon it. The ground-color is light-reddish, with transverse white and blackish bands behind the middle, and a bridle-like black line runs from the snout through the eyes to the base of the ears.

THEODORE GILL.

Myrmecophag'idæ [from the name of the typical genus, *Myrmecophaga*], a family of edentate mammals including the true ant-eaters of South America. They have a more or less elongated tail; the snout pointed; the feet club-footed (*i. e.* with the external edges turned inward), and provided with large claws for digging; the skull is more or less elongated and smooth; the supraoccipital projects forward, and is provided with a median protuberance; the squamosal bone (with which are ankylosed the periotic and tympanic) has a very small zygomatic process at the antero-superior angle; the supramaxillary bones are elongated; the intermaxillaries very small; the palate is very much elongated by the extension backward of the pterygoids; the nasals are simple, rather long, and nearly uniform in width, and emarginated at the ends; the orbits and temporal fossæ are continuous; "the malar bone reduced to a slender stylet free at the posterior end;" "the postero-palatal foramen single, or wanting;" "the foramen rotundum included in the foramen spheno-orbitarium;" the lower jaw has very slender and elongated rami, which are destitute of coronoid processes. The family is divisible into two sub-families: (1) Myrmecophaginæ, including the genera *Myrmecophaga* and *Tamandua;* and (2) Cyclothurinæ, with the genus *Cyclothurus*. *Myrmecophaga* embraces the great ant-eaters; *Tamandua*, the yellow ant-eaters; and *Cyclothurus*, the small, two-clawed species with prehensile tails. Both the *Tamanduæ* and *Cyclothuri* are arboreal species; the latter is especially so, and has a prehensile tail, by means of which it is able to hang from the branches of trees, and in commemoration of this capability the generic name *Cyclothurus* (*i. e.* "twisted tail") has been given. THEODORE GILL.

Myrmeleon. See ANT-LION.

Myrmid'ones, the followers of Achilles in the campaign against Troy, came originally from Ægina, and received their name from *μύρμηκες*, "ants," because Zeus changed all the ants of the island into men, and thus peopled it. Peleus led them into Thessaly, where they settled.

Myrob'alan [Gr. *μυροβάλανος*], a drug formerly much used in medicine as an astringent, and now used by tanners, dyers, and ink-makers for the tannic acid it contains. Myrobalans, sometimes called white galls, are the fruit of *Terminalia Bellirica* and *T. Chebula* (East Indian trees of the order Combretaceæ), of *Phyllanthus Emblica*, a euphorbiaceous plant, and of other trees of tropical regions. There is much variation in the appearance and industrial value of myrobalans.

My'ron, b. at Eleutheræ, a town in North-western Attica, near the Bœotian frontier, about 480 B. C.; became one of the most celebrated sculptors of antiquity. The most famous of his works were his *Cow*, his *Runner*, and his *Discobolus*, of which there still exist several copies both in bronze and marble. He worked generally in bronze.

Myronic Acid. See MUSTARD, by EDWARD CURTIS, M. D.

Myrosine. See MUSTARD, by EDWARD CURTIS, M. D.

Myrrh [Heb. *mar*, "bitter"], the concrete juice of one or possibly two trees whose botany is not yet entirely certain. One source of myrrh at least is the *Balsamodendron myrrha*, a small tree growing in Arabia. Myrrh is exported from the East Indies, and is in the form of reddish-brown, brittle, resinous lumps, of a fragrant odor and bitter aromatic taste. Its principal constituents are a gum and a resin. Myrrh has been known from the earliest ages, being used as a constituent of incenses, perfumes, and salves. Taken internally, myrrh resembles other acrid resinous substances in tending to correct a feeble, relaxed condition of the mucous membranes, and in small dose to promote digestion and quicken the action of the heart. It is very little used as an internal medicine in this country. Locally, an emulsion of myrrh makes an agreeable mouthwash for spongy gums and sore throat and dressing for indolent ulcers. EDWARD CURTIS.

Myrta'ceæ [from *Myrtus*, one of the genera], an important natural order of exogenous trees and shrubs, of tropical and warm temperate regions, distinguished on the whole, the entire leaves dotted with pellucid glands, containing an aromatic oil, no stipules, mostly numerous stamens, and an inferior compound ovary surmounted by a single style. None are indigenous to the U. S., excepting half a dozen West Indian *Eugenias* and the like on the keys of Florida. Europe has only the classical myrtle in the Mediterranean region. A peculiar portion of the order, embracing a majority of the species, is Australian, conspicuous among which are the "gum trees" and "stringy-bark trees," the genus EUCALYPTUS (which see). Within the tropics the fleshy or berry-fruited genera prevail. The order is important for its useful products, such as CLOVES and ALLSPICE, GUAVAS and ROSE-APPLES, BRAZIL-NUTS (the product of a peculiar sub-order), CAJUPUT OIL, etc., all described under their several heads. The eucalyptus trees furnish one kind of kino, tannin, valuable and rapidly-grown timber, various essential oils, and a febrifuge principle used as a substitute for quinia. Besides the common myrtle, callistemous and several Australian shrubs and small trees are cultivated for ornament. A. GRAY.

Myr'tle [Gr. μύρτος], a genus (*Myrtus*) of trees and shrubs, mostly tropical and evergreen, none North American. The *Myrtus communis*, the common European myrtle, is a fine aromatic shrub whose berries yield a pleasant cordial. The leaves produce an aromatic oil, and water distilled with the flowers is the agreeable perfume known in France as *eau d'ange*. Several tropical species are cultivated. The name is popularly but incorrectly extended to other evergreen shrubs.

My'sia [Gr. Μυσία], an ancient territory of Asia Minor, bordering N. on the Hellespont and Propontis, and bounded S. by Lydia and Phrygia. Among its mountains was Mount Ida; among its rivers, the Scamander, Simois, and Granicus; among its cities, Troja; but its interest is more legendary than historical.

Mysore', an independent state of India under English protectorate, is situated between lat. 11° 35′ and 15° N., and between lon. 74° 45′ and 78° 45′ E., bounded on all sides by the territory of the presidency of Madras. Area, 30,886 square miles. Pop. 3,460,696. It is an elevated table-land, rich in gold-dust and salt, and producing, besides the common Indian grains, pepper, cardamoms, cinnamon, and coffee; but water is often very scarce, and the country is infested with tigers and leopards. In one year (1835–36) no less than 349 tigers, 479 leopards, and 113 bears were killed.

Mysore, the capital of the principality of Mysore, is situated in lat. 12° 19′ N. and lon. 76° 42′ E., at an elevation of 2330 feet above the sea. It is fortified, and contains the palace of the rajah and the residence of the English governor. Its splendid aqueduct has now fallen into ruins, and great trouble is often caused by lack of drinking-water. Carpets are manufactured here. Pop. 54,729.

Mys'teries, Mir'acle-Plays, and **Moral'ities** denote the three earliest stages in the development of the modern drama, and their history forms the history of the modern theatre before its existence as an independent institution in society. The mysteries originated very early, before the ninth century, in the divine service of the Christian Church. They were performed in the church building by the clergy, and treated exclusively biblical subjects. At first they were simply symbolical representations of the biblical narratives, but soon they became complete dramatizations. On Good-Friday the cross was taken from the altar and carried in a solemn procession, with loud lamentations, to a side chapel, where it was deposited as in a grave. Early on Easter morning it was carried back to the altar with hymns of joy and songs of triumph, and thus the crucifixion and resurrection of Christ were symbolically represented. Later, the chapel was decorated as a sepulchre, the young priests were disguised as the Roman guard, the woman who came to anoint the corpse of Christ, the angels who sat at the grave, etc., and the biblical dialogue was expanded into arias, choruses, etc. To a congregation whose members could neither read nor understand the Latin words of the common divine service, and very few of whom had received any regular religious instruction, while all embraced whatever they picked up of the sacred history with passionate belief, these mysteries were an effective means of education—the more so as the impression they made was one of devotion, not of entertainment. But in course of time elements of superstition and amusement, worldly vanities, and even profane jestings, crept in, and in 1210, Pope Innocent III. forbade the performance of mysteries in the churches and by the clergy; in 1225 the Council of Treves confirmed this verdict; and in 1252, Alfonso X. of Aragon enforced the prohibition in his state. Thus abandoned by the clergy, the mysteries were taken up by the citizens. They were removed from the church to the market-place, and here they grew into huge compositions, comprising the whole history of mankind, from the Creation to Doomsday. Immense scaffoldings were erected, divided into three floors, the lowest representing hell, the middle the earth, the uppermost heaven, and the performance generally lasted several days and often required the assistance of more than 1000 people. But by this movement the mysteries changed character, and assumed a form under which they are commonly called *miracle-plays*. They still remained something sacred, something pertaining to religion, but the subject of the representation was now the miracles of God's power, not the mysteries of his grace, and the impression was wonder rather than devotion. The central idea of these plays was the situation of man between God and Satan, and their interest consisted in the realism of the description of the temptations which Satan sent in the way of man, and the magnificence of the picture of the miracles by which God crushed Satan and saved man. Christ was generally impersonated by a priest—Satan by a *homo vagus*, a hired mountebank. What God said was sung by a trio; Christ appeared in a garment of undressed lambskin; Herod and Pilate were dressed as Turks, Satan as a leper; the principal temptation of a woman's life came from the monks, who visited her while her husband was absent on a crusade. Thus, the ideas of the day, not those of the Bible, ruled in the miracle-plays. In the management of these representations there were certain peculiar features which gave rise to new modifications and further development, corresponding to the growth of the spirit of the age. Each act or scene of a miracle-play was represented by a separate corporation or guild, which defrayed all the expenses. The carpenters represented the birth of Christ; the jewellers, the adoration by the kings, etc. Hence, the practice of erecting separate stages for each scene, either movable or fixed, in front of the guild-houses. In the fifteenth century these stages were moved from the streets into the guild-halls, the lives of the patron saints of the respective guilds took the place of the biblical events, allegorical representations of Virtues and Vices were substituted for God and Satan; and the whole ended with a practical moral lesson instead of doomsday. The miracle-play was thus transformed into a morality; and the circumstance that an entrance fee was paid at these performances soon led to the formation of associations which received the exclusive privilege of exhibiting theatrical representations: at which point the modern theatre may be said to have been established. The first organization of this kind was the Confrérie de la Passion, which received a privilege at Paris in 1402. In Oberammergau, in the Bavarian highlands, the Passion-play mystery is still performed by the peasants in old style every tenth year, in consequence of a vow, and attracts a vast number of visitors from Europe and America. The intimate connection once existing between the Church and the theatre has now become completely dissolved; the relation between them is often one of antagonism. In Europe, however, the theatre is often supported by the state on the ground that it is a moral institution. (See OBERAMMERGAU.) (See Onésime Leroy, *Études sur les Mystères* (1838); *Mystères inédits du quinzième Siècle*, by Achille Jubinal (1837); *Deutsche Schauspiele des Mittelalters* (1841); Alt, *Theatre und Kirche* (1854); The

Chester Mysteries (1818); *The Townley Mysteries* (1836); H. N. Oxenham, *Oberammergau in 1871.*)

Clemens Petersen.

Mystic Bridge, Stonington tp., New London co., Conn. (see map of Connecticut, ref. 6–F, for location of county), on the Shore Line R. R. and the Mystic River, opposite Mystic River Village. It has a high school and important shipbuilding interests. Pop. in 1880, 910.

Mystice'te [μύσταξ, "moustache," and κῆτος, "sea-monster" or "cetacean"], a sub-order of cetaceans containing the whalebone whales. The intermaxillaries are narrowed forward, forming only the point of the upper jaw, and are underlaid by the supramaxillaries, which form the entire lateral margin of the jaw; the supramaxillaries are not extended backward from the frontal bones, but produced outward in front of the orbits. The olfactory organ is distinctly developed, and the nasal bones project forward, and are not overlapped at their distal ends. The rami of the lower jaw are simply connected by fibrous tissue, and not by suture. No teeth are functionally developed, for, although present in the fœtus, they are absorbed and disappear before birth; instead thereof plates of whalebone are developed from each side of the axis of the roof of the mouth which project beyond the sides of the jaws. The sub-order includes three families—viz. Balænidæ, including the great bow-head or right whale; Balænopteridæ, including the fin-backs; and Cetotheridæ, whose species are all extinct.

Theodore Gill.

Mys'ticism [Gr. μυστικός, "belonging to secret rites"], in theological usage designates the contemplation of mysteries, especially those relating to divine things, by an internal illumination, either the soul's own or from God. The spiritual nature is released from the shackles of the body, sometimes by overcoming it, sometimes by giving loose rein to it. It is antithetical to reception on authority (*pistis*, "faith"), and to the recognition of truth by the ordinary use of the faculties (*gnosis*, "knowledge"); but in its soberer forms it takes both into its service, holding them in a relative subservience. The Germans distinguish between *Mystik*, the legitimate, and *Mysticismus*, the spurious. Mysticism, whether in the Vedas, in the Platonists, or in the Hegelians, is neither more nor less than ascribing objective existence to the subjective creations of our own faculties, to ideas or feelings of the mind, and believing that by watching and contemplating these ideas of its own making it can read in the world without. (Mill, *Logic.*) In the common use of the term it involves a morbid inclination to the mysterious, a giving play to the fancy in the realm of the supersensuous, and is often a synonym of the vague and senseless. Nevertheless, mysticism, even in its extravagance, has often been but the reaction against more dangerous extravagances, and in its highest and purest forms it has been and will ever be characteristic in some degree of all the deeper religious thinking and feeling of the race. It will furnish again, as it has furnished before, to the heart-sick and yearning a refuge from the unscrupulous ecclesiasticism, the formalism, and superficialism of eras of decline in religious life, or of hollow and noisy attempts at restoring it; and, if incapable of producing reformation, will at least herald its way. It is wholesome to know that there are some to whom the world we see is nothing, and the world we do not see is everything. Mysticism has been classified as theopathetic, theosophic, and theurgic, as philosophical and theological, as the mysticism of feeling or faith, of cognition and of will; and in other ways, for it is, after all, but a longing, and its hues shift in every new light. In its older historical divisions we have mysticism Oriental, Neoplatonic (Pseudo-Dionysius), Christian in the Greek and Latin churches. In the Middle Ages it is represented in Hugo de St. Victor (d. 1141), Herman von Fritzlar, Bonaventura (d. 1274), Ruysbroek (d. 1381), Eckart (d. about 1328), Tauler (d. 1361), Suso (d. 1365), Gerson (d. 1429), Thomas à Kempis (d. 1471), Geiter von Kaisersberg, Catharine of Siena (d. 1380), and others. The grades of mysticism were purification, illumination, ecstatic union, and absorption. It was generally theistic, but in no small number of cases pantheistic; as, for example, in Scotus Erigena (d. 872), Schmid (1825), Pfeiffer (1845–57). Among the modern mystics the most distinguished in the Roman Catholic Church are St. Theresa (d. 1582), Francis of Sales, John of the Cross (d. 1591), Angelus Silesius (d. 1677), Poiret; and in the peculiar type of Quietism (which see), Molinos (d. 1697), Madame Guyon (d. 1717), Fénelon (d. 1715). Among Protestants, Jacob Boehme is the greatest of mystics. In Swedenborg the mystic and rational were in extraordinary equipoise. Modern Mohammedanism has revealed mysticism in the form of Sufism (which see) (Tholuck, 1822–25). Mysticism in the later philosophy was represented in Paracelsus, Bruno, Campanella, and others, and showed itself in the main in attempts to construe physics by the processes of an abstract metaphysics, which dictated to nature instead of learning from her (Carrière, 1847). Jacobi and the whole school of belief in philosophy, and the entire body of theologians who have resisted Rationalism (which see), have been grouped as mystics (Ewald, 1822). (See Heinroth (1830), Helfferich (1842), Goerres (1836–42), Noack (1853), Vaughan (1856), Migne (1858). For a full list of works see Walch, *Bib. Theol. Lib.*, ii. (1178); Danz, *Univ. Wörterb.* (1843); Hagenbach, *Encyklop.* (9th ed. 1874, 94, 248, 255).)

Charles P. Krauth.

Mystic River, New London co., Conn., rises in Ledyard township, and after a course of about 10 miles enters Fisher's Island Sound about 5 miles W. of Stonington. It is navigable for vessels of 400 tons to Mystic Bridge.

Mythol'ogy. It is the most characteristic mark of a myth, properly so called, that nobody knows by whom, or at what time, or under what circumstances it was originated: it is simply what people have always "heard tell," as the primary sense of the Greek word μῦθος is simply "word," "speech." But while, by the time a myth has become recognized as such, it does not command belief, yet at the outset it was quite otherwise. Originally, myths were not told with a shrug of the shoulders, but they were told to be believed, and they were believed by those who told them. To disbelieve in the myths currently accepted was to be an infidel, a heretic, a blasphemer—to draw down upon one's self and one's kindred the vengeance of the gods, or at least the anathemas of society. A myth, therefore, is a story of obscure origin which embodies some belief now become antiquated, or which has its root in some habit of contemplating nature that is now outgrown and perhaps hardly intelligible. A collection of such stories belonging to a particular age or people is called "a mythology," and the science or branch of inquiry which describes, classifies, and interprets them is also called "mythology."

The study of this science, when conducted on proper methods, throws great light on some of the early thoughts of mankind, giving us glimpses of the way in which people reasoned about things before there was any such knowledge of nature as we are accustomed to call scientific. It is only within the present century, however, that the subject has been studied to any purpose, and it is only now that philosophical explanations of the myth-making tendency are beginning to be offered. According to the theory of Euhemeros, still advocated by the Abbé Banier about 100 years ago, a myth is simply a bit of exaggerated or distorted history, and when the supernatural or extraordinary features of the story are stript off we have a residuum of genuine history. Zeus and Wodan, for example, were ancient monarchs or heroes who underwent a *post-mortem* process of deification like the early Cæsars, only with more lasting effect; and Herakles was a stalwart pioneer, addicted to hunting wild animals, who once broke into a garden and stole the oranges which had been guarded by powerful dogs. Such a theory originated, of course, in an age in which historical criticism was unknown. The process of eliminating history from legendary narrative by simply winnowing out the credible parts from the incredible is entirely inadmissible; for in order that a historic narrative be regarded as authentic, it is not enough that the events it contains should be perfectly credible; it is also necessary that they should be attested by contemporary records. The explanation is further contradicted by the myths themselves, which do not describe Wodan and Zeus and Herakles as human beings, but as belonging to a higher sphere of existence: the supernatural or marvellous element, which Euhemerism seeks to winnow out, is really the essential part of the story, without which the remainder would be worthless either as history or as legend. But the Euhemeristic explanation is still more completely discredited by its inability to account for a class of phenomena which were unknown at the time when it was suggested—the substantial identity of the principal mythical personages of Greece and India with each other and with those of Scandinavia, and the diffusion of certain myths all over the world.

The Euhemeristic theory is perhaps worthy of this explicit mention by reason of the great reputation which it once enjoyed and the length of time during which it held its ground. The rival theory, that myths are allegories in which are enshrined profound scientific or philosophical mysteries apprehended by the "wisdom of the ancients," has found its supporters even within the present century; but it may be here passed over without comment, since this and all other arbitrary theories characteristic of the infancy of modern scholarship have been once for all set aside by the results of the application of the comparative method to the myths of antiquity and the primitive beliefs of contemporary savages.

Comparative mythology is the department of study which aims at interpreting the mythical stories of different peoples by comparing them with one another, so that, wherever possible, a story carrying its meaning on its face may throw light upon some parallel story, the meaning of which could not well be detected but for some such comparison. This modern branch of study is primarily an offshoot from comparative philology, and it came into existence as soon as the philological interpretation of the Vedas had proceeded far enough to enable scholars to compare the myths of Greece with those of ancient India. As the Sanskrit language has in most cases preserved its roots in a more primitive form than the other Aryan languages, so in the Rig-Veda we find to some extent the same mythic phraseology as in Homer and Hesiod, but in a much more rudimentary and intelligible condition. Zeus, Eros, Hermes, Helena, Ouranos, and Cerberus reappear as Dyaus, Arusha, Sarameias, Sarama, Varuna, and Çarvara, but instead of completely developed personalities they are presented to us as vague powers, with their nature and attributes dimly defined, and their relations to each other are fluctuating and often contradictory. There is no theogony or mythologic system thoroughly worked out, as in Hesiod. The same pair of divinities appear now as father and daughter, now as brother and sister, now as husband and wife; while every now and then they quite lose their personal shapes and appear as mere elemental forces or vivified phenomena of nature. Coupled with this is the fact that in the Vedas the early significance of the myths has not faded, but continually recurs to the mind of the poet; while in the Homeric poems this early significance is almost entirely lost sight of, save in so far as it may sometimes appear, unknown to the poet himself, to determine the current of his narrative. Looking, then, to the Vedas to see what light they throw upon the true meaning of ancient myths in general, we find that the divinities and heroes of the Vedas usually exhibit themselves plainly as personifications of the great phenomena of nature; and this character is, at the outset, distinctly implied in their names. The name of Dyaus, for example, is derived from the root *dyu*, the same root from which comes the verb *dyut*, meaning "to shine." *Dyu*, as a noun, means "sky" and "day"—that is, "the brightness" or "the bright time." There is a passage in the Rig-Veda where Dyaus is addressed as the Sky, in company with Prithivi the Earth and Agni the Fire; and there are many such passages where the character of Dyaus as the personified sky or brightness of daytime is unmistakably brought out. Here we have a key which opens at once some of the secrets of Greek mythology. So long as there was for the word *Zeus* no better etymology than Plato's guess, which assigned it to the root *zen*, "to live," the real elemental character of Zeus remained undetected. But when it was shown, in accordance with the canons of comparative linguistics, that the word *Zeus* is simply the Greek pronunciation of the same word which the Brahman pronounced as *Dyaus*, it followed at once that the supreme god of Greek mythology was originally the personified sky, and thus was revealed the literal meaning of such expressions as Horace's "sub Jove frigido," and the Attic prayer, "Rain, rain, dear Zeus, on the land of the Athenians and on the fields." The root *dyu* is again seen in *Jupiter*, which is identical with the Sanskrit *Dyaus pitar*, or Jove the Father. The same root can be followed into old German, where *Zio* is also the god of day, and into Anglo-Saxon, where *Tiwsdaeg*, the day of Tiws or Zeus, is the ancestral form of *Tuesday*. Again, in Sanskrit the root *dyu* assumes the form *div*, whence *devas*, "bright" or "divine," and the Lithuanian *diewas*, Latin *deus*, and Greek *theos*, all meaning God. Clearly, then, without the help of the Sanskrit root *dyu*, combined with the character assigned to Dyaus in the Vedas, we should be unable to interpret any of the names belonging to the chief deity of the early Indo-Europeans; but with this clue we not only understand these names, but we also perceive that there was once a time when our ancestors could speak of the bright sky as of a superhuman personality fit to be worshipped. And when the comparison is further extended from the names of the gods to the narratives of their adventures, it becomes apparent, as M. Bréal has shown by his admirable treatment of the story of Hercules and Cacus, that the same mythical ideas, and often the same mythical personages with the same or equivalent names, run through all these webs of popular fancy.

But with all the help thus afforded by philological and literary comparison our conception of the true character of a myth is still incomplete. It is a great step in advance when we are able to say that Zeus was not some apotheosized Cretan king, but the personification of daylight, or when we can trace the legend of Hercules and Cacus back to its more primitive version in the victory of Indra over the Panis. But a further step needs to be taken. What is, after all, the meaning of this way of speaking of the sky as a bright hero and the darkness as a three-headed monster? Is it mere poetical personification or ingenious allegory, or, if not thus explicable, in what peculiarities of ancient culture are we to look for the explanation? The suggestion of allegory or poetic license is not in harmony with the fact that the myths were literally believed. Men do not believe allegories and metaphors. A more plausible explanation was offered by Max Müller in his famous essay on comparative mythology, published in 1856. A myth, he says, is a metaphorical saying of which the metaphorical character has been forgotten, so that it has come to be accepted literally. That is, Dyaus was originally a common noun signifying "sky," and when the old Aryan said "Dyaus rains," he only stated the literal fact that the sky pours down rain. But in later ages, when the Greek had forgotten the meaning of Zeus, the expression "Zeus rains" conveyed the notion that there is a person named Zeus who sends down the rain. And after this manner all mythology grew up. Now, there is no doubt that such a personification as Zeus or Dyaus is enabled to survive until a much later stage of culture when its physical meaning is forgotten than if it were remembered. If it had been remembered that Zeus was but a name for the sky, Zeus would no doubt have lost his godship when people became too cultivated to personify natural phenomena. So far, there is a germ of truth in Müller's theory. But it does not account for the personification of Dyaus in the first place. How did the sky ever get so thoroughly anthropomorphized that people came to forget what its name Zeus originally meant? To this question Müller affords no answer, and in order to understand what mythology is we must go farther. As I have elsewhere said, "The principles of philological interpretation are an indispensable aid to us in detecting the hidden meaning of many a legend in which the powers of nature are represented in the guise of living and thinking persons; but before we can get at the secret of the myth-making tendency itself we must leave philology and enter upon a psychological study. We must inquire into the characteristics of that primitive style of thinking to which it seemed quite natural that the sun should be an unerring archer, and the thundercloud a black demon or gigantic robber, finding his richly-merited doom at the hands of the indignant Lord of light." For the purposes of such an inquiry as this one must take into the account the legends and superstitions of barbarous races. In the quaint but not illogical fancies of uncivilized men we may trace the processes of thought which gave rise to the elemental deities of Olympus and Valhalla, and to the heroes which figure in classic epos or humble fairy-tale.

Strange as old superstitions are apt to seem after they have once been entirely outgrown, there is perhaps no superstition so fantastic that we may not understand how it could once have been believed if we only take the trouble to realize how differently situated the mind of the savage is from our own. It is quite natural to all men, whether savage or civilized, whether illiterate or cultivated, to draw conclusions from analogy, and to imagine intimate relations between phenomena that are in the habit of occurring simultaneously or in close succession. Newton's theory of gravitation was at the outset a case of reasoning from analogy, and so is the notion of the Zulu who chews a bit of wood in order to soften the heart of the man with whom he is about to negotiate a trade. The superior correctness of the scientific conclusion is due to the fact that the civilized man has learned to exclude as preposterous a great many guesses which the barbarian has not learned to exclude. Long ages crowded with experiences have taught us that there are many associations of ideas which do not correspond to any connection of cause and effect among external phenomena; and the same long succession of experiences has permanently established in our minds a great number of associations of ideas with which it is needful that new notions should harmonize before we can accept them. But the savage has had but little of this sort of training in sifting his experiences, and such experiences of the world as he gets are but few, monotonous, and narrow. In his mind that enormous mass of associations answering to what we call "laws of nature" have not been formed, and hence when he tries to reason about what he sees there is little but the most superficial analogy to guide his thoughts hither or thither, and it is inevitable that he should arrive at many conclusions which to us seem quaint or grotesque. To him the visions seen and the voices heard in sleep possess as much objective reality as the gestures and shouts of waking hours. In relating his dream he tells how he *saw* certain dogs or demons, or *fought with* certain dead warriors, last night, and the implication, both to himself and to his hearers, is "that his *other self* has been away, and came back when he awoke." The immense mass of evidence collected by Mr. Tylor shows that all uncivilized people have framed this notion of *another self*, and the hypothesis which serves to account for the savage's wanderings during sleep in strange lands and among strange people serves also to account for the presence in his dreams of parents, comrades, or enemies known to be dead and buried. The other self of the dreamer meets and converses with the other selves of his dead brethren, joins with them in the hunt, or sits down with them to the wild cannibal banquet. Thus arises the belief in an ever-present world of ghosts—a belief which the entire experience of uncivilized man goes to strengthen and expand. The weird reflection of his person and imitation of his gestures in rivers or still woodland pools is interpreted by the savage as an appearance of his other self; in the echo he hears the mocking voice of this phantom double, and as his fantastic shadow he sees it dogging his footsteps. Usually, if not universally, in barbaric thought the other self is supposed to resemble the material self with which it is customarily associated. For example, the Australian, not content with slaying his enemy in battle, cuts off the right thumb of the corpse, so that the departed soul may be incapacitated from throwing a spear. Very different is this from the modern philosophic conception of the soul as immaterial. And the difference is again strikingly illustrated when, taking a step farther, we observe that primitive culture makes no such distinction as that between the immortal man and the soulless brute, but speaks of the other selves of beasts in the same terms which are used of human ghosts. The Assamese believe that the ghosts of slain animals will become in the next world the property of the hunter who kills them. Even plants are accredited with souls, so that the Talein will not cut down a tree without first seeking to propitiate its ghost by laying the blame on some one else. But the matter does not end here. Not only the horse and dog, the bamboo and the oak tree, but even lifeless objects, such as the hatchet, or bow and arrows, or food and drink of the dead man, possess other selves which pass into the world of ghosts. Fijians and other contemporary savages expressly declare that this is their belief: "If an axe or chisel is worn out or broken up, away flies its soul for the service of the gods." In this, as I have elsewhere urged, "we see how simple and consistent is the logic which guides the savage, and how inevitable is the genesis of the great mass of beliefs, to our minds so arbitrary and grotesque, which prevail throughout the barbaric world. However absurd the belief that pots and kettles have souls may seem to us, it is nevertheless the only belief which can be held consistently by the savage, to whom pots and kettles, no less than human friends or enemies, may appear in his dreams; who sees them followed by shadows as they are moved about; who hears their voices, dull or ringing, when they are struck; and who watches their doubles fantastically dancing in the water as they are carried across the stream." This is exemplified in the argument of the Algonkins, who insisted to Charlevoix that since hatchets have shadows as well as men, therefore the shadow or soul of the hatchet must accompany the shadow or soul of the warrior to the spirit-land.

Now, when this general theory of object-souls, universal among uncultured men, is expanded into a still more general theory of indwelling spirits, we have before us a set of phenomena which go very far toward explaining the personifications of mythology. To quote again from my work on this subject: "When once habituated to the conception of souls of knives and tobacco-pipes passing to the land of ghosts, the savage cannot avoid carrying the interpretation still farther, so that wind and water, fire and storm, are accredited with indwelling spirits akin by nature to the soul which inhabits the human frame. That the mighty spirit or demon by whose impelling will the trees are rooted up and the storm-clouds driven across the sky should resemble a freed human soul is a natural inference, since uncultured man has not attained to the conception of immaterial force acting in accordance with uniform methods, and hence all events are to his mind the manifestations of capricious volition. The various theories of embodiment show how thoroughly the demons or deities which cause disease are identified with human ghost-souls. On the one hand, in Australasia it is a dead man's ghost which creeps up into the liver of the impious wretch who has dared to pronounce his name; while conversely in the well-known European theory of demoniacal possession it is a fairy from Elf-land or an imp from hell which has entered the body of the sufferer. In the close kinship, moreover, between disease-possession and oracle-possession, where the body of the Pythia or the medicine-man is placed under the direct control of some great deity, we may see how by insensible transitions the conception of the human ghost passes into the conception of the spiritual numen or divinity."

Thus, by a somewhat circuitous process we have at last reached something like a consistent and satisfactory explanation of the true nature of mythology. On the one hand, philology has shown that a myth is an attempt to explain some natural phenomenon by endowing with human feelings and capacities the senseless factors in the phenomenon, as when the ancient Hindoo explained a thunderstorm as the smiting of Vritra by the unerring shafts of Indra. On the other hand, a brief survey of barbaric superstitions has shown how uncultured man, by the best use he could make of his rude common sense, has invariably come to regard all objects as endowed with souls, and all nature as peopled with suprahuman entities shaped after the general pattern of humanity. Thus, is suggested a natural mode of genesis for the personifications of which mythology is made up. We see, moreover, that these personifying stories are not parables or allegories, but sober explanations of natural phenomena. Where we have recourse to some elaborate scientific theorem the ancient was content with telling a myth. Thus, the study of mythology is by no means to be set down as a profitless comparison of ridiculous or trivial fables. When pursued on the wide scale indicated in the present article, it is a study of the greatest and most serious importance, since it throws light of no uncertain character on the thoughts and mental habits of primitive men, as well as on countless superstitious beliefs and customs which have survived in relatively high stages of culture. And perhaps there is no better evidence of the profoundly philosophic character of contemporary scholarship than the pains which it is taking to investigate methodically the legends and sayings which formerly were either thought unworthy of serious study or were but treated as subjects for idle and arbitrary speculation. John Fiske.

Mytile′ne, or **Mityle′ne** [Μυτιλήνη], an important ancient Greek city of the island of Lesbos. Mytilene has uninterruptedly flourished down to the present time. It anciently had a large commerce, and was famed for its beauty and military strength. It is at present called Mitilen or Castro, is under Turkish rule, and is the seat of a Greek metropolitan. Pop. 6000.

Mytilene (the island). See Lesbos.

Mytilidæ. See Mussel.

Myxin′idæ [from the generic name *Myxine*], the typical family of the Hyperotreti (which see). The body is very long, eel-like, naked, and slimy; the cranial cartilages are comparatively well developed; the branchial apparatus is composed of six branchial sacs on each side, which severally communicate by separate short ducts with the œsophagus from the internal sides, and from the external by short canals, with a lateral longitudinal canal, which discharges by a single orifice on each side, but near the median surface; the introferent duct of the œsophagus is between the external branchial apertures, but nearer the left, and passes in front of the heart to the œsophagus; the branchial artery gives off directly separate branches to each pair of branchial sacs; the ovary is single and on the right side; and the eggs, according to Putnam, "are developed along the free edge of the ovary, which extends as a fringe as the eggs increase in size, and the eggs of several stages of growth are always at the free edge;" the nearly mature eggs range from ten to eighteen in number, but are generally about sixteen, and are comparatively very large; the eggs when deposited are encased in an elongated oval hairy shell, provided at each end with a tassel of tubular filaments; the males are very few in proportion to the females. Representatives of the family are found in the cold waters of both the northern and southern hemispheres (*i. e.* North Atlantic and South America), but differ so inconsiderably that they have been differentiated by Putnam as mere varieties of one species, *Myxine glutenosa*. They prefer muddy bottoms, and live chiefly on dead animal matter. Apparent adults vary between a foot and sixteen inches, rarely more. The genus *Bdellostoma*, generally included in this family, is distinguished by the presence of numerous (6–10) lateral branchial apertures corresponding with the number of branchial sacs, and therefore belongs to a distinct family, the Bdellostomidæ. The fishes of this family are celebrated in connection with the researches of Johannes Müller, who in a series of monographs on their anatomy (1834–43) considered the modification of the several systems of organs in all the groups of fishes. (See Putnam, *Proc. Boston Soc. Nat. Hist.*, vol. xvi. pp. 127–135, 156–60, 1874.) Theodore Gill.

Myxolyd′ian, the name of one of the ancient ecclesiastical modes or scales. It differs from the modern scale of G in having a minor instead of a major seventh, thus resembling the scale of the dominant in C major.

N.

N, a nasal dental consonant, being a nasal *d*. In English and Latin the letter also represents the sound heard in *ink*, *anchor*, a sound represented by *ng* in *sing*, *singer*. N. stands for nitrogen, north, new, note, notary, Nepos, (n.) noun, neuter, (n. d.) no date, (Nat.) nativity, natural, besides several others, less frequently occurring.

Nablus′, Nabulus, or **Napolose,** the ancient *Sychem*, town of Palestine and the ancient capital of Samaria, situated 30 miles N. of Jerusalem, on the watershed of the narrow valley between Ebal and Gerizim, 1½ miles W. of Jacob's Well, which is at the mouth of the valley. It is one of the greenest and most fertile spots in Palestine, abounding in figs, grapes, oranges, and olives. The chief productions are cotton, oil, and soap. It has a population of about 13,000, of whom 600 are Christians, 135 Samaritans, 100 Jews, and the rest Moslems, who used to be noted for their fanaticism. R. D. Hitchcock.

Na′bob [Urdu, *nawâb*, a "deputy," plural for *nayib*, the less formal singular number], under the Moguls in India, a viceroy or governor of a province. It afterwards became a mere title of high rank, without office. In process of time many of the nabobs became virtually independent monarchs. It was the mutual jealousy of the nabobs that made India the comparatively easy prize of British adventurers.

Nabonas′sar, Era of, employed in the Chaldæan and Alexandrian Greek chronology and in Berosus, was reckoned from the accession of King Nabonassar to the Babylonian throne, which took place Feb. 26, 747 b. c., as shown by astronomical records.

Nach′tigal (Gustav), b. at Eichstedt, Prussian Saxony, Feb. 23, 1834; studied medicine at Berlin, and practised for some time at Cologne; went in 1860 to Algeria on account of some pulmonary complaint; entered the service of the bey of Tunis in 1863, and went in 1869 to Kooka to convey presents from the king of Prussia to Sheikh Omar of Bornoo. On Feb. 18, 1869, he started from Tripoli, and reached on Mar. 27, Moorzook, where he stopped till Apr. 18, 1870, exploring the country of the Tibboos in the mean time, and arrived at Kooka July 6. He returned by Waday and Darfoor, and reached Cairo in Nov., 1874, having explored the countries belonging to Baghirmi. The results of his explorations he communicated in 1874 in Petermann's *Mittheilungen* and London *Geographical Magazine*. In 1879 he published *Sahara and the Soudan: Results of six years' Wanderings in Africa*, and in 1882 he was appointed German consul at Tunis. D. May, 1885.

Nacogdoches, on R. R., cap. of Nacogdoches co., Tex. (see map of Texas, ref. 3–J, for location of county), 53 miles N. E. of Crockett, and in a fertile region. Pop. in 1870, 500; in 1880, 333.

Na′dal (Bernard H.), D. D., LL.D., b. in Maryland in 1815; graduated at Dickinson College; became a preacher of the M. E. Church in Maryland, Virginia, and Delaware; professor in the Indiana Asbury University about 1850; was a prominent writer on church history in the Methodist *Quarterly Review* and other periodicals; filled pulpits in New Haven, New York, Brooklyn, Philadelphia, and Washington; was at one time chaplain of the national House of Representatives; was the first professor of church history at Drew Theological Seminary, and on the death of Dr. McClintock became acting president. Dr. Nadal was long known as an opponent of slavery, a skilful debater, and a powerful writer. D. at Madison, N. J., June 20, 1870.

Na′dir Shah, or **Kuli Khan,** b. near Kelat, in the province of Khorassan, Persia, in 1688; became while still a young man the leader of a gang of robbers, whose number gradually increased to 3000, and by whose aid he captured and held several towns and fortified places in Khorassan; espoused the cause of Tamasp, the legitimate ruler of Persia, against the Afghan invaders; was appointed commander-in-chief by Tamasp in 1727; defeated the Afghans repeatedly, and succeeded finally in driving them entirely out of the country in 1730. Tamasp now made him governor of the provinces of Khorassan, Mazanderan, Seistan, and Kerman, and he assumed the name of Tamasp Kuli ("Tamasp's slave"), to which the shah added the title of khan. In 1731 he fought against the Turks and defeated them, and when in 1732, during his absence on a campaign against the Afghans, Tamasp was defeated by the Turks and concluded a dishonorable peace with them, ceding several provinces, Kuli Khan deposed him, and raised his son, Abbas III., a child, to the throne. The war with the Turks was renewed and carried on with great success, and when Abbas III. died in 1736, Kuli Khan was crowned shah of Persia under the name of Nadir Shah. His reign was very brilliant in a military respect, especially his expedition into Hindostan. He defeated the Great Mogul, captured Delhi, and carried away to Persia an enormous booty. He restored to Persia her old boundaries from the time of the Sassanides, but in course of time he became greedy, suspicious, and a merciless tyrant; whole cities were put to the sword. In the midst of his brilliant career he was assassinated June 20, 1747. His *Life* was written in Persian by Mirza Mohammed Mahadi Khan, and translated into French by W. Jones (1770). (See also Fraser, *History of Nadir Shah*, 1742.)

Nadudvar′, town of Hungary, in a very fertile district on the Kösely, has 7351 inhabitants.

Næ′vius (Cneius), b. in Campania about 274 b. c.; served in the First Punic war, and became famous as a writer of tragedies and comedies. He belonged to the plebeian party, attacked the nobility with great virulence, was driven into exile, and d. in Utica, Africa, about 204 b. c. A few insignificant fragments of his epic poem on the Punic war, and of his dramas, are still extant, and were collected by Klussmann (Jena, 1843).

Næ′vus [Lat.], birth-mark, mother's mark, a discolored spot on the skin of a human being, usually characterized by the presence of numerous enlarged blood-vessels (more especially venous), and popularly believed to be the result of some ungratified longing on the part of the mother during gestation. Some nævi disappear spontaneously; others remain unchanged; still others grow rapidly, and sometimes inflame and slough. They may be treated by cold and pressure, by vaccination of the spot, by cautery, by excision, by ligation, or by other obliterative methods. Some cases yield readily to one kind of operation, while others may require very different treatment.

Nâ′ga [Sansk., "a serpent"], in Indian mythology, a race of serpents supposed to be endowed with divine qualities who figure largely in the earliest folk-lore of the Aryan races. The Nagas are sometimes identified with the savage non-Aryan hill-tribes of the Deccan; they were said to be descended from the gods Kasyapa and Kadru, and had for their king Sesha or Sesha-naga, the hooded cobra di capello or sacred serpent of Vishnu.

Nâgarjuna, or **Nâgasena,** the thirteenth teacher or patriarch of the Booddhist religion; lived in the first or second century b. c.; was born of a Brahmanical family in the S. of the peninsula. He became deeply learned in the four Vedas and in all the sciences of the time; travelled much, performed miracles, founded the Mâdhyamika school of philosophy, and had among his disciples Aryadeva and Booddhapalita, who propagated his doctrines throughout Southern India. (See Spence Hardy's *Manual of Booddhism*, 1853.)

Nagasa′ki, town of Japan, situated in lat. 32° 43′ N., on a peninsula of the island of Kiu-Siu, has an excellent, spacious, and safe harbor, which since 1859 is open to foreigners. In 1862 tea, wax, isinglass, and camphor to the value of £399,579 were exported from this port, and rice, cotton, firearms, and woollen goods to the value of £1,181,022 were imported. Pop. about 40,000.

Nag′lee (Gen. Henry Morris), b. at Philadelphia, Pa., Jan. 15, 1815; graduated at West Point 1835; resigned Dec., 1835; served in the Mexican war as captain of New York volunteers; engaged in commerce in San Francisco, Cal.; was appointed lieutenant-colonel of the 16th Infantry May, 1861, brigadier-general of volunteers Feb., 1862; was engaged in the first campaigns on the lower Potomac and on the Peninsula; commanded a division in the North Carolina and Southern departments 1863; took command of the 7th army corps July, 1863; was mustered out of the service Apr., 1864, and became a banker in San Francisco, Cal.

Nagore′, a considerable town of Joodpoor, one of the Rajpootana states of Hindostan, subject to Great Britain. It manufactures articles of iron and brass, and is said to have 40,000 inhabitants.

Nagoya, city of Japan, on the main island, in a great plain at the head of the Owari Bay, is well built, has many temples, monasteries, a government college, and a telegraph-station, manufactures fans, lacquered goods, and porcelain, and carries on a considerable inland trade. Pop. estimated at about 400,000.

Nagpoor′, or **Nagpore,** town of British India, cap. of the province of Berar or Nagpoor, situated in lat. 21° 9′ N., lon. 79° 11′ E., 430 miles E. N. E. of Bombay, with which it is connected by railway. It is 7 miles in circumference, poorly built, containing no buildings of interest, and consisting mostly of mud huts. The ground on which it stands is swampy and unhealthy. But its manufactures of cotton cloths, coarse and fine chintzes, woollens, silks, and brocades are important. In 1740 it became the seat of an independent Mahratta prince; in 1853 it was incorporated with the British dominions. Pop. about 115,000.

Nagy Ban′ya [*Nagy* (*nâdy*, monosyllable), "great," *bânya*, "mine"], town of Hungary, near the Transylvanian frontier, has manufactures of earthenware, rich gold and silver mines in the vicinity, and a large trade in wine and the other products of the exceedingly fertile surroundings. Pop. 8732.

Nagy Enyed′ [Ger. *Egidistadt*], town of Translyvania, on the Maros, has a Protestant college, barracks, and 5362 inhabitants.

Nagy Karoly′, town of Hungary, has a fine palace with garden and park, large manufactures of leather and shoes, and extensive cultivation of wine, maize, and tobacco. Pop. 12,532.

Nagy Körös′, town of Hungary, has 22,769 inhabitants, mostly employed in agriculture, vine-cultivation, and sheep-breeding.

Nahant′, Essex co., Mass., consisting of a peninsula extending into Massachusetts Bay and forming the E. side of the harbor of Lynn. It is connected with the mainland by a long narrow isthmus. Nahant has 2 churches, 2 schools, and many fine residences. It is a favorite summer resort. Pop. in 1870, 475; in 1880, 808; in 1885, 637.

Na′hum [Heb. *consolation*], one of the twelve Minor Prophets, is called an Elkoshite, but no place called Elkosh is now known. Jerome identified it with a town of Galilee; Ewald and others with *Alkush*, on the E. bank of the Tigris, about 2 miles N. of Mosul, where "Nahum's tomb" is still shown, but Layard pronounces the structure to be comparatively modern; and there is no notice of Nahum in connection with this place earlier than the sixteenth century. Nahum prophesies after Sennacherib's invasion (700 B. C.) and before the destruction of Nineveh (625 B. C., Rawlinson, or 606, Oppert and Lenormant). His Hebrew is of the most classical style.

Na′iades, the Lamarckian name for the fresh-water mussels forming the family of the Unionidæ. (See UNIONIDÆ.)

Na′iads [plu., Lat. *Naiades;* Gr. Ναϊάδες], in the ancient Greek mythology, the nymphs of fountains, lakes, and streams, represented as youthful female beings possessed of certain divine attributes, such as the power of conferring prophetic gifts.

Naile (FREDERICK J.), U. S. N., b. Oct. 11, 1841, in Pennsylvania; graduated at the Naval Academy in 1861; became an ensign in 1862, a lieutenant in 1864, a lieutenant-commander in 1866; retired, owing to "physical disability," in 1871; served in the Oneida at the passage of Forts Jackson and St. Philip and the capture of New Orleans, and in the passage of the Vicksburg batteries in 1862, and was in various engagements on the Western waters in 1863–64. Commended for "courage, coolness, and skill."

FOXHALL A. PARKER.

Nails (*ungues*), the plates of horny epidermis which in man grow upon the dorsal aspect of the distal phalanges of fingers, thumbs, and toes. They are the homologues of the hoofs and claws of the lower animals. They consist each of a free extremity, of which both sides are exposed; of a body, having one side exposed; and of a matrix or root, of which both sides are concealed in the skin. At the base of the nail appears a crescent-shaped patch of lighter color than the rest, called lunula or albedo.

Nails [Ang.-Sax. *nägel*]. Nails are classified by the U. S. patent-office as cut, wrought, horseshoe, shoe, barbed, composition, button, carpet, coffin, sheathing, galvanized, harness, leather-work, picture, siding, slating, trunk, upholstery, weather-tiling, and screw nails. Of these, the cut, wrought, and horseshoe nails are by far the most important. Formerly—*i. e.* in the beginning of the present century—nails were ordinarily manufactured by hand-forging, usually by women and children, the degradation of the nailmakers forming one of the saddest phases of English industrial life. The application of machinery to the fabrication of all the more important varieties of nails is essentially American in its inception and development. This was a natural result of the universal use of wood for buildings, fences, etc. In 1810 an American machine made cut nails at the rate of 100 per minute. The rough surface of a cut nail where no clinching is required adds about 20 per cent to the holding power. For uses requiring clinching a tapering hand-forged nail, termed the "German wrought," was used until within the past fifteen or twenty years, when manufacturers began to anneal common cut nails, giving them a bending quality; and these have practically driven the others from the market. Were there any occasion, however, for the "German wroughts," there would now be but slight difficulty in making them by machinery, slightly modified from horseshoe-nail machines, which have now reached a very near approach to perfection. The importance attached to the manufacture in this country may be inferred from the fact that previous to 1874 upward of 300 patents were issued for improvements in making cut and forged nails, of which 23 were granted before the beginning of the present century. These embraced the germinal ideas of the present machinery for *cutting* nails, while an earlier English patent, that of William Finch of Wimboorne, Staffordshire, comprised the use of tilt-hammers, the rapid and forcible striking of which enabled several nails to be made from the rod with one heat, whereas by hand the rod required to be reheated previous to the forging of each nail. But Finch's machine divided the work among three attendants, and his description of this improvement over the method then common throws a strong side-light on the condition of the industrial classes: "One man, woman, or child to carry the heated rod to the man, woman, or child stationed before the hammer, which man, woman, or child, by mere activity, will, with one hand, not only form the largest-sized nail, but a far greater number in the same given time, when the third man, woman, or child will, with the same kind of hammer, head and finish a number of said shanks together, leaving them truer and better made for use than the present mode." Trace the progress of nail-forging mechanism from this crude beginning to the automatic horseshoe-nail machinery hereinafter described, and a parallel advance will be found in the liberation of women and children from the stunting labor of the anvil and forge.

The principle of operation in machines for making cut nails is comparatively simple, but the details of construction are numerous, and too complex for explanation without diagrams elaborately described. The iron is first rolled into plates having a thickness corresponding to that of the nail to be made, measured from one flat side to the other, and a width somewhat greater than the length of the finished nail. When the nails are to be annealed for clinching, the length of the plate is transverse to the grain of the iron, in order that the grain may be lengthwise of the finished nail to ensure greater flexibility in clinching. The plate is then placed in a feeding device, which feeds it forward to dies or cutters, which cut a tapering blank from the end of the plate. This blank is then gripped by holding-jaws, which clamp it firmly while a punch or header abuts against the widest end of the blank and upsets a sufficient portion of the metal to form the head. In order to secure the tapering form of the blank without waste of material, the plate is turned laterally, so that its end is at a slight angle to the cutting devices or dies, first in one direction and then in the other, the head of each alternate nail being formed at that lateral edge of the plate opposite that at which the head of the previous nail was made. In some cases the same result has been secured by giving the lateral movement to the cutting dies while the plate is made to travel in a straight line. In one somewhat noted machine the plate is made of a width sufficient to permit blanks for a number of nails to be cut simultaneously from its end. In this apparatus rotating cutting dies, instead of vibrating or reciprocating ones, are used to sever the blanks from the plate, and the nails by this machine are made with chisel-shaped points.

The following, written by the writer hereof immediately after a careful personal examination of the machinery and processes of the North-western Horsenail Co. of Chicago, about four years since, is an accurate sketch of the *modus operandi* of the most approved manufacture of horseshoe nails: "The nail-rod, heated at one end for about a foot in length, has its free or outer end steadied by the hand of an attendant, but is gripped near its inner end by an intermittent feeding device which feeds it inward to the hammering mechanism. This latter comprises a fixed anvil, the face of which corresponds to the contour of one of the flat sides of the nail, and which has at one edge a fixed die arranged vertically at right angles to its face, and corresponding in its form to one of the curved lateral edges of the nail. At the opposite side of the anvil is a moving die having a face the same shape as that of the anvil, but attached to one end of a rocking lever, the opposite arm of which is connected by a universal joint, a rod, and strap with an eccentric on a rock-shaft provided transversly above the parts just noticed. On this shaft, immediately over the anvil, is a disk upon the periphery of which is arranged a roller, which serves the purposes of a striker. As the nail-rod is fed inward, with its heated extremity upon the anvil, the rotation of the striker impinges longitudinally upon the heated end of the rod, striking a 'drawing' blow, which of course elongates the metal. As soon as the striker, carried away by the continued rotation of the disk, has been brought out of contact with the metal, the moving die moves inward, compressing the flattened part to bring its lateral surfaces to the shape required in the edges of the nail. This done, the striker strikes again, to be followed by another action of the dies, until after sixteen blows of the striker the nail is complete so far as the hammering is concerned. But the process of shaping does not end here. The 'point' of the nail at this stage is an eighth of an inch wide, and is rough and jagged. The nail is, moreover, three-fourths of an inch longer than when finished. To complete the work, a little device, termed a 'poker,' bends the point or tip sidewise until one edge intercepts (at a proper place along the length) an imaginary line drawn axially through the nail. This done, a cutter at the opposite side traverses a path corresponding to the curvature just given by the bending to the edge just previously referred to, and cuts off the surplus metal from the tip. This causes the point of the nail to be formed in exactly the proper place, and also ensures a very close approximation to uniformity in the length of the nails. When the nail is thus formed, suitable mechanism gives a retrograde movement to the nail-rod, which brings it into proper relation with a cutter which severs the nail from the rod, the nails as fast as formed dropping to the floor. When the heated portion of the nail-rod is worked up, the rod is returned to the furnace, and another, previously heated is put in its place in the machine.

Within the past few years the wire nails long used in Europe in raisin-boxes, etc., have come into extended use in this country, and their manufacture is carried on in several establishments. The wire nail consists essentially of a cylindrical piece of wire of suitable length, with one end properly sharpened and the other upset to form a head. A good wire nail has great holding-power, and in many cases is preferable even to a wood screw.

Of the minor varieties of nails may be mentioned garden nails, made of cast iron and frequently toughened by annealing; screw nails, made with flat shanks, to which a spiral twist, from a half to a full turn, is given; and barbed nails, notched or provided with notches or with spurs to increase their hold on the wood. Shoe nails are headless tapering nails cut, the smaller sizes, from sheet zinc, the larger from iron. Ornamental nails, such as are used for pictures, coffins, etc., are made with wrought shanks and porcelain or stamped sheet-metal heads, the latter attached by being screwed upon the shanks or by soldering with soft metal. JAMES A. WHITNEY.

Nain [Heb. *beauty*], a poor little village in Galilee, 6 miles S. E. of Nazareth, mentioned only in the New Testament (Luke vii.) as the place where our Lord raised the widow's son from the dead. It was then a walled town, with a cemetery some ten minutes' walk to the E. It now contains a few mud and stone houses occupied by Moslems. R. D. HITCHCOCK.

Nairne (Lady CAROLINA **Oliphant**), BARONESS, b. at Gask, Perthshire, Scotland, July 16, 1766; was called in her youth the "flower of Strathearn," from her great beauty; married in 1806 Capt. W. Murray Nairne, afterward Lord Nairne; belonged to a prominent Jacobite family; wrote *The Laird o' Cockpen*, *The Land o' the Leal*, and other popular Scotch ballads, the authorship of which was kept secret until shortly before her death, which occurred at Gask Oct. 27, 1845. It is said that her poetical productivity was first started by the offence she took at the coarse and rough words of the common popular songs. She laid new words under the beautiful tunes. (See her *Memoir and Complete Lyrical Compositions*, by Charles Rogers (1869).)

Nairne (CHARLES MURRAY), M. A., L. H. D., b. Apr. 15, 1808, at Perth, Scotland; graduated M. A. at St. Andrew's University, and afterward at Edinburgh 1830 and 1832; came to New York 1847; was occupied as lecturer and teacher till chosen prof. of philosophy and belles-lettres in Columbia College, N. Y., in 1857, a position he held 24 years. He was made emeritus prof. in 1881. Wrote *Lectures* and *Orations*. D. May 29, 1882.

Nairn'shire, county of Scotland, bordering on the Moray Frith, Elginshire, and Inverness-shire, and comprising an area of 215 square miles, with 10,445 inhabitants in 1881. The coast is low and sandy, the interior elevated and hilly; most of the ground is covered with forest; only 22 per cent. is cultivated. The capital is Nairn, at the mouth of the river Nairn, with a good harbor, protected by a breakwater; population, 4207, chiefly engaged in herring-fishing. Near by is the village of Cawdor, with the castle of the same name, in which, according to tradition, Macbeth murdered Duncan; the present building, however, is not older than the fifteenth century.

Naj'idæ [from the name of the typical genus], a family of poisonous serpents of the sub-order Proteroglypha (the intermaxillary bones being horizontal, and not reaching the premaxillary anteriorly, in contact with the prefrontals, and bearing a perforated and usually grooved tooth), with the caudal hypapophyses bifid and neural spines and pleurapophyses short, and distinguished by the development of distinct postorbitals; the head is regularly plated above; there are no anteorbital pits. The family, thus limited by Prof. Cope, includes some of the most poisonous serpents of India, among which is the *cobra de capello*, or hooded serpent of India (*Naja tripudians*), and the asp of Egypt (*Naja haje*), celebrated in connection with Cleopatra. This family is most closely related to the Elapidæ, or *coral snakes*, and is confined to Asia, Africa, and Australia. (See ASP and COBRA DE CAPELLO.) THEO. GILL.

Nakamoora Masauwo was of the samuari class, and b. in Tokio, Japan, about 1826; after being thoroughly educated in his native language and literature he acquired a complete knowledge of Chinese, and then added to that the English language. Under the government of the late tycoon he had the management of various private schools and was a professor in the College of Yedo; in 1866 went to England, where he had charge of several Japanese students, and remained two years. On his return home he published a large number of books intended to reflect, by his comments and copious translations, the intellectual characteristics of the Western nations, and was the first man to translate into Japanese the Constitution of the U. S. and the more famous writings of Washington, Franklin, Stuart Mill, Smiles, and many other noted men; resigned his former rank and classed himself with the common people; in 1875 was placed at the head of the newly-established normal school for the education of girls, which had been founded by the empress of Japan.

F. A. P. BARNARD.

Nakhitch'evan, town of European Russia, government of Yekaterinoslav, on the Don, 30 miles from its mouth, was founded in 1780 by a colony of Armenians; is the seat of the Armenian patriarch of Russia, and has some manufactures of cotton and silk and an extensive trade. Pop. 16,584.

Naksha'tra [Sansk. *naksha*, "night," and *tra*, "protecting"], a term originally meaning "star," was applied in Hindoo astronomy to denote the asterisms lying in the moon's path, or mansions in which the moon was supposed to rest. These mansions numbered twenty-seven, and afterwards twenty-eight, and were converted by mythologists into daughters of the patriarch Daksha, who became wives to the moon (which in India is considered masculine). This peculiar system of astronomy was supposed by Biot to be derived from the Chinese, but his arguments were satisfactorily refuted by Prof. W. D. Whitney in his notes to Burgess's translation of the *Sûrya Siddhânta* (New Haven, 1860), and by Max Müller in the preface to vol. iv. of the *Rig-Veda* (1862), where it was proved that the system of Nakshatras was original with the Hindoos.

Nakshivan', town of Asiatic Russia, in Armenia, stands on the Arras, at the foot of Mount Ararat, and boasts of having been founded by Noah when he issued from the ark after the Flood. The surrounding districts are rich in salt and produce excellent grapes. Pop. 5745.

Nal'a, one of the most famous of the legendary heroes of India, was king of Nishadha, and married Damayanti, daughter of Bhima, king of Vidarbha. The loves and romantic adventures of Nala and Damayanti form the subject of the most beautiful episode of the national epic (see MAHABHARATA), of which there are many translations in German, and a fine poetical version in English by Dean Milman. Two other famous Indian poems, the *Nalodaya* and *Naishadharita*, deal with the same subject.

Nama'quas, the principal tribe of the Hottentot race. They differ widely from the Bushmen, being tall and well-proportioned, but they have all the general characteristics of the race—the olive complexion, the oblique eyes, and the thin, tufted hair; their language also is somewhat different from that of the other tribes. They inhabit the territory around the Orange River, and live as nomads; rearing cattle is their principal occupation, hunting and robbery their chief amusement. Those living in Cape Colony S. of the Orange River are generally Christians and live as workmen. Some of them own horses and cars, and are engaged in the transportation of copper ore from the mines to the port.

Namaycush, or **Mackinaw Salmon** (*Salmo namaycush*), *Cristiomer*, one of the largest of the fresh-water Salmonidæ. It is caught by the spear mostly, and inhabits the upper lakes of the St. Lawrence basin. Specimens of 120 pounds are reported, but the average does not often exceed 50. The flesh is good, but not of the first quality.

Name, a word or term of designation. It may be applied to a person or to a thing. Derived from the Sanskrit *nâman* ("name") or some earlier Aryan source, it has passed into many languages; *e. g.* Zend, *vâman;* Persian, *nam;* Afghan, *num;* Armenian, *anum;* Greek, *onoma;* Latin, *nomen;* Italian, *nome;* French, *nom;* Gothic, *namo;* Anglo-Saxon, *nama;* Old German, *namo;* Mod. German, *Name;* Danish, *navn*, resembling the Kurdish *nave* and the Gypsy *nav.* With regard to the names of persons among savages with whom general social relations and history are in an undeveloped condition, a single appellation derived from some association is enough for a name. He who kills a wolf under striking circumstances is called Wolf, and the man who dreams of an eagle is named Eagle. Among certain tribes in North America the animal-spirit peculiar to each Indian is the first creature which appears to him in a dream after fasting and seclusion, and this, his *totem*, gives him a name. The first distinction recognized is that of proper and common names, or that of the individual as distinguished from the family and tribe. As there is something reserved and sacred often attached to the former, there was often a mystery associated with it; and as Schoolcraft observes, "An Indian will tell his specific name with great reluctance, but his generic or family name he will declare with pride."

Among the ancient Egyptians the king had two names—one a prænomen or solar title, in connection with the sun, assumed after he came to the crown. This custom began with the sixth dynasty, as Ra-meri, "beloved of the sun," prænomen—Pepa-Phiops, the family name of that ruler. Egyptian monarchs had also three other royal titles, and foreign princes changed their names to Egyptian. Individuals had often two names, the second called the good, or surname, as Aahmes or Amosis—second name, Panishim. These are found at an early period, but the Egyptians generally used only one. Persons were called by the names of deities, as Har or Horus, Heri or Isis, At-har or Athor; or by some particular condition of the god, as Amenemapt, "Ammon in Thebes;" or by some link connected with the name of a god, as Heriptah, "beloved of Ptah;" Rames, "born of the sun;" Paserienχon, "the son of Chon;" Nsa-Amen, "attached to Ammon;" Mutketp, "the peace of Muth" (a goddess). Many names were derived from animals, as Mau, "lion;" Tamai, "cat or puss." Other names were from qualities, as Se-nefer, "good brother;" Sat-bal-ban, "leading away the evil eye." Few names were derived from places, but all things had their names—not only men and women, but cattle, horses, cows, buildings, tools, etc. Among the Chinese the emperors, besides their proper names, take, on their ascension to the throne, a *neen-hauou*, or yearly appellative, in which the years of their origin are dated, as Taw-Kwang, "reason-glory," A. D. 1830; Kwang-Choo, "the glorious succession," the name of the present emperor. These names are rarely changed during life; after death they assume the *meaau-taou*, or templar appellation, by which they are known in history, as Tae-t-Soo, the name after death of the celebrated Hung-Woo of the Ming dynasty. The family names were originally only 100, but the single names now number 438, to which must be added 30 double names, as Sze-ma, etc., making in all 468, which comprise all that are truly Chinese. Persons of the same name must not marry. These names are derived from various objects, such as Lung, "dragon;" Ma, "hemp;" Shury, "water;" Hwang, "yellow;" Luy, "thunder;" Wang, "prince;" and always precede the after-appellative. At birth a *jov-keaou* or milk-name is given to the child. To distinguish the individual, a surname, *ming*, sometimes double, is given, which is placed after the name, besides which there is a *peaou-tsze*, an agnomen or appellative. To this may be added a *hwan-ming*, a sobriquet. Names are not derived in China from places. The early Hebrews gave an infant a name as soon as it was born from some striking accident relative to it. It thus became commemorative of the history of the family. When Eve bore her first son she said, "I have *gotten* a man from the Lord," whence he was called Cain, meaning "gotten" or acquired. Noah signifies "comfort" (Gen. v. 29). (For texts referring to bestowing the names of the patriarchs of the tribes of Israel see Genesis, chs. xxix., xxx., and xxxv., verses 16, 17, 18.) The vigor and intelligence shown in our Scripture names were remarkable. They greatly influenced Hebrew literature, and are the finest of antiquity. Those of the women were derived from character and circumstance; *e. g.* Adah or Ada, "ornament;" Leah, "weary;" Deborah, "a bee." The names of the patriarchs generally had a mystical meaning. Elijah and Joel are composed of two names of God; Josaphat and Saphatias indicate the judgment of God; Johanan or John of Hanania, his mercy; Nathaniel, Elnathan, Jonathan, and Nathania, all mean "the gift of God," as *Devadatta* was Sanskrit, and as *Theodore,* Greek. Among the Arabs names are few and simple. As Mohammed said, "Give your sons the names of prophets," the result has been an interminable repetition of Mohammed, Ahmed, Mahmoud, Hamet, or Achmet; of Ibrahim (Abraham), Moussa (Moses), Suleiman (Solomon), Dauoud (David), and Aïssa (Jesus). Then come the names of their heroes, such as Osman, Ali, Omar. In a third category are the names beginning with Abd, a "servant," as Abd-el-Kader, "servant of the All-Powerful," Abd-Allah, "servant of God." To these follow names ending in *din*, "religion," as Saladin, "restorer of religion." Some names consist of these elements composed, as Hamet-el-Abd, "Mohammed the servant," and others are merely adjectives, as Saïd, "happy or fortunate," Hassan, "handsome," Hussein, "powerful," Reshid, "just judge," Mustapha, "elected of God." To indicate men more accurately, surnames are often added—*e. g.* El Kebir, "the great;" words of relationship—*e. g.* Abu or Bu, "father," Abu-Nebas, "the father of the race." Among the feminine names are Lulu, a "pearl," Zarifa, "beauty." Girls are also called after the wives or female relatives of the Prophet. Men take as surnames appellations relating to their country, birthplace, origin, family, sect, trade, or occupation. The Greeks in the time of Aristotle gave a child its name on the seventh day after birth. It was afterwards given on the tenth day. It was derived from some quality, such as piety, a great event, a striking personal quality, a happy presage; from some virtue or physical advantage, from friendship, or by chance. The grandson took his name from his grandfather or the nephew from his uncle, and to prevent confusion another name, such as the father's, was added, or else one derived from the calling of the bearer, from his birthplace, or a nickname. The father's name was, with a slight change, also given to one child; *e. g.* Chryseis, "daughter of Chryses." In later times names of people were taken from the gods; *e. g.* Apollodorus, "gift of Apollo." Though denied by many writers, it is evident that something like a generic name was applied to many families; *e. g.* the Heraclidæ, the Cecropidæ, the Atridæ, the Alcmeonidæ. Many of the Greek names were very beautiful—*e. g.* Aphrodite, "foam of the sea;" Artemas (m.), "perfect," Artemisia (f.), "perfect;" Diana, "bright as day;" Diomede, "dear to Jupiter;" Zenobia (f.), "life," from Zeno, the lord of life; Spiridion, "breath of the gods;" Isidore (m.), Isidora (f.), "gift of Isis;" Heliodorus, "gift of the sun;" Zeno, "life" (the lord of); Zoë, "life;" Amaranth, "unfading flower." The Romans, like ourselves, had a family name, called the *nomen gentilitium,* generally ending in *ius, eius,* or *aius.* This, derived from the gens, "clan or tribe," was the *nomen* or name proper. As the clan was divided into families, there was also the hereditary *cognomen*, while the *prænomen* distinguished the individual. Sometimes, by way of further distinction, a second cognomen, called the *agnomen*, was borne. This was often an honorable title derived from some great exploit. The *prænomina* or "Christian names," so to speak, were not more than thirty in number, whence the constant repetition of Marcus, Decimus, Florus, Caius, etc. Romans often took their names from their order of birth, as Primus, Secundus, Tertius ("first," "second," "third"), and cognomens were derived from the months in which they were born or from some personal peculiarity; from being a twin or a posthumous child; from a city, river, or country. The daughter's name was the feminine form of that of the father; *e. g.* Julia from Julius, Octavia from Octavius. To distinguish the individual, she also received another name grown hereditary in the family, as Julia *Agrippina.* But the surname was often fanciful, as *Felicula,* "little cat" or "puss." Nicknames were common. After marriage a Roman lady bore the name of her husband in feminine form, whence it was usual to say at marriage, "Where you are Caius, I will be Caia." Many Roman names were from Etruscan or other old Italian sources; some were from the most trifling or undignified personal peculiarities or occupations. With the Northern invaders came chiefs proud of their own ancient Gothic names and families; that of Theodoric gloried in the recollection of Amal, whence Amalaric, Amalafride, Amalaberg. With Christianity came names from the Bible, but the old heathen family appellations "died hard." St. John Chrysostom in the fourth century complained of this obstinacy, as did St. Gregory in the sixth century. Such were the names Wolf, and those founded on Ans or As, indicative of a god; *e. g.* Anselm, Esmond, Oscar or Elf, Hildebrand, "war-sword," Bertha, "the bright goddess" (Albert, Bertram), Gertrudis, etc. All of these were sources of pride, owing to age and associations.

The entire history of Indo-European names is that of a growth from a condition like that of the Arab and Indian to the one now prevalent among us. Those of the Anglo-Saxons were imposed, says Sharon Turner, as with us, in their infancy by their parents. They were frequently compound words, rather expressive of caprice than of appropriate meaning. The following are specimens: Æthelwulf, "the noble wolf;" Æthel or Ethel, Adel, and Adeline, meaning "noble;" Bertwulf or Bertolf, "illustrious wolf;" Eadwulf, "the prosperous wolf;" Æthelwyn, "noble joy;" Eadric, "happy and rich;" Ælfred, an "elf (*i. e.* shrewd) in council;" Sigeric, "victorious and rich;" Æthelred, "noble in speech" (German, *Rede*); Eadmund or Edmund, "prosperous patron;" Eadwin, "prosperous in battle;" Dunstan, "mountain-stone;" Ethelbald, "noble and bold;" Eadward, "prosperous guardian;" Ethelstan, "noble rock" (or stone); Ethelbert, "noble and illustrious." These names partially remain to-day. Many Anglo-Saxon names were wild and strange; *e. g.* Beanhelm, "helmet of the nobles;" Eardwulf, "wolf of the earth or province;" Werburg, "hedge of the city;" Sigfred, "peace of victory;" Beonheat, "the soaring bee;" Beagstan, "bracelet stone;" Wulfheah (wolf-high), "tall wolf;" Beornoth, "noble's oath;" Wine, "the dear one," which often forms a part of many names; Sæfreth, "freedom of the sea;" Ceolmund, "protecting ship." Female names were not less fanciful. Thus, Dudda, meaning the "family stem," was a father who had three daughters—Deorwyn, "dear to man" or "dear love," Deorswythe, "very dear," and Golde, "golden." A father, Æthelwyn ("noble joy"), had four sons—Æthelwold, "noble governor," Alfwold, "ruling elf," Athelsin, "always noble," and Æthelwyn. It is not settled whether the Anglo-Saxons always used surnames. Many certainly had appellations added to their original names. Thus, there was Wulfsic se blaca, or "the pole," and Thurceles hwitan, or "the white." These were, however, among the Saxons, as for many centuries later in England, derived from many causes, as from the place of residence—*e. g.* Ælfric at Bertune; or from the father, as Elfgare Ælfan suna, "Elfgare, son of Ælfan," or, more shortly, Wulfrig Madding, Badenoth Beotting. Office, trade, affinity, or possession often bestowed a name, as Leofwine ealdorman ("alderman"), Sweigen scyldwirtha ("the shield-bearer"), Eadwig, "his maeg," Ægelifrig munuc ("monk"), Osword, "priest." In the course of time, though very rarely among the Anglo-Saxons, these became family names, and as such still exist. Among women's names are Ethelswytha, "very noble;" Selethrytha, "a good threatener" (Anglo-Saxon ladies appear to have excelled as scolds); Editha, "the blessed gift;" Elfhilda, "elf of battle;" Beage, "bracelet;" Ethelfritha, "noble and powerful;" Adeleva, "noble wife;" Heaburga, "high tower" (a tall lady); Adelfleda, "noble pregnancy;" Elfgiva, "elf favor;" Edgiva, "happy gift;" Ethelgiva, "noble gift;" Wynfreda, Winifrede, "peace of man;" Ethelhilda, "noble war-goddess;" Elfthrythe, "threatening as an elf." Saxon is the stock on which the English and American names of the present day are formed. Next to these come the Norman, but it must be remembered that both were in a great degree founded on a common Teutonic origin. Though the Anglo-Saxons very rarely employed a regular system of family nomenclature similar to our own, they attempted to show relationship by the use of similar personal names. Thus, in one family we find Wigmund, Wig-helm, Wig-laf, Wih- (or Wig-) stan, and the nineteen descendants of Alfred had their names beginning with *Ead* ("prosperous"). The termination *-ing*, as in Brening, Dering, Whiting, means a descendant, or "born of." Surnames were not common before the eleventh century, though they were used, hereditarily, occasionally both by lords and common men. Among the oldest of these family names were the names Liniet (Linney), Grimkelson, Dubbe, Tuk (or Tuckey), Pincebek, and Gamelson. The ingress of the Normans introduced the use of Scripture names. During three centuries after the Conquest people of rank began to gradually assume first some surname of place or characteristic, and then one of family. The younger branches of a family often laid aside the father's name and took one from the place where they lived, and thus (in Cheshire) in three descents as many surnames are found in the same family. Several brothers often assume different surnames. Hence, it is difficult to trace the pedigree of any family beyond the thirteenth century. The roll of Battle Abbey, containing the names of those who fought at the Conquest, gives the cream of the Norman aristocracy, so that a biographer of Chaucer declared that all names to be found in it ennobled their descendants. (For different versions of this roll, see Lower.) The Normans introduced the title *de* ("of" or "from") as indicating the names of their estates; *e. g.* Le Sire de Vitry, Paennel du Monstier-Hubert. The mingling of Norman with English names soon formed a sad chaos, many callings, places, and nicknames being translated into French and thence Anglicized, while the confusion was worse confounded by the latinization of others. *At*, meaning the same as *de*, or indicating residence, enters into many English names; *e. g.* Athill, Atwood. In Norman names many old Norse words became French. Thus, *ey* or ö, "island," became *eu* (Cantaleu); *flôt*, a river, *fleur* (*e. g.* Harfleur); *bo* or *by*, an "island," *bœuf* (Painbœuf); *garth* became *gard* (Epegard), etc.

Celtic names were originally formed on the same principles as the Saxon, the affix *Mac*, denoting "son," being usually assumed in Scotland, as was *O'* ("grandson") among the Irish, and *Ap* with the Welsh. The head of a clan in Scotland is spoken of as *The*—*e. g.* The Macgregor—and he is addressed by the name alone, without an article. The entire clan usually bore the chief's name. Among Celtic names are Angus, "firm;" Fingal, "strongest of the strong;" Brian, "chief;" Fergus, "strong arm or man;" Arthur, "a bear;" Griffith, "a dragon;" Hugh, "mighty, indomitable;" Murdock, "great chief;" Owen (John), "a lamb;" Dugald, "black-haired;" Rowena, "the white-necked" (?); Brenna, Brenda, "raven-haired;" Cordelia, "token of the flowing;" Morgiana, "lady of the sea."

There are in Great Britain nearly 50,000 surnames, derived from every conceivable source, such as animals, offices, saints, traders' signs, virtues, and even from oaths and salutations, such as Bigot, from "by God;" Pardoe, from "par Dieu;" Godsall, from "God's soul;" Olyfader, from "Holy Father;" and Belcher, from "*belchère*." The commonest name is Smith; the next in order Jones, Taylor, Williams, Brown, Davies, Thomas, Robinson. Of the second class as to number are Baker, Clark, Cooper, Davis, Edwards, Evans, Green, Hall, Harris, Harrison, and others, in apparently the same proportion as in America.

In Wales there are districts in which family surnames are not yet known, and there are places all over Great Britain in which nicknames or sobriquets like those of the Middle Ages are in general use. It has been frequently asserted that French names introduced at the Conquest may be known by such prefixes as *de, du, des, de la, saint*, or by the suffixes *font, ers, faut, beau, age, mont, ard, aux-bois, ly, eux, et, val, court, lay, fort, ot, champ*, and *ville;* but this is far from being the case, since very soon after the Conquest these terms came into such general use as to make distinctions almost impossible. The Norman term *fitz* is believed to *always* signify illegitimate descent, but this was by no means invariably the case, the word itself meaning simply *fils*, or "son." Its continued application to legitimate children would have been absurd.

In many European countries the husband adds his wife's name to his own, and in Spain, if the mother is of better family than the father, the children take her family appellation. In inheriting Scotch estates it is a very common condition that a certain name shall be taken with the property.

The study of the names of places is hardly less important than that of persons. From the earliest times men have retained the names of towns, hills, or rivers given by earlier races, so that it often happens, as in the case of the Picts, that all that is known of their language and origin is embraced in these terms. Again, in migrating to other lands the old place-names have always been transferred to new localities, in illustration of which the reader may consult *India in Greece, or Truth in Mythology*, by Edward Pococke (1852), a work in which the author has endeavored to prove that Aryan-Indian names were taken to the West. In like manner the Celt, the Saxon, the Pict, Romans and Normans left their language in such words as *tam, tav*, or *cluyd*, meaning "river or water," whence the Thames, Tavy, and Clyde (Celt.); in *burg*, "a hill," and *bricg*, "bridge" (Saxon); in *Penval*, "the head of the wall" (Pictish); in *castrum*, "a camp," whence *caster* (Roman). In *The Norman People* (London, 1874) it is shown that 124 common English names of places are also to be found in Scandinavia, and in such a way that they evidently originated there. (See Steenstrup, *History of the Normans*, especially Part III.)

(Among the many books on the subject of names the reader may refer with advantage to *The History of Christian Names*, by Miss Yonge; also, *English Surnames*, by Beardsley, 2d ed. 1875.) C. G. Leland.

Na'mur, province of Belgium, situated on the French frontier, and intersected by the Meuse. Area, 1413 square miles. Pop. 314,718. It consists of large, densely-wooded hills, offshoots of the Ardennes, and rich in coal, iron, copper, lead, sulphur, alum, marble, and slate; and beautiful and exceedingly fertile valleys, yielding fine pastures and large crops of wheat, oats, hops, and flax. Besides agriculture and mining, a large manufacturing business is carried on, especially in paper, hardware, and cutlery.

Namur, town of Belgium, capital of the province of Namur, at the confluence of the Sambre and the Meuse. It is fortified, and has an elegant cathedral and many good educational institutions, large breweries, and celebrated manufactures of cutlery and leather, which latter branch of industry gives employment to more than 2000 persons. It was formerly a very strong fortress; was taken by Louis XIV. in 1692, and retaken by William III. in 1695. Joseph II. demolished the fortifications, and, although they were restored in 1817 during the union with the Netherlands, they were demolished again in 1866 with the exception of the citadel, which, however, is most remarkable on account of its picturesque location. Pop. 25,883.

Nancy′, town of France, capital of the department of Meurthe, on the left bank of the Meurthe. It is beautifully situated at the foot of a range of wooded and vine-clad hills, and is one of the finest built towns of France, with many broad and straight streets lined with magnificent houses, and many public squares adorned with fountains and gardens. It owes much of its beauty to Stanislaus Leczinsky, ex-king of Poland, who resided here from 1735 to 1766, and whose statue is in the Place Royale. It has a celebrated school of medicine and pharmacy, and another of forestry, a lyceum, a library of 26,000 volumes, several scientific societies, and many other excellent educational institutions, and large museums and collections both for scientific and artistic purposes. Its manufactures of cloths, woollens, and candles enjoy a high reputation, and its embroideries in all kinds of stuffs are celebrated. It was the capital of the former duchy of Lorraine, and in its immediate vicinity was fought the battle between Charles the Bold of Burgundy and René II. of Lorraine, in which the former was defeated and killed Jan. 5, 1477. At the death of Stanislaus, who held the country after the Peace of Vienna in 1735, the city was incorporated with France (1766). Pop. 73,225.

Nand′idæ [from the generic name *Nandus*], a family of East Indian fresh-water fishes. The body is oblong, compressed, and covered with ctenoid scales of moderate size; the lateral line is interrupted; the head compressed; the opercular bones generally more or less armed; the nostrils normal: the mouth with a lateral oblique cleft; the jaws very protracted; teeth small and developed on the jaws as well as palate; branchial apertures large; branchiostegal rays six in number; the dorsal fin is long, with its spinous portion much longer than the soft; the anal with its soft part opposite to and like that of the dorsal, and preceded by three spines; pectorals with branched rays; ventrals thoracic, and each with one spine and five rays; stomach with no pyloric appendages. The family is represented by three genera—(1) *Badis*, (2) *Nandus*, and (3) *Catopra*—whose representatives are found in the fresh waters of India and the adjoining archipelago. In aspect the species resemble somewhat the rock-basses and sunfishes of the American streams, and attain about the same size. THEODORE GILL.

Nan′du, Rhe′a, or **American Ostrich,** the *Rhea Americana*, a bird of the family Rheidæ, a native of Patagonia and the Argentine Republic. It is about five feet high. It is polygamous, and the several females lay their eggs together, to be hatched by the male. It is a swift runner, but cannot fly. It swims readily. The flesh is very good; and the birds are hunted for their feathers, which are not used as ornamental plumes, but are extensively employed in the manufacture of feather dusters. (See also NANDIDÆ and RHEIDÆ.) THEODORE GILL.

Nan′ek, founder of the important modern sect of the Sikhs of the Punjaub, b. at Talwendy, near Lahore, in 1469, was son of Kalu of the Kshatriya caste; showed an early tendency to mysticism; associated with the fakirs; studied the religious books both of the Brahmans and of the Mohammedans: distributed his property to the poor; visited Mecca and Medina, and wandered through India in quest of a "vision of truth," which he ultimately attained, and thenceforth propagated a new religion with great success, being presented to the emperor Baber in 1527. Nanek taught the unity of God, insisted upon faith in God and love to man, rejected monasticism, and instituted a very simple form of worship, which has since been considerably overlaid by the innovations of his successors. The object of Nanek was a reconciliation of Booddhism with Mohammedanism, and he embodied his doctrine in a book entitled *Adi Granth*, now the Bible of the Sikhs. D. at Kirtipur, on the banks of the Ravi River, in 1539. His tomb has been swept away by the river, but the locality is still a place of pilgrimage.

Nanekism. See NANEK.

Nankeen′ [from the city of Nanking in China], a cotton cloth of a buff-yellow color, which is very enduring. It is made in Asia from a variety of cotton whose fibre is of this color. Artificially-colored nankeens are made from ordinary cotton, and have nearly superseded the real article, which is now rather seldom seen in the European and American markets.

Nanking′, or **Nankin** ("southern capital"), city of China, capital of the province of Kiang-Su, generally called by the Chinese Kiang-Ning-Fu since the removal of the court to Peking (the "northern capital"), is situated in lat. 32° 2′ N., lon. 118° 49′ E., on an affluent of the Yang-tse-Kiang, 3 miles from this river, and 200 miles from its mouth, in a marshy and swampy plain whose excessive moisture makes the place very unhealthy for Europeans, and even for natives from other districts. According to Chinese accounts, it had once 4,000,000 inhabitants, and remains of its ancient wall show a circumference of 35 miles. But the present wall, 40 feet high, has only a circumference of 18 miles, and large parts of the space it encloses are unoccupied. By the removal of the capital to Peking, Nanking lost its chief source of prosperity, and it began to decline. Nevertheless, its monuments, the imperial palace and tombs, the porcelain tower, etc., its libraries and other institutions of learning, its commerce and manufactures, especially of the so-called nankeen, made it an important city. But on Mar. 19, 1853, it was taken by the Tai-Pings, who held it for eleven years and made it the capital of the rebellion; and when it was retaken by the imperialists July 19, 1864, its monuments had been destroyed in the mean time and its commerce and manufactures ruined; the famous porcelain tower had gone. It was built by the emperor Yungkoh (1413–32) in commemoration of his mother. It was octagonal, 322 feet high, slightly tapering, and consisted of nine stories, each provided with a gallery and a projecting roof, from whose corners bells were suspended. In the interior a spiral staircase led to the summit, formed by an elegant spire, on the top of which rested a ball of brass overlaid with gold. The imperial tombs are remarkable for the avenue of colossal sepulchral statues which leads to them, but the place is much disturbed. Of the palace only a few ruins are left. The square tower, 50 feet high, on the top of which is placed a gigantic statue of a turtle, is still standing. The imperial government has made several attempts to revive the manufacturing industry of the place, but without success. The manufacture of the so-called nankeen, which at one time carried the name of the city over the whole world, has shrunk into insignificance, if not stopped altogether. The manufacture of shot and shells, established by the government, has not prospered. Although the city has been made a free port, its commerce is inconsiderable; it is visited by very few foreigners. Its present population is estimated at 300,000.

Nansemond River, a small stream of Nansemond co., Va., whose lower course becomes a wide tidal estuary opening into Hampton Roads. It is navigable 20 miles to Suffolk.

Nanterre, a town of France, in the department of Seine, 6 miles N. W. of Paris, at the foot of Mont Valerien, is celebrated for its beautiful promenades, occupying the site of the old fortifications, and its excellent pastry. In the time of the Merovingians, and again in the fourteenth and fifteenth centuries, the town played quite a prominent part in history. Pop. in 1881, 4984.

Nantes [anc. *Condivincum* or *Namnetes*], city of France, capital of the department of Loire-Inférieure, stands on the right bank of the Loire, 34 miles from its mouth, at the influx of the Erdre and the Sèvre-Nantaise, and communicates with Brest by a canal. The quays, boulevards, and promenades along the Erdre are very elegant, and the whole modern portion of the city is regular and handsome. The most remarkable architectural monuments are—the cathedral, built in the fifteenth century, with its towers hardly rising above the roof, but containing the splendid monuments of Queen Anne, of Francis II., the last duke of Bretagne, and his wife, Margaret of Foix; the castle, commenced in 938, in which Henry IV. signed the Edict of Nantes Apr. 13, 1598, and in which many of the French kings resided temporarily; the bourse, a modern building, and one of the finest of its kind in France, etc. The city has a lyceum, which among other disciplines also gives lectures on botany, a school of navigation, different commercial and industrial schools, a public library, a botanical garden, a museum of antiquities, and an art-gallery. The principal branch of the industry of Nantes is shipbuilding and the production of all kinds of objects necessary to the outfit of a vessel—anchors, cables, cordage, sailcloth, biscuits, preserved meat, etc. The city itself possesses, besides coasters and river-craft, 745 ships, of 134,962 tons burden. Sugar-refining and the manufacture of linen and cotton fabrics, calicoes, flannels, musical, mathematical, and optical instruments, chemicals, leather, brandy, etc., are also extensively carried on. The commerce is very considerable. The harbor, formed by an arm of the Loire, can accommodate 200 vessels, and recent improvements in the river-bed have made it possible for large vessels, which formerly were compelled to load and unload at Paimbœuf, at the mouth of the river, to reach the harbor. Pop. in 1881, 124,319.

Nanteuil (Célestin), b. at Rome in 1813, of French parents, and brought to Paris in 1815, studied painting under Langlois and Ingres, and began to exhibit in 1833: *La Sainte Famille*, *La Mendicant*, etc. Among his later pictures are *La Vigne* (1853), *Phœbé*, etc. It was, however, as an engraver, lithographer, and designer, rather than as a painter, that he acquired his celebrity, executing more than two thousand vignettes for publications. D. in Paris in 1873.

Nanticoke, on R. R., Luzerne co., Pa. (see map of Pennsylvania, ref. 3–H, for location of county), on the S. bank of the E. branch of the Susquehanna, and on a branch of the Lehigh and Susquehanna, 10 miles by rail from Wilkesbarre. West Nanticoke is on the opposite side of the river, in Plymouth tp., and on the Lackawanna and Bloomsburg R. R., 24 miles S. W. from Scranton. Both places have coal-mines. Pop. of Nanticoke in 1880, 3884.

Nantuck'et, on R. R., cap. of Nantucket co., Mass. (see map of Massachusetts, ref. 6–J, for location of county), on Nantucket Island, 28 miles from Cape Cod peninsula. It is connected by steamboats with New Bedford, Wood's Holl, and Martha's Vineyard, and is a summer resort. It was formerly extensively engaged in the whale-fishery. Pop. of tp. in 1880, 3727; in 1885, 3143.

Nantucket Island is situated in the Atlantic Ocean, about 30 miles S. of Barnstable co., Mass., and with the small islands of Tucanuck, Muskeset, and the Gravel Islands forms the county of Nantucket, which has an area of about 60 square miles. Nantucket Island is of a triangular shape, about 15 miles long, and from 3 to 4 miles average width. The soil is sandy. The island contains but one township. Pop. in 1880, 3727; in 1885, 3143.

Napa City, on R. R., cap. of Napa co., Cal. (see map of California, ref. 3–B, for location of county), 40 miles by rail from San Francisco. It has good educational advantages, a public library, plough-factory, tanneries, saw- and planing-mill. The State insane asylum is 1¼ miles from the city. Pop. in 1870, 1879; in 1880, 3731.

Napanee', cap. of Lennox co., Ont., Canada, on the navigable Napanee River and the Grand Trunk Railway, 26 miles W. of Kingston, contains a court-house and an exhibition building; has a large trade, a number of mills and factories, and 3 weekly newspapers. Pop. of sub-district in 1881, 3680.

Na'perville, Du Page co., Ill. (see map of Illinois, ref. 2–G, for location of county), on the Du Page River and on the Chicago Burlington and Quincy R. R., is the seat of North-west College, under the direction of the Evangelical Association, and founded in 1861. Pop. in 1870, 1713; in 1380, 2073.

Naph'tali [Heb. נַפְתָּלִי], the sixth son of Jacob, by Bilhah, the handmaid of Rachel. The tribe of Naphtali numbered 53,400 fighting-men before Sinai, and 45,400 at the entrance into the promised country. It was settled in Northern Galilee from the foot of Anti-Lebanon to Lake Genesareth; Kedesh was its principal town.

Naph'tha [Gr. *νάφθα*], a name formerly applied to a great variety of volatile, mobile, strong-smelling, inflammable liquids, chiefly ethers, as the ethylic sulphate, nitrate, and acetate, which were called *Naphtha vitrioli*, *N. nitri*, *N. aceti*. Methylic Alcohol (which see) is still known as *wood-naphtha*. More recently the term "naphtha" has been restricted to the liquid hydrocarbons, the natural petroleum, or some of its more volatile products, or to the inflammable liquids produced by the dry distillation of organic bodies. The following are the more important naphthas: (1) *Mineral* or *native naphtha*, petroleum (see Petroleum); (2) *petroleum naphtha*, the more volatile portion of petroleum, which is collected separately during the distillation, and either sold as crude naphtha or fractioned into gasoline, refined naphtha, and benzine. (See Petroleum.) (3) *Shale naphtha*, obtained by the distillation of bituminous shales or schists. (See Kerosene, Oil from Shale.) (4) *Boghead or Bathgate naphtha*, *photogen*, *paraffine oil*, *kerosene*, etc., similar to shale naphtha, distilled from boghead shale of Torbam Hill, Scotland. (See Oil from Shale.) (5) *Coal oil*, *photogene*, *kerosene*, etc., distilled from bituminous coals, as the Breckinridge coal of Kentucky, or from rich asphaltic minerals, as the albertite of Nova Scotia, the grahamite of West Virginia, or the Hartley mineral of Australia. (See Oil from Coal.) (6) *Coal-tar naphtha*, the more volatile portions of coal-tar, consisting chiefly of benzol, toluol, xylol, etc. (See Tar and Gas-lighting.) (7) *Bone naphtha*, *bone oil*, *Dippel's oil*, a mixture of hydrocarbons with certain organic bases, pyrrol, pyridine, etc., obtained from the tar of bones and other animal substances. (See Tar.) (8) *Oil of wood-tar* is properly a naphtha, being the more volatile portion of wood-tar. (See Tar.) (9) *Caoutchouc naphtha*, *caoutchoucine*. (See India-rubber.)

All these naphthas, except methylic alcohol (*wood-naphtha*) and caoutchoucine, consist of hydrocarbons, belonging chiefly to the marsh-gas series or the benzol series; the former when found in nature (*petroleum*) or produced at low red heats (*shale oil*, *coal oil*, etc.), the latter when formed at high temperatures, as coal-tar naphtha.

C. F. Chandler.

Naphtha Gas. See Petroleum.

Naph'thalene ($C_{10}H_8$), a hydrocarbon found among the products of the destructive distillation of bituminous coal. (See Gas-lighting and Hydrocarbons.) It occurs in Rangoon petroleum and the tar of shale oil. According to Berthelot, it may be formed synthetically by substituting 2 equivalents of acetylene (C_2H_2) for 2 of hydrogen in benzol (C_6H_6). It is formed by passing the vapors of several other hydrocarbons through a red-hot tube, as toluene (C_7H_8), xylene (C_8H_{10}), cumene (C_9H_{12}), or mixtures of ethylene (C_2H_4) with benzol (C_6H_6), cinnamene (C_8H_8), anthracene ($C_{14}H_{10}$), or chrysene ($C_{18}H_{12}$). Alcohol and ether vapor, and even ethylene and vapors of acetic acid, petroleum, essential oils, etc., yield some naphthalene when passed through red-hot tubes. Soot and lampblack contain naphthalene. Sulphide of carbon vapor mixed with sulphuretted hydrogen, or both mixed with carbonic anhydride (CO_2), yield naphthalene when passed over spongy iron or copper at a dull red heat. Protochloride of carbon (C_2Cl_2), when passed through a red-hot tube with hydrogen, yields naphthalene.

Preparation.—Crude "dead oil," the heavy oil of coal-tar, deposits large quantities of impure naphthalene, which constitutes the material from which naphthalene is prepared by a simple process of purification by sublimation. By treatment with acids and alkalies the last traces of impurity are removed. (See *J. pr. Chem.*, cii. 29.)

Properties.—Naphthalene appears in brilliant white, scaly crystals, very friable, strongly and unpleasantly odorous. The disagreeable odor is said by Ballò to be due to leucoline oil, which can be separated by boiling it with strong sulphuric acid and precipitating the resulting brown solution with ammonia. Specific gravity 1.153. It melts at 174.5° F. (79.2° C.), and boils at 424.5° F. (218° C.). It sublimes at low temperatures and evaporates in the air. It is insoluble in cold, and almost insoluble in boiling water, but dissolves readily in alcohol, ether, fatty and essential oils, and most oils (naphthas) obtained by destructive distillation, in acetic and oxalic acids. It is one of the most stable of the more complex hydrocarbons, and withstands very high temperatures without decomposition, provided oxygen be absent. It dissolves in warm sulphuric acid, forming two crystallizable acids—sulpho-naphthalic or naphthalene-sulphonic acid ($C_{10}H_7HSO_3$) and disulpho-naphthalic or naphthalene-disulphonic acid($C_{10}H_6(HSO_3)_2$). Naphthalene unites directly with 4 atoms of chlorine and bromine. Chlorine also produces substitution products, replacing from 1 to 8 atoms of hydrogen; bromine replaces from 1 to 4 atoms. Derivatives containing both Cl and Br are known as $C_{10}H_3Br_2Cl_3$. All these substitution products unite with 4 atoms of chlorine or bromine. Nitric acid produces three substitution products, replacing 1, 2, or 3 atoms of hydrogen with a corresponding quantity of nitryl (NO_2). The first nitro-naphthalene ($C_{10}H_7NO_2$) is converted by reducing agents into naphthylamine ($C_{10}H_7NH_2$), which bears the same relation to naphthalene that aniline does to benzol. The nitro-naphthalenes correspond to nitro-benzol, nitro-cellulose (gun-cotton), nitro-glycerine, and nitro-phenol (picric acid). By an indirect process H_2 in naphthalene may be replaced by O_2, producing naphthaquinone ($C_{10}H_6O_2$), which bears the same relation to naphthalene that quinone bears to benzol and anthraquinone to anthracene. (See Anthracene and Alizarine.) Some years since Roussin prepared a substance which he supposed to be artificial alizarine, the most important coloring-matter of madder. Alizarine was at that time supposed to be a derivative of naphthalene, as both yield phthalic acid. Roussin's product was not alizarine, and has not proved to possess any value as a dye. It is called naphthazarine, and is dioxynaphtho-quinone ($C_{10}H_4O_2(OH_2)$.)

Naphthalene Colors.—Many of the derivatives of naphthalene exhibit beautiful and intense colors, but a few only have been found available as dyes. (1) Martius yellow, Manchester yellow, *jaune d'or*, is the ammonium calcium or sodium salt of dinitro-naphthylic acid. It is prepared by treating hydrochlorate of naphthylamine with nitrite of potassium, and heating the resulting diazonaphthol with nitric acid:

$$\overset{\text{Naphthylamine.}}{C_{10}H_9N} + HNO_2 = 2H_2O + \overset{\text{Diazonaphthol.}}{C_{10}H_6N_2}.$$

$$\overset{\text{Diazonaphthol.}}{C_{10}H_6N_2} + 2HNO_3 = 2N + H_2O + \overset{\text{Binitro-naphthylic acid.}}{C_{10}H_6(NO_2)_2O}.$$

Martius yellow imparts to wool and silk, without the aid of a mordant, yellow hues from lemon-yellow to golden-yellow, which are not affected by steaming. Picric acid imparts similar tints, but it is volatilized by steam. Martius yellow is not only used for dyeing yellow, but also to modify the hue of aniline red. (2) Victoria yellow or dinitronaphthol ($C_{10}H_5(NO_2)_2OH$) is isomeric with binitro-naphthylic acid, and is also a beautiful yellow dye which requires no mordant for either silk or wool. It is prepared as follows: "One part of naphthalene is mixed with two parts of concentrated sulphuric acid, and heated on a water-bath until the solution is complete; the sulpho-naphthalic acid so obtained is saturated with soda, and the solution is evaporated to dryness. The sulpho-naphthalate of soda is next fused with caustic soda, and the mass resulting from this operation is dissolved in water and supersaturated with HCl, whereby naphthol, or hydrate of naphthyle, is separated. This substance is next boiled with a mixture of sulphuric and nitric acids, yielding binitronaphthol, the yellow coloring-matter; this substance is chemically different from, but, after all, isomeric with, the so-called Martius yellow, or binitro-naphthylic acid. The formula $C_{10}H_6N_2O_4O_2$ answers for both equally well; industrially speaking, both substances approach each other to such a degree that they may be considered identical; both are best used in the state of ammoniacal salt, this being the most readily soluble salt for each. These materials are employed at Paris for the adulteration of gamboge, and very largely used for the coloration of artificial flowers, leather gloves, etc." (3) Magdala red, naphthalene red, naphthylamine red, roseo-naphthalene, is generated from 3 molecules of naphthylamine by the elimination of 3 molecules of hydrogen:

$$\overset{\text{Naphthylamine.}}{3C_{10}H_9N} - 3H_2 = \overset{\text{Magdala red.}}{C_{30}H_{21}N_3}.$$

This change is effected by treating naphthylamine with stannic or mercuric chloride, mercuric nitrate, etc., the reagents which are employed to produce aniline red by a similar reaction. The process is somewhat uncertain. A better process consists in first converting the naphthylamine into azodinaphthyl-diamine by the action of nitrous acid:

$$\overset{\text{Naphthylamine.}}{2C_{10}H_9N} + HNO_2 = \overset{\text{Azodinaphthyl-diamine.}}{C_{20}H_{15}N_3} + 2H_2O.$$

By the action of naphthylamine this compound is converted into magdala red:

$$\overset{\text{Azodinaphthyl-diamine.}}{C_{20}H_{15}N_3} + \overset{\text{Naphthylamine.}}{C_{10}H_9N} = NH_3 + \overset{\text{Magdala red.}}{C_{30}H_{21}N_3}.$$

The product appears in commerce as a dark-brown, somewhat crystalline powder, which is the chloride of the base. In tinctorial power it equals aniline red, while it surpasses it in being a very fast color. It can be readily distinguished from aniline red by the following reaction: On pouring a few drops of its concentrated solution into a cylindrical vessel filled with alcohol, a liquid is formed perfectly transparent, with light rose-color by transmitted light, but exhibiting in reflected light a strong and peculiar fluorescence, giving an appearance of opacity, as if a precipitate were being formed, and diffusing itself through the liquid in clouds of a fiery-red color. (4) Naphthylamine violets and blues are produced by the same reactions employed in converting aniline red into violets and blues (see Aniline Colors); *i. e.* replacing in magdala red 1, 2, or 3 atoms of hydrogen by methyl, ethyl, phenyl, etc. They may also be produced by treating naphthylamine with mercuric nitrate (*Wilder*); by substituting the radical naphthyl ($C_{10}H_7$) for hydrogen in aniline and toluidin (*J. Wolff*); from rosaniline and mono-bromnaphthalene, and from rosaniline and naphthylamine (*M. Ballò*). Blumer-Zweifel (*Dingl. polyt. J.*, cxcvi. 66) produces naphthylamine violet directly on the fibre by printing linen or cotton stuffs with a solution containing in a litre of suitable thickening material 30 grammes of naphthylamine hydrochloride and 15 grammes of cupric chloride solution of 15° B. For dyeing the thickening material is omitted, and the cupric chloride is reduced by a fourth. By increasing or diminishing the quantity of naphthylamine salt the color may be made darker or lighter. The printed or dyed stuffs are left for two or three days in the oxidizing chamber at a temperature of 77° F. (25° C.), and the colors fixed by washing with soap-water. Alkaline baths render the color reddish, acid baths make it bluish. A. Kielmayer (*Dingl. polyt. J.*, cxcvi. 67) has given a similar process, using chlorate of potassium instead of cupric chloride. (5) Chloronaphthalic or chlor-oxynaphthalic acid ($C_{10}H_5ClO_3$). When naphthalene is heated with chlorate of potassium and hydrochloric acid, a mixture of chloro-naphthalene and bichloro-naphthalene is obtained. By heating these with nitric acid a mixture of phthalic acid and chloride of chlor-oxynaphthyl is produced. The latter compound, on being heated with an alkali, is converted into the new acid. In a free state the chlor-oxynaphthalic acid is yellow; it forms beautifully-colored salts with baryta, zinc, and copper. It dyes wool scarlet without a mordant, but scarcely produces any change on cotton mordanted with alumina or iron. This acid almost rivals turmeric and litmus in its sensibility to alkalies. Paper stained with a very dilute alcoholic solution assumes a red color in ammoniacal vapors.

Benzoic Acid, from Naphthalene.—By converting the phthalic acid mentioned above into a calcium salt and heating with slaked lime to 662° or 698° F. (350°–370° C.), it is converted into benzoate of calcium, from which the acid is easily separated. The preparation of benzoic acid and chloro-naphthalic acid by these processes is carried out on a large scale in France.

Literature.—Watts's *Dict.* and supplements: Wagner's *Technology* and *Jahresbericht; Jahresbericht der Chemie;* Th. Chateau, *Couleurs d'Aniline, d'Acide phénique, et de Naphthaline* (Paris, 1868); M. Ballò, *Das Naphthalin und seine Derivate* (Braunschweig, 1870); Dr. P. A. Bolley, *Die chemische Technologie der Spinnfäsern;* M. P. Schützenberger, *Die Farbstoffe* (Berlin, 1868–70); W. Crooks, *Handbook of Dyeing and Calico-Printing* (London, 1874).
C. F. Chandler.

Naphthalene Colors. See Appendix.

Naphthalization of Gas, or **Carburetting Gas,** the process by which the illuminating power is increased by adding to it a small quantity, 10 to 40 grains per cubic foot, of coal-tar naphtha (benzol) or petroleum naphtha. (See article Gas-lighting.) C. F. Chandler.

Naphthylamine. See Naphthalene.

Napier, an eminent noble family of Scotland whose principal peerage dates in that country from 1627. The peerage of Napier of Magdala was created in 1868 (United Kingdom). Besides the eminent names mentioned below, other important members of the family have been Sir Charles James Napier, b. Aug. 10, 1762; the conqueror of Scinde, an able writer, distinguished in the Peninsula, in North America (1813), and in India. D. Aug. 29, 1853.—Rt. Hon. Sir Joseph Napier, Bart., P. C., Q. C., D. C. L., LL.D., b. Dec. 25, 1804; was att'y-gen. for Ireland 1852, and lord chancellor of Ireland. D. Dec., 1882.—William John, ninth Baron Napier (1787–1834), a noted naval officer, who commanded in the war of 1834 in China, and died there Oct. 11, 1834.

Napier (Admiral Sir Charles John), K. C. B., son of Capt. Charles Napier, R. N., and grandson of Francis, fifth Lord Napier, b. at Merchiston Castle, Stirlingshire, Scotland, Mar. 6, 1786; entered the navy at the age of thirteen; was appointed lieutenant in 1805; made commander of the Recruit (18 guns) in 1808; was distinguished in naval engagements with French vessels and at the capture of Martinique, obtaining a post-captaincy for his gallantry (Apr., 1809); served as a volunteer in the British army in Portugal, in company with his three cousins, who were known as "Wellington's colonels;" became commander of the Thames (32 guns) in 1811, and inflicted great damage upon the French in the Mediterranean; was engaged in the British naval operations in the Potomac and against Baltimore in 1814; settled in Paris after the peace, and established the first steamers on the Seine; was placed on naval duty on the coast of Portugal in 1829; accepted from Dom Pedro in 1833 the command of the squadron of the young queen; inflicted upon the fleet of Dom Miguel a decisive defeat off Cape St. Vincent July 5, for which he was made Viscount St. Vincent in the Portuguese nobility and admiral-in-chief of the Portuguese navy. In 1839 he resumed service in the British navy; was engaged as commodore on the coast of Syria in 1840, when he stormed Sidon with a land-force, captured Acre, blockaded Alexandria, and concluded a convention with Mehemet Ali, for which services he was knighted. He sat in Parliament 1841–47; was appointed rear-admiral of the blue, and given command of the Channel fleet in 1847; made vice-admiral May, 1853; commander of the Baltic fleet in the war with Russia 1854, and captured Bomarsund, but failed to realize the expectations formed from his brilliant antecedents; was made admiral of the blue 1858, and sat in Parliament for Southwark from 1855 till his death, which occurred at Merchiston Hall, Hampshire, England, Nov. 6, 1860. He wrote *An Account of the War in Portugal* (1836) and *The War in Syria* (1842), and furnished materials for a *History of the Baltic Campaign* (1857). (See his *Life and Correspondence*, by Maj.-Gen. E. Napier, 1862.)

Napier (Sir Francis), tenth Baron, K. S., P. C., Bart., b. Sept. 15, 1819; succeeded his father 1834; British minister at Washington 1857–58; at the Hague 1858–60; was sworn of the privy council 1861; was British ambassador to Russia 1861–64; at Berlin 1864–66; governor of Madras 1866–72.

Napier (John), laird of Merchiston, b. at Merchiston Castle, near Edinburgh, Scotland, in 1550; studied at the University of St. Andrew's; spent several years in travels in France, Spain, and Italy, and on his return entered upon a life of studious leisure. He first became known as an author by his *Plain Discovery of the Whole Revelation of St. John* (1593), giving in the dedication some wholesome advice to King James upon the reform of his "house, family, and court." About this time he was engaged in researches into the construction of warlike machines, and a letter to Anthony Bacon, dated in 1596, describes his invention of a mirror to set fire to ships by reflecting the rays of the sun, and of an instrument for scattering shot over a wide area; but these inventions seem never to have been tested or even perfected. In 1614 he published his great discovery of logarithms in a work entitled *Mirifici Logarithmorum Canonis Descriptio*, which, according to Kepler, he had indicated as early as 1594 in a letter to Tycho Brahe. In 1617 he published *Rabdologiæ, seu Numerationis per Virgulas Libri duo*, describing the invention known as Napier's Bones (which see). He d. at Merchiston Apr. 4, 1617. His son Robert published 1619 a posthumous work, *Mirifici Logarithmorum Canonis Constructio*, explaining the method of constructing tables of logarithms. Archibald, his eldest son, was created Lord Napier in 1627, and was ancestor of the Napiers of military and naval celebrity in modern times. Biographies of Napier were published by the earl of Buchan (1787) and by Mark Napier (1834).

Napier (Macvey), b. in Stirlingshire, Scotland, Apr. 12, 1776; studied law; became writer to the Signet 1799; published in 1817 an essay on the *Philosophical Writings of Lord Bacon;* edited the *Supplement* to the *Encyclopædia Britannica* (6 vols., Edinburgh, 1815–24); appointed professor of conveyancing in the University of Edinburgh 1825; edited the *Edinburgh Review* for seventeen years (1829–46); superintended the 7th ed. of the *Encyclopædia Britannica* (1830–42); was for many years librarian to the Society of Writers to the Signet, and became in 1837 one of the principal clerks to the court of sessions. D. at Edinburgh Feb. 11, 1847. A posthumous work by Prof. Napier, *Lord Bacon and Sir Walter Raleigh*, appeared in 1853.

Napier (Robert), b. at Dumbarton, Scotland, June 18, 1791, was the son of a blacksmith, and was apprenticed to that trade; set up a blacksmith's establishment at Glasgow in 1815; engaged in iron-founding and engineering in 1821; began to construct engines for steamers in 1823, and laid the foundations of an extensive business; established in 1830 a steam-packet company; built in 1834 the machinery for the vessels of the Dundee and London Steamship Company; in 1836 fitted out the Berenice steamer for the East India Company; equipped the British Queen to ply to New York in 1839, and in 1840 furnished to the Cunard Company its first four vessels. In 1853 he fitted out the Duke of Wellington, then the largest vessel in the British navy; admitted his sons into partnership in the same year; built for the British admiralty the Black Prince, of 6100 tons, in 1859, and the Hector, of 4060 tons, in 1860, and constructed many steam-rams and iron-clad ships of war for foreign governments. Mr. Napier received the great gold medal of honor at the Paris Exposition of 1855, and was president of the Institution of Mechanical Engineers. D. June 23, 1876.

Napier (Lieut.-Gen. Sir William Francis Patrick), K. C. B., b. at Castletown, Kildare, Ireland, Dec. 17, 1785, son of Col. George Napier, great-grandson of the fifth Lord Napier, brother of Sir Charles James and Col. George, and cousin of Admiral Sir Charles Napier, who together constituted a remarkable assemblage of military, naval, and literary talent, all being descendants of the laird of Merchiston, the inventor of logarithms. He entered the army in 1800; became captain 1804; served at the siege of Copenhagen 1807; accompanied Sir John Moore to Portugal 1808; was wounded at Almeida 1810, and at Cazal Nova 1811; was engaged in the battles of Busaco 1810, Fuentes de Onoro 1811, Salamanca 1812, Bidassoa 1813, and Orthes 1814, besides many minor actions; became major 1811, and lieutenant-colonel 1813, and wrote a *History of the War in the Peninsula and in the South of France from 1807 to 1814* (6 vols., 1828–40), which has been very variously judged, but is admitted to be one of the most remarkable military histories of modern times. He was supplied with important materials by the duke of Wellington, Marshal Soult, and many eminent officers, both French and English. His wife, a niece of Charles James Fox, greatly aided him by translations from the French, especially the cipher correspondence between Napoleon and his brother Joseph, king of Spain. This history called forth a large number of replies and criticisms from officers alluded to in the text, and the later editions contain replies printed under the title *Justificatory Pieces.* Napier was made colonel in 1830, major-general 1841, lieutenant-governor of Guernsey 1842, knighted 1848, and made lieutenant-general 1851. He devoted his later years to the illustration of his brother's exploits in the East, publishing *The Conquest of Scinde* (1845), *Administration of Scinde* (1851), and *The Life of Sir Charles Napier* (1857); he also issued in 1855 *English Battles and Sieges in the Peninsula*, consisting of passages from his larger history, revised and sometimes rewritten. D. at Scinde House, Clapham, Feb. 12, 1860. The accomplished Lady Napier d. a few weeks later.—Capt. Henry Edward Napier, youngest brother of Sir Charles and Sir William, b. Mar. 5, 1789, served in the navy, wrote an extended *Florentine History* (6 vols., 1846–47), which was highly commended, and d. Oct. 13, 1853.

Napierian Logarithms. See Logarithms, by Prof. W. G. Peck, LL.D.

Napier of Magdala (Robert Cornelius Napier), Baron, b. in Ceylon, in 1810, son of Major C. F. Napier of the Royal Artillery; was educated at the Military College at Addiscombe, and entered the Royal Engineers as second lieutenant in 1826; served throughout the Sutlej campaign of 1845–46, as chief engineer in the battles of Moodkee and Ferozeshah (severely wounded), and as brigade-major of engineers at the battle of Sobraon; served in the Punjaub campaign of 1848–49; was chief engineer and wounded during the siege of Mooltan 1849; commanding engineer of the right wing at the battle of Goojerat and pursuit of the Sikh army; actively engaged throughout the Indian mutiny campaigns; chief of staff to Outram in 1857, and distinguished in the actions leading to the first relief of Lucknow and subsequent operations; brigadier and chief engineer at the siege and capture of Lucknow; commanded a brigade at the capture of Gwalior, reducing the fort of Powrie Aug., 1858; commanded a division in the China expeditionary force, and distinguished throughout the campaign resulting in the surrender of Pekin, and promoted to be major-general; appointed lieutenant-general in 1867, and commanded the Abyssinian expedition resulting in the capture of Magdala and release of the British prisoners. He achieved, indeed, a brilliant success here. King Theodore was thoroughly defeated in an engagement on the heights of Islamgie, Apr. 10, 1868, and the English commander followed up his victory by the storming of Magdala, Apr. 13; after which, King Theodore in despair committed suicide. On Napier's return to England, in July, he was elevated to the peerage under the title of baron of Magdala, and received an annual pension of £2000. (See Abyssinia and Magdala.) In 1868 he was raised to the peerage for his eminent services, and nominated a G. C. B., having previously been made C. B. and K. C. B. for his services during the Indian mutiny. Was governor and commander-in chief of India 1870–76, when transferred to Gibraltar as governor. In 1874 he was commissioned general.

Napier's Bones (or **Rods**), a set of tablets of bone, horn, ivory, or other material, invented by the mathematician Napier for facilitating multiplication and division. They are of no practical use, and are only interesting as a mathematical curiosity.

Na'ples [It. *Napoli;* Gr. *Neapolis*], the largest and most magnificently situated town of Italy, lying on the bay of the same name, in lat. 40° 50′ N., lon. 14° 16′ E., and enjoying a climate of rare perfection. From the curving line of the bay the city ascends from the Castello dell' Ovo to the top of the Capodimonte, a distance of more than 3 miles, and then sweeps round the summits of the semicircular hills down to the extreme points of the bay, thus forming a crescent, which, beheld from the sea, presents a picture almost unrivalled in its kind. Nothing, however, can exceed the view from the heights above the town, the city itself and its populous suburbs extending for miles and miles along the bending shore, the purple waters of the bay and the sea beyond, out of which rise Ischia and Capri and the shining points of Castellamare, Sorrento, etc.; while on the left Somma and Vesuvius, with all their grand and tragic associations, are glowing in the light of a southern sun. Extensive as is the bay, the harbor is very limited, and ships of war and other large vessels find safer anchorage near Baiæ. The city is dominated (rather than defended) on the W. by the castle of St. Elmo, once of immense strength, which crowns the hill of Sant' Erasmo or Santermo; on the seaside are the fortresses of Castello Nuovo, often compared to the Tower of London, and adorned with a triumphal arch in honor of Alfonzo of Aragon (1442); the Castello dell' Ovo, with its absurd traditions about Virgil, but which was probably built by the Norman William I. (1150); also many batteries. There is regular steam-communication by water between Naples and all the principal Mediterranean ports, and railways connect it with Central and Northern Italy. The city is divided into the Old, or E., and the New, or W., towns by the ridge extending from the palace of Capodimonte to the sea, thus forming a kind of double crescent. The modern streets are broad and well paved, while the older thoroughfares, lined by houses of great height, are, the Toledo excepted, extremely narrow, and sometimes very steep and crooked, and the glimpses caught of them in driving through the wider avenues are strikingly picturesque. The principal streets of Naples are the Via Roma (formerly the Toledo), a grand street intersecting the old town; the Chiaja, or Riviera di Chiaja, which, passing the charming gardens of the Villa Nazionale on the left and a row of fine buildings on the right, winds for several miles along the curving, undulating western shore of the bay, and is the fashionable promenade of the city; the Vittorio Emmanuele, which skirts and crosses the higher portions of the town, commanding views of surpassing loveliness; the Corso Garibaldi; the Molo, etc. The lower part of the Toledo (now unfortunately trying to be called Roma) formerly offered to the visitor the most animated pictures of Neapolitan habits, where the whole domestic life of the poorer classes might be studied in the open air. Here they dressed and undressed their children, boiled their maccaroni, fried their fish, roasted their chestnuts, ate and drank, quarrelled and sang, worked and begged. All this has greatly changed since the unification of Italy and the consequent reduction—one might almost say annihilation—of the *lazzaroni*. The public squares, called *larghi*, are irregular, and, though flanked by showy edifices and decorated with fountains, are not generally attractive. The churches are numerous (over 300), some very quaint and curious in their construction, with domes glittering with gilded and colored tiles, which give them a semi-Oriental aspect, but as a whole they have more archæological interest than architectural merit. In the sacristy of the gorgeous church of San Gennaro is the almost priceless treasury of the saint; here also are the *ampolle* or small phials said to contain the blood of St. Gennaro, which is believed to liquefy twice every year. Among other prominent churches are the Incoronata, founded by Joanna I., with damaged frescoes attributed to Giotto; Santa Chiara, with fine frescoes and curious old monuments; San Domenico Maggiore, very rich; the church of the Gerolomini, one of the finest in the city; San Francesco di Paola, the cupola of which is surpassed in size and boldness of execution only by that of St. Peter's in Rome and the Duomo in Florence. The convents, including those recently suppressed, number more than 100, exclusive of those in the suburbs, and among these the monastery or Certosa of San Martino, near the castle of St. Elmo, is the most conspicuous. Of the fourteen theatres, San Carlo is the largest and most elegant, and, next to the Scala of Milan, ranks as the first in Europe. The National Museum is one of the most interesting in the world. It contains a great number of objects found in Pompeii and its neighborhood, statues and bas-reliefs in marble, mosaics and mural frescoes of the highest interest, more than 3000 specimens of ancient glass, an immense collection of small antique bronzes, painted vases, etc. The precious objects, such as cameos, engraved gems, gold and silver ornaments, number about 2000, chiefly of Greek and Roman workmanship. The Egyptian collection is extensive. The library contains 160,000 volumes, besides many manuscripts on parchment and paper, and no less than 1800 from Herculaneum on papyrus; the Pinacoteca, nearly 1000 pictures. Naples is well provided with the higher institutions of learning, and has always been distinguished for the number and extent of its charitable organizations; but the poverty and beggary for which it has been no less remarkable are a proof of bad management in these latter institutions. Besides countless hospitals and other *ricoveri*, the Reale Albergo de' Poveri, with its dependencies, has sometimes sheltered as many as 4000 persons, and yet the streets of Naples were at the same time hideous with misery. Outside of the Capuan gate is the cemetery of the non-Catholics, remarkable for the simplicity and elegance of the monuments. The old Campo Santo, that of the victims of the cholera, and the new Campo Santo, are all on the road to the Poggio Reale. The new Campo Santo is of great extent, is laid out with taste, and shows an immense improvement in public sentiment. Among the many objects of interest in the immediate vicinity of Naples is the grotto of Posilipo, the work of Lucullus or of Agrippa. This is a gallery cut through the rocky promontory of Posilipo, about 1850 feet long, 17 or 18 in width, and at the extremities above 50 feet in height, though much lower towards the centre. Just over the E. entrance is the reputed tomb of Virgil. The new marine aquarium, constructed by Dr. Dohrn, is very interesting.

The foundation of Naples is pre-historic, and of course uncertain. The still older town, *Parthenope* or *Palæopolis* (the site of which was probably Posilipo), was, according to the legend, named from the siren Parthenope, here vanquished by Ulysses. Both towns were Greek colonies, and Greek continued to be spoken until the second century of the Christian era. The ancient city was small, but well fortified, and first appears in history as an ally of Rome against the Samnites. It continued faithful to the Romans in their wars with Hannibal, and eventually became the favorite resort of the Roman aristocracy, the ruins of whose splendid villas still meet the eye in every direction. These beautiful shores were then not only the theatre of literary leisure and social pleasures, but of some of the most frightful crimes in the history of the world. After suffering much from the barbarians, it was besieged (537) by Belisarius, who, entering the town through an aqueduct, gave it up to his soldiers. Totila, who took it afterwards, treated it more humanely. Later it became the capital of a dukedom, gradually extending over the neighboring towns and islands, but always partially dependent upon Sicily. The duchy of Naples had fierce conflicts with that of Benevento, sustained itself against the Saracens, and finally employed them as allies in spite of papal excommunication. In 1037 the city fell into the hands of the Normans under Ruggiero, and was well governed by him and his successors as a part of their kingdom. The Suabian dynasty followed in 1194, and in 1250 Naples rebelled unsuccessfully against Conrad, the son of Frederic, but in 1268, at the instigation of the pope, Conradine, the last of his house, was taken prisoner and beheaded by Charles of Anjou, on whom the pope had bestowed the kingdom of Naples. Charles beautified the city and made it his capital. The weakness of Joanna I., the assassination of her husband, etc. brought upon Naples the vengeance of Louis of Hungary, who, entering it preceded by a black flag, treated it with terrible severity, and for a century the greatest disorder and misery prevailed. In 1442, Alfonzo of Aragon besieged the city and entered it through an aqueduct, as Belisarius had done before him. In 1495, Naples joyfully opened her gates to Charles VIII. of France, who, however, was soon forced to share his prize with Spain. Francis I. vainly endeavored to recover it from his rival, Charles V. In the siege of 1528 both besieged and besiegers suffered cruelly from plague and famine. Under the government of the Spanish viceroys Naples presented a scene of disorder and squalor not to be described, while churches were multiplied and convents occupied the most beautiful and healthy positions in the city. Strong efforts were made by the best citizens and the purest ecclesiastics to introduce the Reformed religion, and a popular tumult in 1547 forced Charles V. to annul the order for the establishment of the Inquisition. But cruel religious persecution under other forms and the most intolerable despotism finally brought about (1647) the famous insurrection of Masaniello (which see). Not long after, a terrible plague appeared, during which 30,000 persons perished in six months. In 1701 the nobility attempted to overthrow the existing government and place an archduke of Austria at its head. When Charles III. entered the city (1734) he is said to have found 16,500 priests and 30,000 thieves. During the wars of the French Revolution, Naples was several times taken, lost, and re-taken by the French. In 1815 the Bourbons were once more restored; the citizens endeavored to obtain reforms, and the government promised them, but they never came. Remonstrance was followed by repression, resistance by fair promises and foul treachery, until 1860, when, on Sept. 7, Garibaldi entered the city, and the people, being called upon to decide their own destiny, voted for the annexation of Naples to the constitutional kingdom of Victor Emmanuel II. Since then marked changes for the better have taken place; extensive machine-factories (the result of English enterprise) are in operation; native industries are multiplying; common schools have been established; and, though in the neighborhood of the Porto may still be seen too much of that mad gayety clothed in filthy rags which has made Naples notorious, yet on the whole there is an aspect of greater decency and greater comfort. Trade is increasing; the number of vessels, coasting and others, which enter the port annually exceeds 10,000. The imports consist chiefly of grain, sugar, tea, coffee, spices, and foreign manufactured goods; the exports are fruits, wines, olive oil, madder, and various manufactures of the city and province. The tortoise-shell and coral ornaments made here are very beautiful, and the gloves famous for their cheapness. Naples, however, lacks commercial facilities, is without docks, without magazines for merchandise, etc., and traffic with the interior languishes from insufficient and insecure communication. It is to be hoped that a wiser municipal policy will soon correct these evils; for, notwithstanding the ignorance and degradation of the lowest stratum of society, and the obscurantism of the highest, there is a large and intelligent class among the citizens, and even among the priests, who manifest a keen interest and are ready to take an active part in every true reform. Pop. 493,315.

CAROLINE C. MARSH.

Naples, Ontario co., N. Y. (see map of New York, ref. 5–E, for location of county), at the head of Canandaigua Lake, has an academy, several mills, and is in a fine fruit-growing section. Pop. in 1870, 902; in 1880, 1360.

Naples, Bay or **Gulf of,** a portion of the Mediterranean on the S. W. coast of Italy, running inland about 10 miles between Cape Miseno and Cape Campanella, 20 miles distant from each other. Its shores have a world-wide reputation for beauty of scenery and charm of climate.

Naples, Kingdom of, one of the old political divisions of Italy. (See ITALY, also SICILY.)

Napoleon, on R. R. and Maumee River, cap. of Henry co., O. (see map of Ohio, ref. 2–D, for location of county), 35 miles S. W. of Toledo, has mills, machine-shops, and a foundry. Pop. in 1870, 2018; in 1880, 3032.

Napoleon I., b. at Ajaccio, in the island of Corsica, Aug. 15, 1769, was the second son of Carlo Bonaparte (1746–85), a man of elegance and ability, but of limited means, and Letizia Ramolino (1750–1836), a lady of great beauty, extraordinary mental vigor, and virtue: he had three sisters and four brothers. Through the influence of Count de Marbœuf, French governor of Corsica, he obtained a free place at the military school of Brienne in 1780, and here, as in Paris, whither he was removed in 1784, the small, thin, sallow-faced Corsican boy with the large black eyes attracted much attention by his talent for mathematics, by the clearness and power of his perceptions in general, and by the imperturbability of his temper. In 1785 he was made a sub-lieutenant of artillery, and in the following years saw some active service in his native country. On the rising of Paoli, who hoped by English support to wrench Corsica from France and make it independent, the family of Bonaparte joined the French party, and Napoleon served against the rebels. But in 1792 the whole family was driven out of the island, and moved in great poverty and distress to Marseilles. In 1793, Napoleon was made a captain, and having taken part with honor in the pacification of Marseilles, he was sent the same year as lieutenant-colonel to the besieging army before Toulon. On Sept. 12 he received the command, and Dec. 19 the English and Spanish, who occupied the city, were compelled to abandon it, although the conquering army was a wretched horde, miserably armed, poorly trained, and without discipline, while the vanquished was a regular corps of high standing. He was made a brigadier-general Feb. 6, 1794, and sent by the Convention to the army in Italy, where he soon acquired great influence with the military commission, especially through young Robespierre. This connection with the son, however, implicated him in the fall of the father (July 28); he was called to Paris, and even imprisoned, and although he was liberated after a couple of weeks, the active command was taken from him. A new period of misery followed. He was so poor that he could not afford to wear gloves or to have his boots blackened, and dangerous visions began to haunt his mind. He thought of going to Asia. "Asia contains 600,000,000 men," he said; "there something can be done; Europe is worn out." He felt inspired at the idea of acting with 600,000,000 men; his enormous energy dared to measure itself with such enormous tasks. He did not go immediately, however. He was too practical a man not to wait for the proper opportunity. The Directory knew about him, and when it saw itself beleaguered in the Louvre by the Parisian mob, and its very existence endangered by the insurrection of the national guard, it sent for him. On Oct. 4, 1795, he received the command of the garrison of Paris, and the next day he cleared the streets with grapeshot, pursued the rioters into their hiding-places, disbanded the national guard, disarmed the populace, and ended the French Revolution. On Mar. 9, 1796, Napoleon married Josephine Beauharnais, widow of Gen. Beauharnais, who had been guillotined in the Reign of Terror. She was not remarkably beautiful, but she had grace; nor was she very accomplished, but she was brilliant. And the deep affection which Napoleon felt for her, and always continued to feel, she returned with a romantic enthusiasm, which on some occasions rose into a most touching devotion. She was rich and somewhat extravagant. Her household was arranged in great style, and her receptions gathered all the celebrities of the day. It was chiefly due to her influence and her intrigues that Napoleon was appointed commander-in-chief of the army in Italy. On Mar. 21, eleven days after his wedding, he left Paris, and now followed till Apr. 18, 1797, the most brilliant campaign the world ever saw. The French army sat perched somewhere on the rocks of the Maritime Alps, watched by the allied Austrian and Sardinian armies—sick, naked, starving, defeated, and demoralized, numbering hardly one-third of the force of the enemy. With this army Napoleon descended from the Alps, defeated the Austrians at Montenotte and Millesimo (Apr. 11 and 15), beat the Sardinians at Ceva and Mondovi (Apr. 20 and 22), defeated the Austrians at Lodi (May 10), shut them up in the fortress of Mantua, and conquered Lombardy in a few weeks. At the end of July a new Austrian army under Wurmser appeared in the field, purposing to relieve Mantua. It was beaten at Lonato and Castiglione (Aug. 3 and 4), at Roveredo and Bassano (Sept. 4 and 8), and Wurmser too was shut up in Mantua. A third and a fourth Austrian army were defeated at Arcole (Nov. 17) and Rivoli (Jan. 14); Mantua was compelled to surrender (Feb. 2), and Napoleon broke into Styria, approaching Vienna. His progress was stopped by the preliminary treaty of Leoben (Apr. 18, 1797), which was followed by the Peace of Campo Formio (Oct. 17). Austria ceded the Netherlands and Lombardy. On Dec. 5 he returned to Paris, and was received with boundless enthusiasm. His genius and his fortune, his youth and his energy, and, more than anything else, the nobleness of his ambition, made him a national hero. The soldiers had seen how entirely he forgot himself in the battle in order to do his duty to France, and the Directory knew that he had behaved in the same manner not only in all diplomatic negotiations, but also in all the enormous money transactions which had taken place through him. The French people heard that "le petit caporal" was as disinterested as he was brave, and he became their idol. The Directory, however, began to fear this man, whose genius and popularity placed him entirely beyond its control; and when he himself proposed an invasion of Egypt, with a further design of conquering the English possessions in India, it readily assented to his plans, and fitted out a magnificent fleet and army for the purpose. On May 18, 1798, he set sail from the harbor of Toulon, and on July 2 he landed at Alexandria, allured thither by the shadow of Alexander the Great. How soon he understood that he was running after a dream is uncertain, but he discovered it early enough not to be lost in the illusion. After the battle at the Pyramids (July 21) he entered Cairo, conquered Egypt, and began a series of reforms which looked like the foundation of a new empire. But when in the spring of 1799 he pushed forward into Syria, he was stopped at St. Jean d'Acre. The siege would be long and difficult, the capture would not be worth anything, the soldiers murmured, and he returned to Cairo. In Egypt, however, he could not remain. Although the army which the Turkish sultan landed at Abukir was not only defeated, but routed and massacred (July 25, 1799), all communication with France had been cut off by the English fleet since Aug. 1, 1798, and his situation was not only difficult, but it was barren. In the fall of 1799 he gave up the command to Gen. Kleber, secretly left Egypt on a small vessel, escaped happily from the English cruisers, and appeared unexpectedly (Oct. 14) in Paris. The Directory labored at this time not only under great political, financial, and military difficulties, but also under internal dissensions between its members. Napoleon allied himself with the party of Sieyès, and on Nov. 9, 1799, the government of the Directory was overthrown. On Dec. 27 a new constitution was promulgated, and shortly after sanctioned by the French people by a majority of over 3,000,000 votes. Napoleon became first consul, with the whole administration, civil and military, in his hands, and with the power of appointing all public officers and proposing all public measures. He was from this moment the ruler of France. In Jan., 1800, he moved into the Tuileries, where Josephine presided over a gay, elegant, and exceedingly extravagant court.

The first period of Napoleon's government was marked not only with vigor, order, and honesty in the administration, but also with wisdom and sagacity in its measures. The concordat with the pope was concluded and the Church re-established; the lists of emigration were closed, and about nine-tenths of the emigrants returned; the Bank of France was founded, and the finances brought into order; the *Code Napoléon* was produced, and a truly popular scheme of education was started. The beneficial influence of these measures was felt the more vividly that France was undisturbed by wars for two years. Peace was concluded with Austria at Lunéville Feb. 9, 1801, after the brilliant campaign across the Alps and the battle of Marengo, June 14, 1800, and with England at Amiens Mar. 25, 1802. France was increasing without and recovering within, and when Napoleon on Dec. 2, 1804, crowned himself emperor of the French in the church of Notre Dame, he acted not only on the basis of a majority of 3,572,329 votes, but also in accordance with the noblest instincts and wisest ideas of this majority. In 1805 the war recommenced. A coalition was formed between England, Russia, Sweden, and Austria. The reason of this war was partly the policy of aggrandizement which France pursued, partly senseless jealousy; and the reduction of France to her boundaries of 1792 was fixed as the purpose of the coalition. But Napoleon literally overwhelmed his enemies before any of them could strike a blow. On Sept. 24 he crossed the Rhine; on Oct. 20 he compelled the Austrian army to surrender at Ulm; on Nov. 13 he entered Vienna, and on Dec. 2 he completely routed the allied Russian and Austrian armies at Austerlitz. Austria had to sue for peace, and bought it at Presburg (Dec. 26, 1805) by ceding all her Italian possessions and Tyrol. Napoleon now endeavored to secure his position as master of Central and Southern Europe by establishing one of his brothers, Joseph, as king of Naples; another, Louis, as king of Holland; his stepson, Eugene, as viceroy of Italy; and his brother-in-law, Joachim Murat, as grand-duke of Berg; and this brought him into collision with Prussia. On Sept. 25, 1806, he left Paris; on Oct. 14 he utterly defeated the Prussian army at Jena; on Oct. 27 he entered Berlin; and the Russians, who hastened to the support of Prussia, were defeated at Eylau (Feb. 8, 1807) and at Friedland (June 14). On July 9 the Peace of Tilsit was concluded, the kingdom of Westphalia was erected for Jerome Bonaparte, the dukedom of Warsaw for the king of Saxony, and the whole northern part of Germany was to remain occupied by French troops. It seems as if Napoleon and Alexander I. of Russia, on their meeting at Tilsit, had come to a sort of understanding with respect to a division of Europe. At least Napoleon's actions indicate such an agreement. One morning (Nov. 13, 1807) the *Moniteur* announced that the dynasty of Braganza had ceased to reign. Next year (May 8, 1808), the Spanish king was compelled to abdicate. Joseph was made king of Spain, Murat of Naples. In Spain, however, the population rose against the arrangement, and Napoleon had to go thither himself to quell the insurrection. Meanwhile, Austria again began war against France. But Napoleon hastened back through France to Germany, took the command Apr. 17, 1809, defeated the Austrians at Thann, Landshut, Eckmühl, and Regensburg (Apr. 19–23), pursued them farther along the Danube, and entered Vienna May 13. On May 21 he was defeated himself at Aspern and Eslingen, but on July 6 he nearly routed the Austrian army at Wagram, and peace was concluded at Vienna Oct. 14, 1809, Austria again ceding large parts of its territory, this time its Polish possessions. On his return to Paris, Napoleon was divorced from Josephine (Dec. 16, 1809)—a step which cost him as well as her great pangs, but which probably seemed to him to be necessary for the consolidation of his dynasty. She had borne him no children, and a connection with one of the old royal families might put a stop to many dangerous intrigues. On Apr. 2, 1810, he married the Austrian archduchess Marie Louise, daughter of the emperor Francis, and on Mar. 20, 1811, she bore him a son, the king of Rome.

This moment is generally considered as the culmination of the career of Napoleon. It appears so, though in reality he was already far down the descent. He had promised a hero—he turned out a business-man, and the higher classes of the French people knew it. That innocence of genius which inspires enthusiasm had gone, while that dignity of character which awakens reverence had never come. He used people, though he knew they were rascals, such as Fouché, Barère, and a thousand others, and he employed means which he knew were despicable, such as the whole police institution of the empire. This reacted on himself. He became false, he told lies, and his falsity again affected his friends. Some of them became traitors, as, for instance, Bernadotte and Murat; his brothers left him; Joseph wished to abdicate, Louis did abdicate. But the worst was that he had made a mistake, and, as business-men are often apt to do, he staked his whole fortune on the blunder. He had no other means of carrying on war against England than starvation, and no other means of starving her than to exclude her from the Continent. This plan was consequently adopted, but, unfortunately, the measure worked both ways; in starving England the Continent was starved. The emperor Alexander of Russia at last refused to carry through the system. Napoleon then gathered on the Russian frontier the largest army Europe had ever seen, consisting of 500,000 men, the flower of the youth of France, with contingents from Germany, Italy, etc., and on June 24, 1812, he crossed the Niemen. On Sept. 15 he entered Moscow, but between the 15th and the 20th three-fourths of Moscow was burnt to the ground, and after lingering for a month among the ruins, for overtures of peace from St. Petersburg, he began the retreat (Oct. 19). The winter was uncommonly severe, and the Russian hordes followed him like a whirlwind. When he left Smolensk he had only 40,000 fighting-men, after crossing the Beresina hardly more than 25,000. Leaving the command to Murat, he hastened to Paris, where he arrived Dec. 18. A new conscription was made, and in the spring of 1813 he again stood at the head of an army of 350,000 men. But the Russian disaster had broken the spell. His enemies, Russia, Prussia, Austria, Germany, gathered around him, and the battle of Leipsic was lost (Oct. 19). He retreated, and the allied armies followed him into France. A new army of 300,000 men was raised during the year 1813, though France was drained nearly to the bottom, and in Jan., 1814, he began operations against the invading enemies. But on Mar. 30 they captured Paris, and on Apr. 4, Napoleon abdicated at Fontainebleau. He descended into the court of the palace to bid farewell to the Old Guard; the Old Guard wept, and there is still a large part of Europe which weeps when it looks at this picture, while another part wonders how the man could live, feels indignant because he did not fall on his sword, and considers the scene an offence against the dignity of human nature. And still there was an afterpiece. The island of Elba was erected into a sovereignty and given him for a residence, together with a very large appanage from France. But he stayed here only from May 3, 1814, to Feb. 26, 1815. Secretly he left the island, and landed (Mar. 1) at Frejus. All France rushed to meet him, the church-bells pealed throughout the country, and his march to Paris was one long triumph. The assembled sovereigns at Vienna began to tremble. After the first effervescence, however, it became evident to him that he had nothing to lean on but the blind instinct of the lower classes and the bad passions of the higher; and even his firmest adherents noticed with anxiety that he slept more and showed a tendency to buy the enforcement of his will. On June 18 he lost the battle of Waterloo, and as he understood very well that it would be impossible now to make terms with his enemies, he went on board the English man-of-war Bellerophon and surrendered himself to his lifelong foe. The English carried him to St. Helena, a lonely rock 1000 miles from the nearest coast, and here he d. May 5, 1821, and was buried under two willow trees. But the grand picture of Prometheus chained to the rocks, a catastrophe worthy of the opening chants, was piteously destroyed by his friends, who filled Europe with stories of his daily quarrels with Sir Hudson Lowe, his jailer. In 1840 his remains were carried to Paris and entombed under the dome of the Hôtel des Invalides. CLEMENS PETERSEN.

Napoleon II. (FRANCIS JOSEPH CHARLES), the only child of Napoleon I. by Marie Louise of Austria, b. in the Tuileries Mar. 20, 1811, and baptized June 9 as king of Rome. After the defeat at Waterloo, Napoleon I. abdicated in favor of his son, and proclaimed him emperor of the French (June 22, 1815) under the title of Napoleon II., but the allied powers paid no regard to this arrangement. While, in the spring of 1816, Marie Louise went to Parma, which was given her as a sovereignty, but to which her son had no right of succession, the child was brought to Vienna to be educated under the immediate tutelage of his grandfather, the emperor Francis. The boy was entered in the Austrian almanac of state without the name of Napoleon, and his official title was duke of Reichstadt, after a small estate in Bohemia. Many singular rumors spread through Europe concerning the young duke, but they seem to have had no foundation. He was instructed in military science, and in 1830 was made major of a battalion of the regiment Giulay. In Apr., 1832, he was suddenly seized with consumption, and the progress of the disease was so rapid that his mother had hardly time to reach Vienna before his death; he d. in her arms June 22, 1832. As Napoleon III. ascended the French throne, the duke of Reichstadt is generally reckoned among the French sovereigns, under the title of Napoleon II., though he never actually occupied the throne.

Napoleon III. (CHARLES LOUIS), the youngest son of Louis Bonaparte, king of Holland, and Hortense Beauharnais, the stepdaughter of Napoleon I., b. at Paris Apr. 20, 1808. The parents lived separately, the children with the mother. After the fall of Napoleon I., Queen Hortense repaired in 1816 to Arenenberg in Thurgau, and Louis frequented for eight years the gymnasium of Augsburg, and after 1824 for some time the military school of Thun. The first part of his public life was somewhat adventurous. He took part in the Italian revolution of 1831, and when this was put down by the interference of France and Austria, he hastened to Poland, but in Dresden he heard of the fall of Warsaw. After the death of his elder brother in 1831, and of the duke of Reichstadt in 1832, he became the bearer of the idée Napoléonienne and the heir of its destiny. He had at first a somewhat fantastic conception of his position. A sort of conspiracy in Strasburg proclaimed him emperor Oct. 30, 1836, but only for two hours. He was brought to Paris, but the government found it too ridiculous to prosecute him; he was sent to America. On Aug. 6, 1840, he landed at Boulogne with 50 men and conquered the tollgates. This time, however, he was sentenced to imprisonment for life, and he remained in the citadel of Ham till May 25, 1846, when he succeeded in making his escape. Nevertheless, the idée Napoléonienne was more than a phantasm, and he himself more than an adventurer. His pamphlets, *Rêveries Politiques* (1832), *Des Idées napoléoniennes* (1839), *De l'Extinction du Paupérisme* (1844), contain much good sense and very little hypocrisy, and in Arenenberg and London, where he lived for a long time and was well known, he was liked and respected. The revolution in Paris of Feb., 1848, brought at once the name of Napoleon into the foreground. But the position which he now took was a little reserved, and his manœuvres against the National Assembly, which tried to exclude him from France, were very shrewd. He was recalled by the French people. On Sept. 25 he took his seat as a member of the Assembly, and on Dec. 20 was elected president of the French republic by a majority of 6,048,872. The relations, however, between him and the Assembly continued disagreeable. He wished his term of office extended to ten years, and his appanage increased to 6,000,000 francs; the Assembly refused. Then he demanded a revision of the constitution and the establishment of universal suffrage; the Assembly refused again. At last, when the candidature of the prince of Joinville for the next presidential election began to show itself as a probability, he dissolved the Assembly (Dec. 2, 1851) and appealed directly to the people, putting down with merciless severity all opposition. But his measures were sanctioned by an overwhelming majority, and on Jan. 14, 1852, a new constitution was promulgated—an imitation of the constitution of 1799—by which he actually became the ruler of France. The transition from this form of government to the imperial monarchy was easy, and took place Dec. 2, 1852, without any disturbances. On Jan. 30, 1853, he married Eugénie de Montijo, and Mar. 16, 1856, she bore him the Prince Imperial, who died June 1, 1879.

While the first part of the life of Napoleon III., before Dec. 2, 1852, shows no other plan than that of acquiring a throne, more especially that of France, it seems impossible to explain the latter simply as a series of manœuvres for the purpose of consolidating this throne. Many of his actions have, and can have, no bearing on his dynastic plans, but all of them have an aspect of incompleteness, as if they were performed by a great man of grand ideas, but whose hands were bound by bad associates, or by a small man of no ideas, but stimulated into action now and then by some mysterious influences. The impression of his life as a whole is not unlike that of the life of his uncle, only on a smaller scale, and with the difference that the uncle started as a genius, the nephew only as a name. The position he occupied in Europe was at one time brilliant. The Crimean war (1854–56), which was only a half success, immensely expensive, and small in its results, brought him into intimate intercourse with the other sovereigns. The Italian war (1859), although likewise only a half magnificence, made him immensely popular. The Mexican war (1862–63) was showy enough, as far as it gave him a crown to dispose of, but from this time people began to entertain certain doubts. His singular stopping short in the very midst of an action had hitherto been explained as depending on some secret wisdom, but it began now to receive explanations of another kind; and although he entertained Europe well enough by the opening of the Suez Canal, the World's Exposition, the rebuilding of Paris, by congresses and visits, yet for the last five or six years of his reign he was felt pressing on the development of Europe like a nightmare. When, after the battle of Sadowa, the Austrian emperor telegraphed and ceded Venetia to him, Europe laughed and felt the trick, and when in 1870 he declared war against Germany, many expected his fall, though none so piteous an exit. (See FRANCO-GERMAN WAR.) Died at Chiselhurst, in England, Jan. 9, 1873.

CLEMENS PETERSEN.

Napoleon IV. (PRINCE LOUIS NAPOLEON) is the name given by the Bonapartists to the only child of Napoleon III. and the empress Eugénie, though he never ascended the throne. He was b. Mar. 16, 1856, and was educated in the Tuileries; but when, on Sept. 4, 1870, the people of Paris, after the battle of Sedan and the downfall of Napoleon III., proclaimed the republic, he escaped with his mother to England. He received here a military education at Woolwich Military Academy. During the war against the Zulus, in South Africa, he volunteered his services, and was killed by them June 1, 1879.

Napoléon Vendée. See BOURBON VENDÉE.

Napoleonville, cap. of Assumption parish, La. (see map of Louisiana, ref. 11–E, for location of parish). Pop. in 1880, 497.

Nap'pe, one sheet of a surface. Thus, if an hyperbola is revolved about its conjugate axis, it will generate a surface which is everywhere continuous; this surface is an hyperboloid of *one* nappe; if the curve is revolved about its transverse axis, it will generate a surface composed of two parts or sheets; this surface is called an hyperboloid of *two* nappes. If an indefinite straight line revolve about another line, which it intersects, it will generate a cone of two nappes, with a common vertex. W. G. PECK.

Naquet' (ALFRED JOSEPH), b. at Carpentras, in the department of Vaucluse, France, Oct. 6, 1834; studied medicine at Paris, and was appointed professor at the medical school in 1863. His principal scientific works are *Principes de Chimie fondés sur les Théories Modernes* (1865), *De l'Atomicité* (1868), *Précis de Chimie legale* (1872). He has become famous, however, by his participation in radical political movements. He was one of the organizers of the congress of Geneva, and his speeches on this occasion cost him fifteen months' imprisonment, besides a fine. For his *Réligion, Propriété, Famille* (1869) he was also punished by imprisonment and a fine. In 1873 he published *La République radicale*, but his journal (*La République* 1876) was not successful.

Naraka, the general term used by the Brahmans of India for hell, in which they enumerate twenty-one or twenty-eight separate divisions, besides an indefinite number of others not separately named. In the *Institutes of Menu* and the *Vishnu-Purana* may be found elaborate descriptions of the varied and ingenious punishments which there await the impious.

Narbonne', town of France, department of Aude, 8 miles from the Mediterranean. It is an old town, and was known to the Greeks 500 B. C. In 118 B. C. it was colonized by the Romans, and in the times of the emperors it became a magnificent city, the capital of Gallia Narbonensis, adorned with temples, triumphal arches, and amphitheatres, and famous for the purity and salubrity of its air. Three emperors, Carus (282–283) and his two sons, Carinus and Numerianus (283–284), were born here. In 719 the Saracens took and burnt it; in 859 the Northmen took and plundered it; yet in the twelfth and thirteenth centuries it was a city with 40,000 inhabitants and extensive commercial connections; in 1271 it began building its magnificent Gothic cathedral, but it never finished it. The city sank suddenly. All its splendor has now shrunk into a collection of antiquities. Even its pure air has been spoiled by swamps in the vicinity filling it with their poisonous gases. Its only celebrity at the present time is its honey, which is the best in France, both in color and flavor. Pop. 28,134.

Narcis'sus, a genus of bulbous plants of the order Amaryllidaceæ, natives of the Old World. The genus includes the garden and green-house plants called jonquil, narcissus, daffodil, and polyanthus, cultivated for ornament. They mostly have handsome flowers, appearing in spring, and many are very fragrant.

Narcissus, in Greek mythology, a son of the river-god Cephissus and the nymph Liriope; was celebrated for his beauty, but was punished by Nemesis for his vanity by falling in love with himself on seeing his image in a fountain. Pining away with this love-sickness, his body was metamorphosed into the flower which bears his name. There are other versions of the myth, but the above was the most common, though hardly the oldest.

Narcot'ics [Gr. νάρκη, "numbness"], a term used in medicine to refer generically to such drugs as have the power of stupefying the cerebral faculties, or inducing sleep, or deadening ordinary sensibility. No exact division of narcotics can be made, but such drugs as opium, belladonna, stramonium, henbane, Indian hemp, chloral, and the ethers are those to which the term is commonly applied.

(For the properties and uses of these drugs see the individual headings.) EDWARD CURTIS.

Nar′do, town of Southern Italy, province of Lecce, about 4 miles from the Gulf of Taranto and 12 from Gallipoli. It is a very ancient city, mentioned both by Ptolemy and Pliny, and its intrenched walls with their twenty-four towers, as well as the old castle, still recall the feudal age. The episcopal palace, a modern building, is very fine, and the cathedral contains some pictures of interest. The University of Nardo had a high reputation from the tenth to the fifteenth century, but at the present day its only literary boast is two small libraries—one, of about 4000 volumes, belonging to the episcopate; the other, consisting of the slender collections found in the lately suppressed convents, and making in all about the same number, has been given to the municipality by the government. The inhabitants of this town are mostly engaged in agricultural and pastoral pursuits, and even the beautiful cotton counterpanes for which it was famous thirty years ago are no longer made here. Pop. 10,220.

Nares (EDWARD), D. D., b. at London in 1762; educated at Christ Church, Oxford, and became fellow of Merton College 1788; took orders in the Church of England 1792; married a daughter of the duke of Marlborough 1797; became rector of Biddenden, Kent, 1798; Bampton lecturer 1805, and professor of modern history at Oxford 1814. He published, among other works, *The Plurality of Worlds* (1802), *Thinks I to Myself*, a novel (1811), *Elements of General History* (1822), and *Memoirs of William Cecil, Lord Burghley* (3 vols., 1828–31). D. at Biddenden Aug. 20, 1841.

Nares (GEORGE STRONG), b. in 1831 at Danestown, near Aberdeen, Scotland, was educated at the Royal Naval College; engaged in the Arctic expedition 1852–54, and was in 1875 placed at the head of the expedition sent out in search of the north pole. He has published *The Naval Cadet's Guide* (1860; reprinted in 1862 under the name of *Seamanship;* 4th ed. 1868), *Reports on Ocean Soundings and Temperature* (in the Challenger; 6 parts, 1874–75), *The Official Report of the Arctic Expedition* (1876), *Narrative of a Voyage to the Polar Sea in 1875–76* (2 vols., 1878). In the period between his first and his second Arctic expeditions Sir Nares was mostly employed in explorations of the southern polar seas and the coasts of China.

Nares (ROBERT), F. R. S., b. at York, England, June 9, 1753; was educated at Christ Church, Oxford; took orders in the Church of England 1778; became rector of Sharnford, Leicestershire; assistant librarian at the British Museum 1795–1807; preacher at Lincoln's Inn 1788; canon of Lichfield 1799; archdeacon of Stafford 1800; prebendary of Lincoln and rector of All Hallows, London. With Mr. Beloe he founded and edited the *British Critic* 1793–97; was a contributor to the *Classical Journal;* was vice-president of the Royal Society 1823; published several volumes of sermons and theology, and was author of *Elements of Orthoepy* (2d ed., Lond., 1794) and a valuable *Glossary, or a Collection of Words, Phrases, Names, and Allusions, etc. which have been thought to require illustration in the Works of English Authors* (1822), of which a new edition was published by J. O. Halliwell and Thomas Wright (2 vols., 1861). D. at London Mar. 23, 1829.

Nar′ni [anc. *Narnia*], town of Italy, province of Perugia, about 8 miles from Terni, picturesquely situated almost on the crest of a rocky hill washed by the Nera. Striking as is the aspect of the town from below, it contains no buildings of interest except the very ancient cathedral, the communal palace, and the old castle, now a prison. In its vicinity, crossed by the railway, are the remains of a magnificent Roman bridge built by Augustus; also portions of a very old aqueduct about 14 miles in length, passing through mountains E. of Narni. Here too are the famous thermal springs praised by Pliny the Elder under the name of Carestia. Narni, named from the Nera or Nar, resisted Hannibal successfully; was occupied by the duke of Spoleto in the ninth century; was cruelly sacked and burned at a later period, and never after recovered its prosperity. It was the birthplace of the emperor Nerva. Pop. 10,000.

Na′ro, town of Sicily, province of Girgenti, about 15 miles from the town of Girgenti. It is well built, and contains some fine churches and an old feudal castle with four towers. In the neighborhood are remains of ancient aqueducts, grottoes, and sepulchres. There are also productive sulphur-mines in the vicinity. Naro is said to have been built by the Saracens on the ruins of the ancient *Motyum.* Tasso in his *Gerusalemme* calls it *Naja.* Pop. 10,336.

Narragan′sett Bay reaches N. 28 miles from the Atlantic into the State of Rhode Island. It is deep and well sheltered from the sea, containing the islands of Aquidneck (or Rhode Island proper), Conanicut, Prudence, and other smaller ones. Its climate is mild as compared with the rest of New England. It has valuable fisheries, and receives the estuaries of the Providence and Taunton rivers.

Narragansett Pier, South Kingston tp., Washington co., R. I., 7 miles E. of Kingston, the county-seat (see map of Rhode Island, ref. 6–G, for location of county). It is on a branch of Stonington and Providence R. R. and on the Atlantic, and is a popular place of summer resort.

Narragansetts, a tribe of Algonkin Indians who at the settlement of New England possessed a territory nearly the same as the present State of Rhode Island, and gave their name to its magnificent bay. For some years, under their chief Canonicus, they refrained from hostilities, were friendly to Roger Williams, with whom they made a treaty 1536, aided the colonists against the Pequots, ceded a large tract of land to Gorton in 1644, and took up arms in 1645, but soon made peace. In the great war with King Philip (1675) they were suspected of aiding that chieftain, and were consequently twice attacked in force. On the second occasion their swamp-fortress, within the present township of South Kingston, was taken by storm and the tribe nearly annihilated. They subsequently remained at peace, became civilized, gradually intermarried with the whites, and have lost their native language. A remnant numbering about 150 still resides at Charlestown, R. I. A grammar of their language was printed by Roger Williams—*Key into the Language of America* (London, 1643).

Nar′ses, b. in the latter part of the fifth century, probably in humble circumstances; was a eunuch and a slave in the palace of the Byzantine emperors. His talents attracted the attention of Justinian, who made him keeper of the privy purse and a member of the council. In 538 he went to Italy as commander of a force sent either to reinforce or to watch Belisarius, but he was recalled in 539. Nevertheless, after the death of Belisarius he was made commander-in-chief in Italy in 552, and his success as a general was most brilliant. At Sentaglio he defeated the Gothic king Totila, who was killed in the battle. He then conquered Rome; defeated Teias, Totila's successor, on the banks of the Sarna, and completely crushed the power of the Goths in Italy. Justinian made him governor of Italy with the title of exarch. He fixed his residence at Ravenna, and governed the country with much severity, but also with much wisdom. Nevertheless, after the death of Justinian and the accession of Justinus II., he was ignominiously deprived of his office in 565, and d. in retirement at Rome in 568. It is said that the invasion of the Lombards, which took place shortly before his death, was an intrigue by him to get revenge on the court of Constantinople.

Nar′va, town of Russia, government of St. Petersburg, on the Narova. On Dec. 30, 1700, Charles XII., with 8000 Swedes, here defeated Peter the Great, with 80,000 Russians. Pop. 6175.

Narvaez′, de (PANFILO), b. at Valladolid, Spain, about 1480; went to the West Indies soon after their discovery by Columbus; took an active part in the conquest of Santo Domingo, Jamaica, and Cuba; was sent in 1520 by Velasquez, in command of an expedition to Mexico, with orders to supersede and imprison Cortés, but was surprised and taken prisoner by the latter at Zempoalla, losing an eye in the engagement; his followers were incorporated with the victors, and rendered essential aid in the conquest of the Aztec empire. On recovering his liberty after five years' captivity, Narvaez unsuccessfully appealed to the Spanish government for the punishment of Cortés. In 1528 he was given command of an expedition of 400 men with which to found a colony in Florida; discovered Tampa Bay; landed Apr. 16, 1528; engaged in hostilities with the natives, and while coasting in boats along the N. shore of the Gulf of Mexico perished in a storm near the mouths of the Mississippi, Sept., 1528. The only survivors were Alvar Nuñes, Cabeza de Vaca, and three companions, who after eight years' wanderings reached Mexico through Texas and Sonora, 1536.

Narvaez (RAMON MARIA), duke of Valencia, b. at Loja, Spain, Aug. 4, 1800; entered the army in youth, and in the first Carlist war attained the position of captain-general of Old Castile. He took part in an attempted revolution against Espartero in 1839, and had to take refuge in France, where he plotted with the ex-queen, Maria Christina, in whose interest he placed himself at the head of an expedition with which he penetrated to Madrid in 1843 and overthrew the government of Espartero. In the following year he became prime minister; was created field-marshal, count of Cañadas Altas, and duke of Valencia, and effected the formation of a new constitution (1845), suppressing with rigor all opponents. In 1846 he quarrelled with the ex-queen, resigned his post, and went as ambassador to France; resumed power in 1847, but soon lost it again for the same reason as before. In 1849 he was again at the head of the government during the diplomatic quarrel with England which culminated in the withdrawal of the British ambassador, Sir Henry Bulwer. In 1851 he went as ambassador to Vienna; became again prime minister in 1856; repressed several revolutionary outbreaks and took stringent measures against the press; was overthrown Nov., 1857; was again prime minister from Sept., 1864, to June, 1865, and from July, 1866, until his death, at Madrid Apr. 23, 1868.

Nar'whal [Icelandic *nâhvalr*], or **Sea-Unicorn** (*Monodon monoceros*, Linn.). The narwhal, belonging to the family of the Delphinidæ, or dolphins, amongst the cetaceans, has long been considered one of the great curiosities of natural history. It is most nearly related to the white whale (*Delphinapterus catodon*), and forms with it the subfamily Delphinapterinæ. Belonging to an order in which many of the members never develop teeth at all, it, of all animals, is supplied with a tooth altogether out of proportion to its size; and this tusk is moreover developed in utter contravention of the rules of bilateral symmetry, which in every other known case amongst vertebrates govern the production of the teeth. In both sexes the lower jaw is edentulous; in the male the upper jaw is provided, on the left side, with a fully-developed tusk, which attains to a length of from eight to ten feet. This tusk is straight, spirally grooved externally, and hollowed within into a persistent pulp-cavity. On the right side the corresponding tooth generally remains hidden, smooth and solid, within the jaw. These teeth are generally described as incisors, but erroneously, as the alveoli are situated at the junction of the intermaxillary and maxillary bones, and, according to Mivart, are even "embedded entirely in the maxilla." In addition to these, there are two small rudimentary molars concealed in the upper jaw. The female, although as a rule without apparent teeth, has the incipient tusks concealed in the jaw; one of these is, however, said to be sometimes developed as in the male; and in the latter also both are sometimes symmetrically produced. The narwhal in form of body resembles the porpoises; its mouth is small, and its single spiracle or blow-hole is situated on the top of the head. Its flippers or "fins" are small, and it has no dorsal fin. It attains to a length of fifteen feet, exclusive of the tusk, and in color is marbled with brown and whitish. The single species inhabits the Arctic seas, where it lives largely on cuttle-fishes, and in its turn serves an important purpose in the domestic economy of the Esquimaux, yielding them a large supply of oil, etc., and an ivory of considerable commercial value. It has, however, of late become somewhat rare.

Edward C. H. Day.

Nascapees', or **Naskapis**, an Indian tribe of Labrador, the most eastern branch of the Algonkin stock, occupying the interior table-land from Lake Mistassini to the Atlantic. They are closely related to the Montagnais in language, but, unlike them, have profited to but a very limited extent by the missions which have been sent among them at intervals for more than two centuries. They are the tribe called by Gallatin Scoffics and Sheshapootosh, but these names were entirely erroneous and are not known in Labrador. A few devotional works have been printed, and grammars of the language exist in manuscript. In 1870 they were estimated by the government at 2860.

Nas'cent State, in chemical transformations [Lat. *nascens*, "being born," "coming into existence"], a term in use in chemical writings to express the general fact that some elements and compounds manifest, when in the state of evolution from previous combination, tendencies to combine directly with, and even to decompose, bodies to which they are indifferent or upon which they are inactive, *after* actual evolution or assumption of a free state at common temperatures. The most familiar and the most remarkable examples of this class of phenomena are exhibited by the element Hydrogen (see under this head). When evolving from combination in a diluted acid by means of a soluble metal, it is endowed with affinities so much exalted that it will not only combine with other elements that may be present, such as sulphur, phosphorus, arsenic, carbon, etc., but will in many cases decompose oxides or other compounds of these elements, combining with and carrying off the latter in gaseous or volatile forms of combination. Thus, when common iron, which contains carbon, is thus dissolved in a diluted acid, hydrocarbon gases and vapors of a very interesting kind are found mixed with the hydrogen gas, giving it the peculiar disagreeable odor with which most persons are familiar, *pure* hydrogen being odorless. In more recent chemical writings and textbooks there is often a tendency to attach but little importance to the phenomena of the nascent condition, passing them over with a brief mention and definition. This is probably because little or no progress has been made towards a clear explanation of the facts which are generalized under this term. These facts cannot thus, however, be destroyed; and the science of chemistry, properly so called, must include them and give them a most prominent place in any comprehensive theoretical view that is likely to be of permanent value and endurance. Thus, the idea may be thrown out that there should certainly be a connection with the fact that water when mixed with acids undergoes *condensation*, and that therefore water in diluted acids, and its contained hydrogen, are not specifically, either physically or chemically, the same bodies as pure water and its contained hydrogen, but have molecules more condensed—endowed, we may be sure, with some greater energies. This illustration is merely used to support the view that the so-called nascent state and its connected phenomena demand study, and cannot be ignored as a mere form of words without definite significance in science. (See Volumes, Molecular.) Henry Wurtz.

Nase'by, a v. of England, county of Northampton, is famous for the battle (June 14, 1645) in which Fairfax utterly defeated Charles I. When the latter, who was besieging Oxford, heard that the king had captured Leicester, he marched into Northamptonshire and took up a strong position near Naseby. On the morning of June 14 the two armies, nearly equal in numbers, stood arrayed opposite each other—the royal commanded by the king himself, with Prince Rupert on his right wing and Sir Marmaduke Langdale on his left, and the Parliamentary commanded by Fairfax, with Cromwell on his right wing and Ireton on his left. The attack was made by the royal forces, and Prince Rupert succeeded in overwhelming Ireton and put his corps to flight. On the other side Cromwell utterly defeated Langdale, but, while Prince Rupert left the general battle in order to pursue Ireton, Cromwell wheeled round and attacked the royal centre in the rear. Thereby the battle was soon decided. The Parliamentary army had about only 1000 killed, while the royal army had 800 killed and 4500 prisoners. The king barely escaped, and his private papers fell into the hands of his enemies, and were afterward published under the title *The King's Cabinet Opened.*

Nash (Abner), b. in Prince Edward co., Va., about 1730; removed at an early age to Newbern, N. C., where he became a lawyer; was a member of the provincial congresses of 1774 and 1776, of the council 1775, and of the house of commons 1777–78; was Speaker of the senate 1779, governor 1780–81, and delegate to the Continental Congress 1782–84 and 1785–86. His first wife was the widow of Gov. Arthur Dobbs. He d. at New York Dec. 2, 1786.

Nash (Gen. Francis), brother of Abner, b. in Virginia; settled in Orange co., N. C., where previous to the Revolution he was clerk of the superior court of the county; served as captain of the royal militia in suppressing the "Regulators" at the battle of the Alamance 1771; was a member of the provincial congress of 1775, by which he was appointed lieutenant-colonel; was made brigadier-general by the Continental Congress Feb., 1777; commanded a brigade at Brandywine and Germantown; was mortally wounded at the latter battle, and d. at Kulpsville, Pa., Oct. 17, 1777. A monument to his memory, voted by Congress, was never erected, but one has been placed over his grave by subscription of the citizens of Germantown and Norristown.

Nash (Frederick), son of Abner, b. at Newbern, N. C., Feb. 9, 1781; graduated at Princeton in 1799; became a distinguished lawyer; served frequently in the State legislature; was judge of the superior court 1818–26 and 1836–44, and of the supreme court from 1844 until his death, which occurred at Hillsborough Dec. 4, 1858.

Nash (John), b. in London, England, in 1752; became a distinguished architect; obtained in 1797 a patent for improvements in the construction of the arches and piers of bridges; was much employed in designing mansions for the nobility and gentry. In 1815 he was taken into the government service, and for many years thereafter was engaged in laying out streets and public edifices in London. Regent street, the terraces of Regent's Park, Haymarket Theatre, Buckingham Palace, and the Pavilion at Brighton are favorable specimens of his skill. D. at East Cowes Castle May 13, 1835.

Nash (Joseph), b. in England about 1812; became distinguished as a painter in water-colors, especially as a delineator of architectural subjects, and of historical scenes in illustration of Shakspeare and Sir Walter Scott, and published *The Architecture of the Middle Ages* (folio, 1838) and *Mansions of England in the Olden Time* (4 vols. folio, 1839–49). D. Dec. 19, 1878.

Nash (Richard), known as Beau Nash, b. at Swansea, Wales, Oct. 18, 1674; studied at Oxford, but was expelled about 1690; held for some time a commission in the army, and began the study of law at the Temple; became famous as a diner-out, a gamester, and leader of fashionable dissipation, and in 1704 undertook the management of the balls at Bath, then the most celebrated watering-place in England. For fifty years he was master of ceremonies, acquiring a wide notoriety for his strictness in enforcing decorum in the midst of gayety and dissipation, and was popularly called "the king of Bath." He made his living chiefly by gaming, and was noted for generosity. In his old age he fell into neglect and often experienced destitution. D. at Bath Feb. 3, 1761. He was honored by a public funeral, and his *Life* was written by Goldsmith.

Nash (THOMAS), b. at Lowestoft, Suffolk, England, in 1567; graduated at Cambridge 1584; settled in London in 1589; engaged in the famous "Martin Marprelate controversy," publishing several pamphlets in grotesque style upon the prelatical side, and wrote a number of dramas; he lived in extreme poverty. One of his spectacular plays, *Summer's Last Will and Testament*, was represented before Queen Elizabeth in 1592, and he aided Marlowe in his *Dido, Queen of Carthage*. D. London, probably 1601.

Nash (WILLIAM), D. D., b. in Stuttgart, Germany, in 1807; educated at the University of Tübingen. While yet young became a M. E. minister in the Western U. S., and founded American German Methodism. Since 1859 has edited the German publications of the M. E. Church; is author of a German commentary, *Christological Meditations*, etc.

Nashua, on R. R., Chickasaw co., Ia. (see map of Iowa, ref. 2-I, for location of county), has valuable water-power, a flouring-mill, and is surrounded by good farming land. Pop. in 1870, 817; in 1880, 1116.

Nashua, city and R. R. centre, one of the caps. of Hillsborough co., N. H. (see map of New Hampshire, ref. 10-E, for location of county), on W. bank of Merrimack River, 35 miles S. of Concord and 40 N. W. of Boston, was incorporated as a city in 1853, and ranks second in point of manufactures and third in population in the State. It has a public library of 6000 volumes. Pop. in 1870, 10,543; in 1880, 13,397.

Nashua River rises in Worcester co., Mass., flows N. E., and falls into the Merrimack at Nashua, N. H. It affords great and well-utilized water-power.

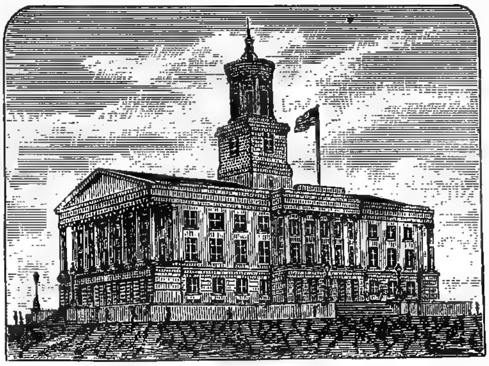
Nashville, cap. of Berrien co., Ga. (see map of Georgia, ref. 7-H, for location of county), 25 miles N. W. of Stockton. Pop. in 1870, 95; in 1880, not in census.

Nashville, city, on R. R., cap. of Washington co., Ill. (see map of Illinois, ref. 9-D, for location of county), has several mills. Pop. in 1870, 1640; in 1880, 2222.

Nashville, Washington tp., cap. of Brown co., Ind. (see map. of Indiana, ref. 8-E, for location of county). Pop. in 1870, 270; in 1880, 348.

Nashville, cap. of Nash co., N. C. (see map of North Carolina, ref. 2-H, for location of county), 12 miles W. by N. of Rocky Mount, which is on the Wilmington and Weldon R. R. Pop. in 1880, 212.

Nashville, city, cap. of Tennessee, and seat of justice of Davidson co. (see map of Tennessee, ref. 6-E. for location of county), an important R. R. centre, in 36° 10′ N. lat. and 86° 49′ W. lon., on the S. bank of the Cumberland River, 200 miles above its mouth, here spanned by a Fink truss railway bridge and a fine suspension-bridge. The river is navigable below Nashville for nine months in the year, and to Carthage, several hundred miles above, for some time. The city rests on a rocky foundation, the river bluffs rising 80 feet above low-water mark. On Capitol Hill, overlooking the city, is situated the State capitol, built of Tennessee granite, and one of the finest and costliest buildings in the U. S. The city is supplied with water and gas, the Vanderbilt (named in honor of Cornelius Vanderbilt of New York, who contributed $1,000,000 to its establishment), Fisk, and Nashville universities (see NASHVILLE, UNIVERSITY OF), the Montgomery Bell Academy, 2 seminaries, and a medical college and hospital. It is the chief commercial centre and wholesale market S. of the Ohio River. It requires an average of $5,000,000 to handle the cotton crop which comes into it. The tobacco trade here is very large. The city is supplied with a paid fire department, with steam engines, an electric fire-alarm telegraph, and several horse-car routes.



State Capitol (Nashville, Tenn.).

Manufactures.—The census of 1880 shows 268 manufactories; capital, $3,892,380; wages paid during the year, $1,312,765; value of products, $8,597,278. Nashville has 2 cotton-factories, 1 large woollen-mill, saw and flouring mills, planing and sash factories, cotton-seed oil-mills, tanneries, furniture and carriage factories, foundries and machine-shops, etc., also two noted mineral springs (sulphur and chalybeate). Since the last census its industrial interests have been remarkably enlarged, causing a proportionate increase of population. Pop. in 1870, 25,865; in 1880, 43,350. ED. OF "AMERICAN."

Nashville, Battle of. The BATTLE OF FRANKLIN (which see) was not ended until 10 P. M. of Nov. 30, 1864, but during that night Gen. Schofield withdrew, and by noon of Dec. 1 occupied the heights surrounding Nashville, which place was now strongly fortified. Hood's advance appeared before Nashville by noon of the 2d, and by the morning of the 4th he had established his lines in front. By this time, however, the command of A. J. Smith had arrived from Missouri, and Steedman with 5000 men and Morgan's division from Chattanooga, which, with convalescents and one-year recruits, raised the effective force of Thomas to nearly that of Hood; leaving the latter, however, still superior in cavalry, Thomas having been stripped to outfit Gen. Sherman's column. Impressed with the necessity of having an effective cavalry force, Thomas used every exertion to remount his troops, and would have been ready to commence an offensive movement at an earlier day but for a storm of sleet on the night of Dec. 8, by which the armies were icebound until the 14th, when, the weather moderating and Thomas being ready, a plan of attack for the next morning, weather permitting, was agreed upon that night. A dense fog prevailed in the morning (15th), but soon lifted sufficiently to permit the movement of the troops to the positions assigned them, and the original plan of operations for the day, with but slight change, was successfully carried out, resulting in driving the army of Gen. Hood out of its original line of works, and back to a position along the base of Harpeth Hills, and the capture of 16 pieces of artillery and 1200 prisoners. His loss in killed and wounded was also heavy, while Thomas suffered but little. The battle was resumed by Thomas on the morning of the 16th, and continued until the Confederate lines were hopelessly broken and the shattered army was in full retreat, closely followed by the victors until dark. During the two days' operations 4462 prisoners were taken, 53 pieces of artillery, and many small-arms. The pursuit was continued next day, and until the 27th, when the remnant of Hood's army succeeded in crossing the Tennessee, after which pursuit was abandoned by the main army, though Col. Palmer, with a body of cavalry, starting from Decatur, overtook the flying army and destroyed over 300 wagons, 78 pontoon-boats, and 500 mules. The results of this campaign, extending from Sept. 7, 1864, to Jan. 20, 1865, were 13,189 captured Confederate prisoners, 72 pieces of artillery in good condition, 2000 deserters. The estimated loss of Thomas was 10,000 in all. Hood escaped with a mere wreck of his army, and at his own request was relieved from command Jan. 23, 1865.

Nashville, University of. The University of Nashville dates its origin more than ten years anterior to the birth of the State of Tennessee. In 1785 it was founded, incorporated, and endowed under the name of the Davidson Academy. The same institution, under one name and another, has shared the vicissitudes and fortunes of the feeble settlement, the rising city, and the growing State even to the present day. As it now approaches the close of the first century of its history, its friends may contemplate with satisfaction the benefits it has widely scattered over the land, and may point with pride to the long catalogue of those who have gone forth from its halls to the great duties of life. In the year 1875 the literary department was converted into a normal college supported by the university, the Peabody education fund, and the State of Tennessee. It aims to afford normal instruction and training of the very highest order to both males and females.

The Peabody fund has also established 114 scholarships, worth $200 a year, for two years, which are distributed among the twelve Southern States. The beneficiaries are selected by the State superintendents of instruction. The Montgomery Bell Academy is the preparatory school of the university, and had its origin in the benevolent bequest of a late worthy citizen of Tennessee, whose honored name it bears. It is largely patronized, and annually furnishes gratuitous instruction to a number of students of the State. While it supplies an excellent education to the business-man, it also qualifies the student for the studies of the college and other schools of the university. The medical department was opened in 1850. Unprecedented success gave it in 1861 the second position in point of patronage among all the medical colleges in America, and a position second to none in appliances and instruction, uniformly maintained even to the present date. Its museum is one of the largest in the U. S., and contains models of incalculable usefulness not found elsewhere. The number of students annually in attendance varies from 300 to 400. Information respecting expenses can be obtained on application to the dean of the faculty. The buildings, situated on an elevated campus of sixteen acres, 1 mile from the public square, consist of a large stone edifice, containing a chapel, lecture and recitation rooms, museum, and offices; an imposing brick building containing the library, society-rooms, and a large working laboratory; an edifice appropriated to the medical college, with lecture-rooms, museum, etc.; a new and finely-equipped gymnasium, and a dwelling-house for the chancellor. Eben S. Stearns, D. D., LL.D., is the chancellor, etc. EBEN S. STEARNS.

Na'smyth (JAMES), b. at Edinburgh Aug. 19, 1808; was educated at the School of Arts and the Edinburgh University; removed to London, and in 1834 to Manchester, where he became a successful machine constructor and inventor. The steam-hammer, steam pile-driver, improved forms of ordnance, etc. are among his inventions. He also acquired fame as a practical astronomer, giving special attention to selenography, in which he employs telescopes and other instruments of his own construction. In 1857 he retired with an ample fortune. He is the author of *Remarks on Tools and Machinery*, in Baker's *Elements of Mechanism* (1858), and *The Moon considered as a Planet, a World, and a Satellite.*

Na'so, town of Sicily, province of Messina, S. of Cape Orlando, and very near the Mediterranean. The river from which this town is named flows into the Tyrrhene Sea near Cape Orlando, at a point called San Gregorio, and here vessels often seek shelter during tempests. It is much frequented by coasters trading in nuts and cocoons, and a fine harbor might be constructed here at small expense and to the great advantage of navigation in these waters. It is a walled town, and contains some churches interesting for their architecture. In 1823 it was severely injured by an earthquake. The Maria Santissima, a very old sanctuary, stands on the raised promontory of Cape Orlando. Pop. 8172.

Na'son (ELIAS), M. A., b. at Wrentham, Mass., Apr. 21, 1811; graduated at Brown University in 1835; gave much attention to the languages, music, and botany; was for a time teacher and editor in Georgia, and in 1840–49 an instructor in Newburyport, Mass.; has held Congregational pastorates in Massachusetts and New Hampshire; author of *Lives* of Sir C. H. Frankland (1868), Susanna Rowson (1870), Nathaniel Howe (1851), Charles Sumner (1874), and Henry Wilson; also of a *Gazetteer of Massachusetts* (1874) and other works.

Nas'sau, formerly an independent duchy of Germany, but since 1866 forming part of the Prussian province of Hesse-Nessau, comprise an area of 1800 square miles, with 468,311 inhabitants, 1866. The country, extending along the Rhine, the Main, and the Lahn, and traversed S. by the Taunus and N. by the Westerwald, is beautiful and rich. The mountains are covered with extensive forests abounding in game, and contain iron, lead, copper, coal, marble, and building-stone. The valleys produce wheat, tobacco, flax, and fruit of superior quality, and the choicest Rhenish wines, such as Johannisberger, Hochheimer, Rüdesheimer, and Marcobrunner. As celebrated as its wines are its mineral springs; the watering-places which are built around them, such as Wiesbaden, Ems, and Selters, are visited by people from all parts of the globe. But this land was ruled by one of the most narrow-minded and stupid of families; and its history from 1793 to 1866 is a fine bit of humor now that its blunders and calamities are past. In the thirteenth century the family which ruled the country split into two branches, called, after the two brothers, Walram and Otho. Of those two branches the younger, the Othonic, is now reigning in the Netherlands. The older, the Walram line, obtained the title of dukes of Nassau by the formation of the Rhenish confederacy in 1806, and their troops fought under Napoleon against Prussia and Austria in Spain and Russia. The duke, however, was shrewd enough to abandon Napoleon at the right moment, and in reward he received a considerable augmentation of his territory by the Congress of Vienna. In 1815 he gave a constitution; but when, in 1818, the constitution began to work and the house of representatives demanded an account of revenues and expenditure, the duke cried aloud about revolution, and finally employed force to silence the representatives. When then the revolution really came, the duke entirely mistook the direction in which he had to go for safety. In 1848 he followed Prussia, but Prussia was weak, confused, and vacillating. Thus the duke slowly glided over to the side of Austria, and there he stood in 1866. But in the course of a very few days his country was overrun and incorporated with Prussia. He obtained, however, a very large pension, and the whole family is possessed of immense wealth.

Nassau, town of New Providence, and capital of the BAHAMA ISLANDS (which see). It has a good harbor, is fortified and well built, and is celebrated for its salubrious climate. Pop. about 9000.

Nasser-ed-din, shah of Persia, b. Apr. 24, 1831, son of the late monarch, Mehemet (or Muhammad) Shah, by Queen Velliat of the Kadiar tribe, and grandson of Abbas Mirza; succeeded to the throne Sept. 10, 1848; suppressed several revolts of the nomadic tribes; maintained neutrality during the Crimean war, at the close of which he signed a treaty with Russia; waged a nominal war against England in 1856, which was terminated by the Treaty of Paris 1857; gave his support to the passage of the Anglo-Indian telegraph through his dominions 1866; visited the principal countries of Europe 1873, and wrote an amusing diary, which has been translated by J. W. Redhouse. The shah's desire to introduce reforms and material improvements into his kingdom actuated this visit, and was exemplified by the Reuter concession (1873), subsequently annulled, and by the fact that he has learned French and Turkish in order to familiarize himself with the history and condition of European countries.

Nas'sick, or **Nashik,** town of British India, presidency of Bombay, on the Godavery, near its sources, is one of the principal seats of Brahmanism, and contains numerous temples, generally built of black basalt, and many ecclesiastical and theological institutions. It seems also to have been a prominent Booddhist place, as it contains several very striking Booddhist monuments. Pop. about 25,000.

Nast (THOMAS), b. at Landau, Bavarian Palatinate, Sept. 27, 1840; came with his father to the U. S. in 1846; received only six months' art-instruction under Theodor Kaufmann; began when fifteen years old to furnish illustrations for papers; was in Europe 1860–61, and during the war began his long series of powerful and effective political caricatures, most of which have appeared in *Harper's Weekly.*

Nastur'tium [Lat., "nose-twist," from its pungent quality], a genus of cruciferous herbs, mostly aquatic, containing many species, among which are water-cress and horseradish. (See CRESS and HORSERADISH.) Popularly, the names nasturtium and nasturtion (often abridged to 'sturtion) are given to *Tropæolum majus*, a fine, showy climbing herb, a native of Peru, often seen in gardens. Its orange flowers are used in salads, and its pungent buds and fruit are pickled and incorrectly called capers.

Nasua (Storr), a genus of the Ursidæ or bear family. The coatis or coatimondis are closely allied to the raccoons of the U. S., which they much resemble in appearance and habits. They have, however, longer and more mobile muzzles, and are restricted to the tropical parts of America. EDWARD C. H. DAY.

Natal', an English colony on the south-eastern coast of Africa, extending along the Indian Ocean from lat. 28° to 30° S., and bounded S. by Kaffraria, from which it is separated by the Umzimculu; N. by the Tugela River, which divides it from Zululand; and W. by the Quattilamba (or Drachenberg) Mountains, which form the boundary between it and the Orange River Free State. Area, 17,000 square miles, about one-third the size of England. Pop. 380,000, of whom 330,000 are natives, 30,000 are whites (one-fifth Dutch), and 20,000 Indian coolies. The surface rises from the low coast-land, where cotton, rice, and sugar are grown, through terraces where the common European cereals and fruits are cultivated, into an elevated table-land at the foot of the Quattilamba, where excellent pastures are found. Sugar is the chief product. Elephants, hippopotami, lions, leopards, crocodiles, and poisonous serpents are frequent in the jungles of the low coast-land.

Cap. Pietermaritzburg. The country was discovered by Vasco da Gama Dec. 25, 1497, and Natal became a British colony Aug. 8, 1843.

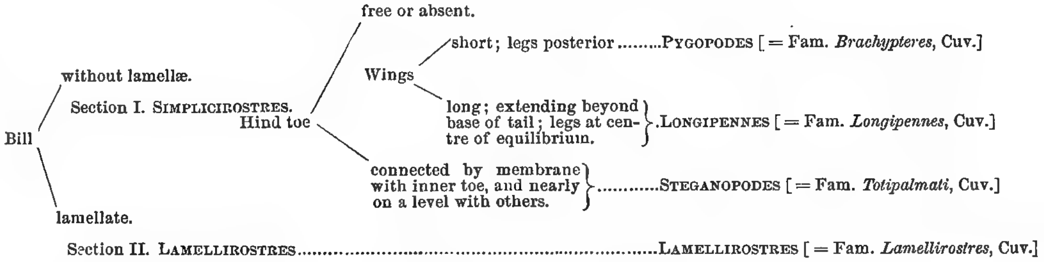
Natal, or **Rio Grande do Norte,** town of Brazil, the capital of the province of Rio Grande do Norte, on the Potengi. It has a good harbor, whose entrance, however, is impeded by a sandbar, and has 10,000 inhabitants.

Natato'res [Lat. "swimmers"], an artificial combination of birds, agreeing only—and but partially even in this respect—in being adapted for swimming. It was formerly regarded as an order or sub-class, but is now discarded by the best authorities. The group is characterized by having the upper part of the "crus" (tibia and fibula) enclosed within the skin of the trunk, and by having the feet generally webbed (the toes connected together by membrane as far as the claws). In addition to the above characters, the legs are placed comparatively far backward, and are usually short; the hind toe is occasionally altogether wanting; the plumage is thick and well supplied with oil from the gland on the rump. The Natatores of Illiger (A. D. 1811), thus characterized, correspond to the "palmated birds" or "swimmers," the third division of Willoughby's (1678) water-birds, to the Anseres of Linnæus, and to the Palmipedes of Latham and Cuvier. The term Natatores is sometimes rendered into English literally as "the swimmers;" otherwise the group is known as "the water-birds." But, admirably fitted as the Natatores are for an aquatic life, there are some members of the group which have so far diverged from the typical habit as seldom to approach the water, and many sea-fowl do little more than obtain their prey from that element by darting down on it from the air. On the other hand, the more typical forms live almost altogether on the water, some flying badly, or altogether unable to fly, by reason of the shortness or rudimentary condition of their wings, and only visiting the land for temporary rest or breeding. We thus find in it illustrations of extremes of habit and of structure—penguins, with wings reduced to almost fin-like appendages, associated with the longest-winged, the most powerful, the most enduring, the most graceful, and the swiftest of flyers, such as we find amongst the frigate-birds, the albatrosses, and the terns. So also some species are carnivorous, disdaining neither fish, insect, nor carrion, whilst others are almost exclusively herbivorous; and whilst some carry food to their helpless young (*Altrices*), the young of others (*Præcoces*) are enabled to seek their own food almost as soon as hatched. So important has this last distinction seemed that some former authorities raised the question whether, after all, the group as a whole was as natural as it seemed, and whether it did not really contain the elements of two sub-classes.

The Natatores, as might be expected from their habits, are found abundantly distributed in all parts of the world, and many species have very extended ranges; thus the common skua (*Lestris catarractes*, Linn.) of Iceland and Arctic Europe has been met with in the Straits of Magellan and on the Falkland Islands. (*MacGillivray.*) Numerous as the water-fowl are in individuals, there are, according to G. R. Gray, only about 600 species, and they constitute less than one-eighteenth of known birds.

The Natatores have been variously subdivided into so-called orders and families. We give below a table of the orders of this sub-class, taken from the *Systematic Review of the Class of Birds*, by Prof. Lilljeborg of Upsala, as translated in the *Smithsonian Report* for 1865, and we have added in brackets the names of the "families" of Cuvier that correspond to these "orders:"

TABLE OF ORDERS OF THE SUB-CLASS NATATORES (Illiger).



Bill
without lamellæ.
Section I. SIMPLICIROSTRES.
Hind toe
free or absent.
Wings
short; legs posterior.........PYGOPODES [= Fam. *Brachypteres*, Cuv.]
long; extending beyond base of tail; legs at centre of equilibrium. .LONGIPENNES [= Fam. *Longipennes*, Cuv.]
connected by membrane with inner toe, and nearly on a level with others. ............STEGANOPODES [= Fam. *Totipalmati*, Cuv.]
lamellate.
Section II. LAMELLIROSTRES.........LAMELLIROSTRES [= Fam. *Lamellirostres*, Cuv.]

Lilljeborg subdivides the above four "orders" into ten "families." Later authorities admit fourteen, viz..

PYGOPODES:		
Fam. 1.	Aptenodytidæ (=Spheniscidæ)	Penguins.
2.	Alcidæ	Auks.
3.	Colymbidæ	Loons.
4.	Podicipidæ	Grebes.
LONGIPENNES:		
5.	Procellaridæ	Petrels and albatross.
6.	Laridæ	Gulls and terns.
STEGANOPODES:		
7.	Sulidæ	Gannets.
8.	Pelicanidæ	Pelicans.
9.	Pelicanidæ	Pelicans.
10.	Phalacracoracidæ	Cormorants.
11.	Plotidæ	Darters.
12.	Tachypetidæ	Frigate-birds.
13.	Phæthontidæ	Tropic-birds.
LAMELLIROSTRES:		
14.	Anatidæ	Swans, geese, ducks, mergansers.

Prof. Huxley has proposed a classification of birds founded upon certain osteological characters. In his system the Natatores are broken up into four groups ranged under ten primary divisions. The Cecomorphæ (including the Alcidæ, Colymbidæ, Podicipidæ, Procellariidæ, and Laridæ); and (2) Spheniscomorphæ (including Aptenodytidæ) are grouped, with others, under the name Schizognathæ; and (3) the Chenomorphæ (=Anatidæ) and (4) Dysporomorphæ (=Steganopodes) are combined with many others, as Desmognathæ; the Amphimorphæ (= Phænicopteridæ) are interposed between the Chenomorphæ and Pelagomorphæ (herons, etc.). EDWARD C. H. DAY.

Natch'ez [properly **Natches**], a tribe of Indians of the Huaxteco-Maya family, found by Spanish explorers in 1560, and by La Salle in 1683, occupying a tract E. of the Mississippi embracing the site of the present city of the same name, which was first settled by Iberville. Their customs, language, and religion differed radically from their neighbors, the Choctaws, but were akin to those of the Tensas, Natchitoches, Washitas, and Caddoes. They worshipped the sun, giving the name of "great sun" to their principal chief, whose office was hereditary in the female line, constructed mounds, and had a large temple where a sacred fire was always maintained. The Natchez possessed a civilization seemingly far in advance of the neighboring tribes, which they derived, like the Peruvians, from mythical progenitors. They were noted for licentious customs, but were brave and generally friendly to the French, although Bienville came into momentary collision with them in 1716, and again in 1722. The tyranny of Chopart, governor of Fort Natchez, occasioned a massacre of the French Nov. 28, 1729, from which few escaped. This treachery was avenged by the French, who, during the two following years, availing themselves of an alliance with the Choctaws, killed a large part of the warriors of the tribe, sold above 400 prisoners, including the "great sun" and his family, into slavery in Santo Domingo, and drove the remnant to the borders of Texas. Since that period they have resided with the Chickasaws and Muskogees, and still number 300 souls, retaining their language and governed by a "great sun." The famous account of the Natchez given by Chateaubriand is grossly incorrect. PORTER C. BLISS.

Natch'ez, city, on R. R., cap. of Adams co., Miss. (see map of Mississippi, ref. 8–E, for location of county), on the E. bank of the Mississippi River, in lat. 31° 34′ N., lon. 91° 25′ W., contains excellent schools, a Catholic cathedral, a Jewish synagogue, 3 orphan asylums, steam saw and planing mill, a cotton-seed oil-factory, steam-ginneries and grist-mills. Principal business, handling cotton. Pop. in 1870, 9057; in 1880, 7058.

Natchitoch'es, a tribe of Indians kindred to the Caddoes, the Washitas, and Capichis, and probably belonging, like the Natchez, to the Huaxteco-Maya family. They formerly lived on Red River, La., having a fortified town on an island, but, being dislodged by the fugitive Natchez in 1731, they united with the Caddoes, among whom a small remnant still exists. They worshipped the sun, maintained sacred fire in their principal temple, manufactured salt, and were friendly to the French, with whom they had commercial relations.

Natchitoches, city, cap. of Natchitoches parish, La. (see map of Louisiana, ref. 8-B, for location of parish), about 450 miles N. W. of New Orleans, has a high school and a good system of public education, wagon, cart, and plough manufactories, 2 convents, the U. S. land-office for the northern district of Louisiana, a fine cathedral, and other public buildings. The surrounding country is well adapted to agricultural pursuits, and large quantities of cotton, corn, molasses, rice, and numbers of horses and cattle are sold here each winter. Pop. in 1870, 1401; in 1880, 2785.

Natic′idæ [from the proper name, *Natica*], a family of the class of gasteropods and order of Pectinibranchiates, distinguished at first sight by the large foot in which the shell is more or less immersed, at least in crawling. The visceral sac is curled in a more or less depressed helix; the mantle is small; the head more or less produced in an elongated and retractile muzzle; the tentacles are united by a transverse membrane; the eyes situated on peduncles immersed at the outer base of the tentacles; the radula or lingual ribbon has the teeth in seven longitudinal rows; the median is wide, has a distinct basal lamina, and is armed with three primary denticles; the inner lateral is oblique, more or less transverse, produced toward the median tooth, and armed with one strong denticle and more or less numerous smaller ones on each side; the external lateral are claw-like, the inner bifid at the extremity, the outer simple; the foot is very large, but variable in size, greatly developed in front, and there provided with a fold or veil which is reflected upon the head, and conceals in part the tentacles as well as the eyes. The shell is oval, and more or less obliquely depressed, and has an ovate aperture, which is entire in front and pointed behind. The operculum is sub-spiral, but varies in texture and development, it being in some horny and in others calcareous; in those in which the animal is only partially retractile it is quite minute. The family is an extensive one, embracing numerous species diffused throughout all seas. The following genera are now generally recognized: *Natica, Surinatia, Neverita, Polinices, Mammilla, Cernina, Amaura, Amauropsis, Naticina*, and *Sigaretus*. Most of these are represented by species on the American coast. The animals are carnivorous, and indeed quite voracious, feeding upon dead fish as well as upon other mollusks, especially the small bivalve forms. With the teeth of the lingual ribbon they are enabled to perforate shells, and in great part make the small round holes often seen in those picked up on the beach; they burrow in the sand, and almost conceal themselves therein. Some, at least, make a very singular nest; it is composed of sand, has the form of the old-fashioned lamp-shade or a broad bowl, and is quite thin; this is filled with small cells, in each of which is an egg with its embryo shell. The nest of one species thus characterized was regarded by some old naturalists as a peculiar coral animal, and named *Flustra arenosa*, etc. THEO. GILL.

Na′tick, Middlesex co., Mass. (see map of Massachusetts, ref. 2-H, for location of county), on the Boston and Albany R. R., 17 miles from Boston, has a public library of 10,000 volumes, water and gas works, manufactories of shoes, hats, boxes, and carriages. Principal business, shoe-manufacturing. Pop. of tp. in 1880, 8479; in 1885, 8460.

Na′tion [Lat. *natio*, from *natus*, "born"], a term used in two senses, though invariably applied to a people or a maximum body of men. In one sense, the political, it is used to designate an autonomy—that is to say, the citizens of a state or states united under one head, subject to one government, bound to obey the same laws. In the second, or ethnological sense, it means a people of one blood, one language, and having the same manners and customs. In some cases the word comprises these two meanings; thus, Italy is a nation both politically and ethnologically. But it more often happens that various races, though united under one government, and thus formed into one political nation, are, in truth, of different nationalities. Of this Russia, Austria, and, in a less degree, Great Britain, are examples. Ambitious rulers and statesmen, desirous of aggrandizing their *government*, have at all times striven to form the *political* nation, without respect for differences of race or language; while patriots, as distinct from statesmen, have sought to preserve as a nation those of one blood and speech, and thus to combine political and ethnological ties. Poles, Georgians, and Hungarians have rebelled against their Russian and Austrian conquerors not merely to resist oppression, but from a passionate desire to keep their nationality intact.

It is noteworthy that in the case of ancient Rome, and in that of modern America and Great Britain, conquered races and emigrants have with few exceptions adapted themselves to the new nationality, and felt a certain pride in becoming a part of it. The title of "Roman citizen" was esteemed by aliens and by vanquished races. Irish and German emigrants after a time call themselves Americans, and in fact do become so. The outgoers from old Rome, as those of to-day from America and England, held fast to their own nationality; thus, Canadian and Australian colonists and their descendants call themselves English, though they may never have seen the mother-country. The strongest modern illustrations of transition from the ethnological to the political view of a nation may be seen in Great Britain and France, in both of which countries peoples of a different stock, as the Scotch and the Alsatians, pride or have prided themselves on their nation as a government. The ethnological view being essentially sentimental, and the political practical, it follows that the latter is most in accordance with the spirit of the age and with great ideas, which can be fully developed only by great nations. JANET TUCKEY.

National Banks. See BANKS, by JOHN JAY KNOX.

National Bureau of Education, an office in the department of the interior, had its rise in a need long felt by leading educators of some central agency by which the general educational statistics of the country could be collected, preserved, condensed, and properly arranged for distribution. The bureau was created by the act of Congress of Mar. 2, 1867, Gen. Garfield being chairman of the committee of representatives which reported the bill, and its foremost supporter on the floor of the House. In the text of the act the functions of the bureau are thus stated: "For the purpose of collecting such statistics and facts as shall show the condition and progress of education in the several States and Territories, and of diffusing such information respecting the organization and management of school systems and methods of teaching as shall aid the people of the U. S. in the establishment and maintenance of efficient school systems, and otherwise promote the cause of education." The bureau is not an administrative agency, and is not invested with any authoritative direction of the school systems of the States, its operations being limited to the collection and diffusion of information, but the field of research for obtaining the requisite information is not restricted. Hence the publications of the bureau comprise, in addition to the reports and papers on the condition of education at home, a large amount of valuable information as to the systems, means, and results of instruction in foreign countries. The bureau is conducted by a commissioner of education appointed by the President. The first incumbent of the office was Hon. Henry Barnard, LL.D., of Connecticut, who retired after three years' service, and was succeeded in 1870 by the present commissioner, Gen. John Eaton. The working force consists of 38 clerks and employés of different grades. The appropriation for the expenses, 1882-83, was $44,580 salary fund, $5975 contingent fund, and $2000 for the distribution of documents. The expense of printing is chargeable to the printing fund of the department of the interior. The publications thus far issued comprise 14 annual and 3 special reports, averaging more than 1000 pages each, and about 60 "circulars of information," in the shape of pamphlets, varying in size from a few pages to more than 200, and containing a great variety of educational information of very great value and utility. These documents are printed in large numbers, and are circulated gratuitously throughout the country. A vast amount of useful information respecting the school systems and institutions of our own and of foreign countries is thus made accessible to all persons sharing in the management of educational affairs.

As one of the fruits of its operations, the bureau has collected a pedagogical library of almost unexampled richness in its special line, comprising about 15,000 bound volumes and 37,000 pamphlets. The bureau has also laid the foundation of a pedagogical museum, to illustrate school architecture, furnishing and fitting, and appliances and apparatus for instruction of all descriptions. Some indication of the extent of the operations of the bureau is afforded by the fact that the number of its correspondents is over 13,000. So marked has been its success and efficiency that it is now generally regarded by educators as an indispensable agency for the promotion of the educational interests of the country. Every educational inquirer feels it necessary to have access to its publications. Its system of statistics has gradually been perfected until it may be regarded as in most respects a model. M. Levasseur, an eminent savant and educator of France, says: "The bureau is a mirror in which American schools may see themselves grouped side by side, compare their organization, appreciate their differences, and measure their progress in successive years. Its reports are the most copious fountain from which one can draw: having them, one can dispense with others; without them, it is almost impossible to obtain a complete idea of American education as a whole, the original documents are so numerous, diverse, and difficult to get together." JOHN D. PHILBRICK.

National Cemeteries. See APPENDIX.

National Convention, The, an assembly of deputies of the people, denotes the bloodiest phase of the French Revolution. It began its sittings on Sept. 21, 1792, and dissolved itself on Oct. 26, 1795. It succeeded the National Assembly, and was succeeded by the Directory. Its first act was to declare France a republic; then followed the trial and condemnation of the king. The chief administration of affairs was entrusted to the Committee of Public Safety, which was possessed of almost unlimited power, and the principal instrument through which that power made itself felt was the Revolutionary Tribunal. In the very first days of its existence the assembly was led by the Girondins; it then fell under the sway of the Jacobins, supported by excited mobs; at last it became a mere tool in the hands of Robespierre. With the overthrow of Robespierre a great reaction set in. The Jacobins were suppressed, peace was concluded with Prussia and Spain, and at last the National Convention itself disappeared.

National Debt. See DEBT, NATIONAL.

National Guard [Fr. *garde nationale*], a kind of militia in France, mostly recruited from the bourgeois class, and representing the burgher interests. In some of the French towns the national guards had long been known, but they were first organized in Paris in 1789 by the revolutionary Committee of Safety. There were 48,000 in Paris, 300,000 in France, and the whole were under La Fayette and carried the tricolor flag. In 1795 they were defeated and broken up by Napoleon, were reorganized by him in 1814, dissolved by Charles X. in 1827, again reorganized in 1830, and again in 1831. They fell away from Louis Philippe in 1848, were remodelled in 1852, served against the Germans in the war of 1870–71, and in the latter year a part of them took a share in the Communist struggle. In some other European countries and in some of the U. S. there are militia organizations called national guards.

National Military Homes. See SOLDIERS' HOMES.

National Parks, portions of the public lands reserved from sale and settlement on account of their interesting natural features, in order that they may be maintained as places of public resort for ever. Only two national parks have ever been made in this country by authority of the general government—viz. the Yosemite Valley and the Yellowstone National Park. The former was granted to the State of California by the Senate and House of Representatives of the U. S. of America in Congress assembled, and became a law June 30, 1864, and the tract was the "cleft" or gorge in the Granite Peak of the Sierra Nevada Mountains, in the county of Mariposa, at the head-waters of the Merced River, and known as the Yosemite Valley, with an estimated length of 15 miles, and a width of 1 mile from the main edge of the precipice on both sides. The tract was set aside for the benefit of the people, for their use, resort, and recreation, and declared inalienable for all time. At the same time, the Mariposa Big Tree Grove, comprising an area not to exceed four sections, was set apart under like legislation. These tracts have been surveyed and mapped with great care by State authority.

The Yellowstone National Park is located in the extreme N. W. corner of the Territory of Wyoming. It is 65 miles in length from N. to S., and 55 in breadth from E. to W., comprising an area of 3575 square miles. This tract was withdrawn from settlement, occupancy, or sale under the laws of the U. S. by an act of the 42d Congress, and dedicated and set apart as a public park or pleasure-ground for the benefit and enjoyment of the people. This act became a law by the approval of the President Mar. 1, 1872. The main purpose of the law was the protection of the wonderful curiosities from injury or spoliation, and their retention in their natural condition. It is probable that no other area of equal dimensions has so many objects of wonder, as hot springs, geysers, waterfalls, cañons, etc. The natural scenery is unique, and will remain so for all time. There are more hot springs and geysers in this area than in all the remainder of the world besides. F. V. HAYDEN.

National Stock-Yards, Ill. See APPENDIX.

Natolia. See ANATOLIA.

Na'trolite [from *natron*, "soda," and Gr. λίθος, "stone"], a mineral belonging to the zeolitic section of hydrous silicates, and essentially a silicate of alumina and soda, with 9.5 per cent. of water. It occurs generally in slender crystals assignable to the trimetric system, also frequently in radiated fibrous masses. It is met with most commonly in volcanic rocks, but occasionally also in granite and gneiss. Bergen Hill, N. J., Copper Falls, L. S., and localities in Nova Scotia have yielded fine specimens. EDWARD C. H. DAY.

Natron. See SODA.

Nat'terjack, the *Epidalea calamita*, a toad-like batrachian of Europe, abundant in parts of England and Ireland. It resembles the common toad in appearance, but does not hop. Its progression is by running. It frequents dry places near the sea. It is seven inches long, and has a very disagreeable odor.

Natu'na Islands, a group of islands situated in the China Sea, between Borneo and the peninsula of Malacca. Area, 600 square miles. Pop. 1300. They are high and mountainous, and produce rice, maize, sago, and cocoanuts. Fishing is the chief occupation of the inhabitants.

Nat'ural. In music, the regular notes of the scale when unaffected by sharps or flats (as in the key of C major) are said to be *natural*, or in their original and ordinary condition. And when any note has been modified by the use of a ♯ or ♭ (whether placed at the clef or occurring as an accidental), such alteration may be revoked by prefixing to the note the sign ♮. This sign is called a "natural," because it restores to the altered note its original character. The natural is a modifying sign of later date than the sharp or flat. In many compositions of the old English school the sharp is used to contradict a previous flat, and a flat to contradict a sharp, though this involved a technical error which was unavoidable at the time, but is now obviated by the use of a distinct sign to indicate the natural. The natural is also of service in cases where a change of key takes place, as at the opening of a second or third movement, where such sharps or flats in the signature as are no longer needed are revoked by the substitution of as many naturals. Double sharps or double flats are restored to simple sharps or flats by the signs ♮♯, or ♮♭. In figured bass the sign ♮ *without* a figure always means a natural *third*.—Natural *modulation* is that which is confined to digressions into such keys as are nearly related to the tonic, and is marked by an easy, fluent, and intelligible course of thought, with an avoidance of abrupt and foreign harmonies. WILLIAM STAUNTON.

Natural Bridge. (1) In Walker co., Ala., is an arch in the sub-Carboniferous conglomerate stone, here so stratified as to resemble artificial masonry. It has a span of 120 feet and is 70 feet high. There is a smaller arch in the immediate vicinity. It is in a beautiful region. (2) In Trinity co., Cal., a small creek runs for 3000 feet through an arch of 80 feet span and 20 feet in height. The bed of the stream is 170 feet below the top of the bridge. (3, 4) In Siskiyou co., Cal., the Lost River flows under two arches of sandstone 30 feet apart. The stream is 80 feet wide, and the bridges each measure about 12 feet from side to side. (5, 6) The Coyote Creek in Tuolumne co., Cal., 10 miles N. from Sonora, flows under two natural bridges. The larger one is 285 feet from side to side, but of small span. The top of the arch is 30 feet above the cavity, and 66 feet above the water. The other bridge is of about the same dimensions, and is half a mile lower down the stream. (7) A bridge in Christian co., Ky., has a span of 70 feet and is 138 feet high. (8) In Adams, Berkshire co., Mass., the Hudson Brook flows for 30 rods under an arch of white marble. The cavity is from 30 to 60 feet deep and 15 feet wide. (9) At the village of Natural Bridge, in Jefferson co., N. Y., the Indian River flows through passages under the surface-rock of coarse white sandstone. (10) The most famous of all in the U. S. is that in Rockbridge co., Va., 14 miles from Lexington. Cedar Creek here reaches the lower end of a cañon of siliceous limestone, 200 feet deep. The arch is 60 feet in spring. Its crown is 40 feet thick. It is crossed by a public road 240 feet above the water.

Nat'ural His'tory is a term which has been used in different senses at different times and by different persons. (1) Formerly it was extended to embrace the consideration of all the objects, as well as the phenomena, of nature, and hence, in addition to mineralogy, zoology, and botany, embraced chemistry, physics, and astronomy; and protests were made by physicists at the attempt to restrict the term to its present more generally accepted sense. (2) It is now, however, limited to the history of the natural objects known under the names of minerals, plants, and animals in their normal conditions. (3) There is also a tendency to still further restrict it to zoology, for which it is frequently used in conversation, and occasionally in popular literature, as an interchangeable term. This last usage, however, is not sanctioned by good authority or by the necessities of the case, the word zoology being all-sufficient, and the common name being necessary for that branch whose objects of study belong to the three kingdoms in question. Natural history, then, properly speaking, is the history of natural objects—minerals, plants, and animals—in their various normal conditions, and has been divided (*e. g.* by Cuvier) into *General* and *Particular*. *General Natural*

History, in this acceptation of the term, embraces the consideration of all objects in their relations to each other and in the economy of nature. *Particular Natural History* is restricted to the consideration of special forms in regard to (1) the sensible properties of the entire body and its parts; (2) "the mutual relations of those parts, the motions which they produce, and the changes which they undergo whilst they remain united;" (3) "the active and passive relations of this body with every other body in the universe;" and (4) "the explanation of all these phenomena." The objects taken cognizance of by natural history fall naturally into two great groups: (1) the *Mineral Empire* or *Mineral Kingdom*, considered under the head of MINERALOGY; and (2) the *Organic Empire*, discussed under the term BIOLOGY. Biology is itself subdivided into (*a*) BOTANY, which treats of the Vegetable Kingdom, and (*b*) ZOOLOGY, which has for its domain the Animal Kingdom. Nothing can be predicated respecting characters common to all the bodies which belong to the several kingdoms indicated which does not more properly pertain to the science of somatology, which falls within the sphere of the physicist; and there is little in common even as to methods of study or terminology. THEODORE GILL.

Naturaliza'tion. Naturalization takes place when an alien transfers his allegiance from the country of his origin and the sovereign of the same to another country and sovereign. There may be *partial* or qualified naturalization, which does not make aliens completely equal in all respects to native-born citizens or subjects; thus, by the Constitution of the U. S. (Art. II. sect. 2, § 5) no naturalized citizen can become President of the U. S., and for some time in England no such person could be a member of the privy council or of either house of Parliament. Complete naturalization gives all the rights and imposes all the obligations of a native-born citizen. Most states give privileges of naturalization, but there is great difference in regard to the conditions. Hence, a conflict of laws may arise with respect to the same individual on his return to his original country. The English doctrine for a long time was that allegiance to the Crown was perpetual and indissoluble. Hence, an Englishman naturalized by the law of the U. S. was held to be still a British subject, and many such were in the early part of this century taken on the high seas out of our vessels, on the ground of owing military duty to the Crown, and were impressed into the English naval service. If the allegiance were indissoluble, *jure gentium*, it would not follow that this procedure of taking these persons out of neutral vessels was authorized; at present this claim must be abandoned as far as the U. S. are concerned, owing to the new position in regard to naturalization which treaty has imposed on Great Britain, and in regard to taking persons out of neutral vessels on the high seas, which that government took in the case of the Trent.

Naturalization involves all rights of person and property, including generally that of holding real estate, but does not extinguish claims which were in force at the time the person concerned altered his allegiance. Thus, numbers of young men have left different parts of Germany to escape from the military duty required for a certain time of all able-bodied males. The fact of passing through the forms of allegiance according to the laws of the U. S. would not protect such persons from the operation of laws to avoid which they removed from their native country.

How far the incomplete process of naturalization is to have effect in entitling a person to protection is a matter of doubt, since it depends on the person himself whether he will complete the act according to his expressed intention. The case of Koszta, who was seized in a Turkish port at the instigation of the Austrian consul-general, next was put into the hands of the French consul-general in consequence of the threat of force made by a captain of one of our public vessels then in the port, and finally set free so as to go to the U. S., is in point. This was in 1854.

In quite recent times treaties of the U. S. with German powers and with Great Britain have so defined the claims of the original and the adopted country as to prevent conflict of laws as far as possible. In the treaty with the North German confederation and in that with Bavaria made in 1868 five years of uninterrupted residence with formal naturalization constitutes citizenship on both sides. The declaration to become a citizen is of no effect. Residence is understood, as the Bavarian treaty expresses it, in the *jural* sense, so that it is not interrupted by a transient absence. A person returning to his former residence is not protected by his naturalization from responsibility for crimes committed before his emigration; and such a person residing more than two years in his original country is held to have renounced his naturalization. In the Bavarian treaty it is agreed that the treaty shall not affect a provision of the military law by which Bavarians, emigrating before the end of the prescribed military service, cannot on their return be admitted to permanent residence in the land until they shall have become thirty-two years old. The convention with Great Britain provides that the subjects or citizens of either nation, naturalized according to the laws of the other, shall be held to be for all purposes subjects or citizens of the other; that they may again exchange their nationality on terms to be agreed upon within a certain time after the date of the convention; and that on renewing their residence in either country they may be readmitted to the character and privileges of a citizen or subject, and not be claimed by either country on account of the previous naturalization.

THEO. D. WOOLSEY.

Naturalization, the conferment by a state or nation upon an alien of rights and privileges, both civil and political, which are vested in native-born citizens or subjects; the admission of an alien by due public authority to the rights of citizenship. Naturalization is effected in a variety of modes in different countries—either by letters patent of the sovereign, or by special legislative act conferring citizenship upon a particular individual, or under the provisions of general laws which establish special regulations for the removal of the disabilities of foreigners upon their own application. It will only be practicable, here, to consider the laws of England and the U. S. on this subject, and the treaties made by the U. S. with foreign nations. By the common law a foreigner while temporarily resident within the country is bound to yield a local or temporary allegiance to the state and obey its laws, and in return for this obligation is entitled to protection by its government, and may obtain redress for injuries in its tribunals. But this duty of allegiance is distinguished from that which is obligatory upon citizens, since it ceases when the residence is discontinued, together with the privilege of protection attendant upon it. The allegiance of citizens, on the other hand, is natural and permanent, and is a duty resting upon them wherever they may go or reside, of which they cannot divest themselves even by their own choice; and as incident to it they are at all times entitled to the protection of their own state, even though they may have voluntarily abandoned it and given up all intention of again residing within its limits. Allegiance by the citizen or subject and protection by the government are therefore correlative obligations, and both appertain temporarily to resident aliens as well as permanently to citizens. Foreigners are also placed under important disabilities in regard to the right to acquire and dispose of property, and to exercise political franchises; and in various other respects a discrimination is made between them and citizens to their disadvantage. (See the rules on this subject stated under ALIEN.) By the common law, therefore, the ties of natural allegiance are declared to be indissoluble, while foreigners had no means of acquiring a similar status to that of citizens otherwise than by private legislative act, or in England by grant from the Crown. During the colonial period of American history the colonies themselves exercised the prerogative of adopting naturalization laws, mainly for the purpose of promoting immigration. During the period of the Confederation, also, the several States exercised independently of each other the power of adopting naturalization laws, and as, under such circumstances, entire uniformity of legislation was practically unattainable, the diversity in the systems adopted threatened to lead to serious difficulties and embarrassments in the intercourse between the States. For it was provided by the Articles of Confederation that the free inhabitants of each State should be entitled to all the privileges and immunities of citizens in the several States. It therefore followed as a necessary consequence that those States in which the most stringent regulations were adopted in regard to the qualifications of aliens which would entitle them to become citizens were obliged to extend the privileges of citizens to foreigners naturalized in other States where citizenship might be more easily acquired. In order to avoid the difficulties arising from such diverse legislation, a clause was inserted in the U. S. Constitution providing that "Congress shall have power to establish an uniform rule of naturalization." In the exercise of this power various statutes have been passed by Congress from time to time prescribing the requisite qualifications to entitle an alien to become naturalized, and the particular methods and formalities which he must observe in making his application. It has been held by the courts that this power vested in Congress is exclusive, and that the several States have no authority to legislate upon the subject of naturalization, even though laws thus adopted may not be in contravention of Congressional enactments. But the authority conferred upon Congress by the Constitution only extends to the question of citizenship, and no restriction is therefore imposed upon the right of the States to adopt legislation removing in a greater or less degree the disabilities of aliens in regard to the acquisition, holding, and transfer of property, or qualifying them to vote, or investing them with other similar privileges; and laws of this kind have been enacted in many of the States. (See Citizen.) In the establishment of naturalization laws by Congress a very liberal policy has been pursued, and aliens after a certain period of residence, which has been prescribed in order to enable them to become acquainted with our system of polity and the nature of our institutions, may be admitted to the full rights of citizenship with but very few restrictions. The disqualifications still existing are that no naturalized citizen is eligible to the office of President or Vice-President, there being a prohibition against it in the Constitution. It is also provided that no person shall be elected to the U. S. Senate who shall not have been a citizen for nine years, or to the House of Representatives unless he shall have been a citizen for seven years. But in nearly all respects naturalized citizens are placed on the same footing as those who are native-born. Thus, it is declared by the provisions of the recent amendments to the Constitution that "all persons born or *naturalized* in the U. S., and subject to the jurisdiction thereof, are citizens of the U. S. and of the State wherein they reside;" "no State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the U. S." (14th Amendment); "The right of citizens of the U. S. to vote shall not be denied or abridged by the U. S. or by any State on account of race, color, or previous condition of servitude" (15th Amendment). Substantial equality of civil and political rights and privileges is thus secured to both classes of citizens. The provisions of the U. S. naturalization laws are at present (1876) as follows: The alien must declare on oath before a circuit or district court of the U. S., or a district or supreme court of the Territories, or a court of record of any of the States having common law jurisdiction and a seal and clerk, two years, at least, prior to his admission, that it is *bonâ fide* his intention to become a citizen of the U. S., and to renounce for ever all allegiance and fidelity to any foreign prince, state, or sovereignty, and particularly by name to the prince, state, or sovereignty of which the alien may be at the time a citizen or subject. But his full admission to citizenship cannot take place until he has resided within the U. S. for the continued term of five years next preceding his admission, and one year at least within the State or Territory where the court is held to which he makes application. At the time of his application to be admitted he must declare on oath before some one of the courts above mentioned that he will support the Constitution of the U. S., and that he absolutely and entirely renounces and abjures all allegiance to every foreign power, and particularly to that state of which he was before a citizen. These proceedings are duly recorded by the clerk of the court. It must be made to appear to the satisfaction of the court admitting the alien that he has duly fulfilled the prescribed qualifications in regard to the term and place of residence, and that during that time he has behaved as a man of good moral character, attached to the principles of the Constitution of the U. S., and well disposed to the good order and happiness of the same. The proof of residence must be established by other testimony than the applicant's oath, though in regard to the other facts to be proved his oath will be admissible. Generally, however, it is required that even on these points other evidence shall be introduced in corroboration of his own affidavit; the testimony of a single witness will be sufficient. If the alien has borne any hereditary title or been of any of the orders of nobility in the kingdom or state from which he came, he must also make an express renunciation of his title or order of nobility; and this renunciation is recorded in the court. If the proof required is established to the satisfaction of the court, an order is made that the alien be admitted to become a citizen, and the proceedings are duly recorded. The record, like the record of a judgment of a court of competent jurisdiction, is conclusive in collateral proceedings as to the facts stated therein, and cannot be impeached by extrinsic evidence showing that the prerequisites to naturalization have not been complied with. If the alien is a minor, the rules in regard to his admission to citizenship are somewhat different. If he has resided in the U. S. three years next preceding his twenty-first birthday, and five years (including the three of minority) before making his application to be naturalized, the residence being continuous, he is not required to make the preliminary declaration above described of intention to become a citizen; but he must make the same declaration at the time of his admission as is required of other applicants, and must further declare on oath, and prove to the satisfaction of the court, that for two years next preceding it has been his *bonâ fide* intention to become a citizen, and must in all other respects comply with the naturalization laws. But the minor children of alien parents who are naturalized become thereby citizens themselves without any application on their own part being necessary if they are then dwelling in the U. S. It has been declared sufficient under this provision in several decisions that the father should be naturalized in order to confer the rights of citizenship upon the minor children, and that the naturalization of both parents is not necessary. All children born out of the limits and jurisdiction of the U. S., whose fathers are at the time of their birth citizens thereof and have resided therein, are also declared themselves to be citizens without naturalization. So any woman who marries a husband who is a citizen of the U. S., and who might herself be lawfully naturalized, is deemed herself to be a citizen; under this provision it has been held that the husband need not be a citizen at the time of the marriage, but that a woman married to an alien becomes a citizen by the subsequent naturalization of the husband. His citizenship, whenever it exists, confers citizenship upon her. If the husband dies before he is actually naturalized, but after he has taken the preliminary oath of intention to become a citizen, his widow and children are declared to be citizens, and are entitled to all rights and privileges as such upon taking the oath prescribed by law. There are also special statutory provisions in regard to the naturalization of aliens who have served in the U. S. army, and of foreign seamen. Any alien of the age of twenty-one years and upward who, having enlisted in the U. S. army, is honorably discharged, is admitted to become a citizen upon his petition without any preliminary declaration of intention to become such, and is not required to prove more than one year's residence in the U. S. previous to his application; but due proof of residence, of the alien's good moral character, and of the fact of honorable discharge must be presented to the court admitting him. As regards seamen, it is provided that every seaman, being a foreigner, who declares his intention of becoming a citizen in any competent court, and shall have served three years on board of a merchant-vessel of the U. S. subsequent to the date of such declaration, may, on his application to any competent court and the production of his certificate of discharge and good conduct during that time, together with the certificate of his declaration of intention to become a citizen, be admitted a citizen of the U. S.; and every such seaman is deemed to be a citizen for the purpose of serving on a U. S. merchant-vessel after his preliminary declaration of intention has been made, and after such three years' service, though no further steps be taken; but such seaman shall, for all purposes of protection as an American citizen, be deemed such after the filing of his declaration of intention to become such citizen. There are also particular provisions in the naturalization laws in regard to the naturalization of aliens residing within the U. S. before Jan. 29, 1795, and of those therein residing between June 18, 1798, and June 18, 1812; but these are no longer of sufficient practical importance to require their statement in this connection. The general provisions of the naturalization laws apply to aliens of African nativity and to persons of African descent. But aliens who are citizens or subjects or denizens of a country with which the U. S. are at war at the time of their application cannot then be admitted to the rights of citizens. They cannot avail themselves of the privileges afforded by the naturalization laws until the restoration of peace.

In regard to the rights acquired by naturalized citizens, it is provided by the statutes that all naturalized citizens of the U. S. while in foreign countries are entitled to and shall receive from this government the same protection of person and property which is accorded to native-born citizens. Certain specific acts in violation of the provisions or policy of the naturalization laws are declared by statute to be crimes, subjecting the offender to prosecution by the U. S. government through its proper officials. Thus, where any oath or affidavit is to be taken under these laws, and the affiant knowingly swears falsely, he may be indicted, and on conviction punished by fine and imprisonment. It is also a crime for any person who applies to be naturalized, or any witness appearing in his behalf, to knowingly personate any other person than himself, or falsely to appear in the name of a deceased person or in an assumed or fictitious name; or falsely to make, forge, or counterfeit any oath, notice, affidavit, certificate, or other instrument, paper, or proceeding required or authorized by the naturalization laws; or to sell, dispose of, or use such oath, notice, etc. as genuine or for any unlawful purpose; or to use, attempt to use, or participate in the use of any certificate of citizenship, knowing it to be forged or counterfeit or to have been fraudulently or unlawfully procured; or to receive such a false certificate, knowing its fraudulent character; or falsely to represent one's self to be a citizen of the U. S. without having been duly admitted to citizenship, for any fraudulent purpose whatever. Other violations of the naturalization laws are also declared to be criminal. (See *U. S. Revised Statutes*, pp. 1051, 1057, 380, and 351.)

In England no general naturalization law was enacted until the year 1844. Before that time naturalization could be effected only by special act of Parliament, but it had been provided by statute that an alien naturalized in this mode should still remain under important disabilities; he was still incapable of being a member of the privy council or of Parliament, of holding a civil or military office, or of receiving grants of land from the Crown. A practice, however, has existed from an early period for the king to grant letters of denization to aliens, which have the effect to remove an alien's disqualifications to a limited extent. A denizen is described as occupying a kind of middle state between an alien and a natural-born subject, having, as it were, an intermediate legal status. Thus, he may take lands by purchase or devise, though an alien cannot, but he cannot take by inheritance. A denizen, moreover, cannot belong to the privy council or Parliament or hold any public office of trust. A comprehensive statute in regard to the naturalization of aliens was enacted in 1870 (33 and 34 Vict. ch. 14), and this is the law at present in force. By this it is provided that an alien who has resided in the United Kingdom, or has been in the service of the Crown, for a term of not less than five years, and intends, when naturalized, to continue either his residence or his service, may apply to one of Her Majesty's principal secretaries of state for a certificate of naturalization. The applicant must present such evidence of residence or service and intention to reside or serve as the secretary of state may require, and the secretary may then, in the exercise of his own discretion, with or without assigning a reason, give or withhold a certificate, as he thinks most conducive to the public good, and no appeal lies from his decision; but such certificate will not take effect until the applicant has taken the oath of allegiance. An alien to whom a certificate of naturalization is granted is entitled in the United Kingdom to all political and other rights, powers, and privileges, and is subject to all obligations to which a natural-born British subject is entitled or subject, with this qualification, that he shall not, when within the foreign state of which he was previously a subject, be deemed to be a British subject unless he has ceased to be a subject of that state in pursuance of the laws thereof or in pursuance of a treaty to that effect. If any doubt exists in respect to the nationality of a person as a British subject, the secretary may grant to him a special certificate of naturalization, stating therein that it is granted for the purpose of quieting such doubts. Aliens naturalized before the passage of this act may obtain certificates of naturalization under its provisions upon the same terms as other aliens. The status of married women and minor children in respect to nationality follows that of the husband, and they become naturalized subjects upon his obtaining a certificate of naturalization. But after the father's death the status of the infant children is governed by that of the mother; and if she were then an alien, she might take out a certificate which would naturalize them all.

By the principles of the common law, to which reference has above been made, in regard to citizenship and allegiance, it is evident that naturalization laws merely confer a right of citizenship upon a foreigner in a country not his own, while his former duty of allegiance to his own state still remains obligatory. It thus happens that one person may be at the same time a citizen or subject of two different nations. This has sometimes led to irritating controversies between different governments, and therefore in modern times a number of civilized nations have recognized by general statute or by treaty the right of a subject to throw off his duty of allegiance to his native land upon becoming naturalized in a foreign country. This is termed the "right of expatriation," and has sometimes been claimed to be a natural right inherent in all persons, though it is now generally regarded as dependent upon the expressed will of a person's native government, and only capable of exercise when the privilege has thus been granted either by statute or treaty. (See EXPATRIATION.) The English naturalization act adopted in 1870, to which reference has above been made, also contains comprehensive general provisions declaring that any British subject who voluntarily becomes naturalized in a foreign state while he is under no disability shall from that time be deemed to have ceased to be a British subject and be regarded as an alien. It is further provided that a natural-born subject, who is also at the time of his birth, by the laws of a foreign state, a subject of that state, may, if of full age and under no disability, make a declaration of alienage before certain British officials, and thus cease to be a British subject. So a person born in a foreign country of a father who is a British subject may in a similar way make a declaration of alienage. Moreover, it is declared that a natural-born British subject who has thus become an alien in pursuance of the act may, on proper application to a secretary of state, obtain a certificate of nationality readmitting him to the status of a British subject. The secretary may, however, give or withhold such certificate in the exercise of his own discretion. (33 & 34 Vict. ch. 14.) In furtherance of the same liberal principles, a treaty has been made between Great Britain and the U. S. providing that citizens or subjects of either country naturalized as citizens or subjects of the other country shall be deemed to have divested themselves of their original nationality; the naturalization may, however, be renounced and the original nationality resumed if the person should renew his residence in his native country and apply to be readmitted to the privileges of a citizen or subject therein. (Treaty concluded May 13, 1870; see *U. S. Statutes at Large*, vol. xvi. 399; xvii. 15.) Treaties of the same general nature have been made by the government of the U. S. with Prussia (Feb. 22, 1868; see *Stat. at Large*, xv. 115), with Bavaria (May 26, 1868, *Ib.*, xv. 147), with Mexico (July 10, 1868, *Ib.*, xv. 223), with the grand duchy of Baden (July 19, 1868, *Ib.*, xvi. 329), with the kingdom of Würtemberg (July 27, 1868, *Ib.*, xvi. 333), with the grand duchy of Hesse (Aug. 1, 1868, *Ib.*, xvi. 337), with Belgium (Nov. 16, 1868, *Ib.*, xvi. 341), with Sweden and Norway (May 26, 1869, *Ib.*, xvii. 19), with the Austro-Hungarian monarchy (Sept. 20, 1870, *Ib.*, xvii. 43), with Denmark (July 20, 1872, *Ib.*, xvii. 151), with Ecuador (May 6, 1872, *Ib.*, xviii. 69). These various treaties are quite similar in their provisions, and the one concluded with Prussia may be taken for the sake of illustration as an example of them all. There are, however, in some cases important differences of detail, for which reference must be made to the statutes. By this treaty it is provided that citizens of either country who become naturalized citizens of the other, and reside therein uninterruptedly for five years, shall be held to have become citizens of the latter country, and shall be treated as such. But the declaration of an intention to become a citizen of the one or of the other country has not for either party to the convention the effect of naturalization. A naturalized citizen on returning to his original country is liable therein to trial and punishment for an action punishable by its laws and committed before his emigration, saving always the limitation established by its laws. So if a naturalized citizen renews his residence in his original country without the intent to return to the country of naturalization, he is held to have renounced his naturalization. The intent not to return may be held to exist when the person naturalized in the one country resides more than two years in the other country. This treaty between the U. S. and Prussia was to continue in force for ten years from the time of ratification. (See ALIEN, ALLEGIANCE, CITIZEN, EXPATRIATION; Cockburn on *Nationality*; Scott on *Naturalization*; Cutler on *Naturalization*; Hansard on *Aliens and Naturalization*; Wheaton on *International Law*.) GEORGE CHASE. REVISED BY T. W. DWIGHT.

Naturalization in Zoology. See ACCLIMATIZATION.

Natural Philosophy. See DYNAMICS and MECHANICS, by PROF. W. P. TROWBRIDGE, A. M., M. N. A. S.

Nat'ural Theo'logy treats of the existence and attributes of God as revealed to us in the constitution and order of the natural world. As a perfected system it results from the investigation of the two following questions: (1) Is this universe, with all its orders of being, the work of a personal creator or the result of impersonal forces? (2) The *existence* of a personal creator being proved, what can be learned from nature of his character and of his relations to his creatures?

The investigation of these questions starts with the assumption that every event must have an adequate cause, and that there may be such relations between causes and effects, such combinations of matter and manifestations of force producing specific results, that the existence of a designer may be inferred and his character revealed. Until these postulates are admitted, no step can be taken in solving the questions proposed, and such a science as natural theology is impossible. The grounds for these assumptions are found in the intuitive beliefs of the human mind. The belief in design is, by high authority, put on the same basis as belief in causation. (Porter, *Human Intellect*, ch. vi., and others.)

But natural theology embraces much more than the simple recognition of design in the universe, though such a recognition is the first step towards a full investigation of the subject. This investigation concerns itself with the complexity and perfection of means in carrying out design, and especially with the relation of design to sensitive and rational beings, as revealing the character of the designer.

The materials for this investigation are found in the whole natural world, as well as in the physical, intellectual, and moral nature of man. We are called upon to examine results only, and our reasoning on this subject can in no way be legitimately affected by any theories as to the time or secondary agencies required in producing the present order of things. The proof of design in a clock is in no way affected by a question of the time required or the instruments used in its construction. The man of common intelligence can see evidence of design in it from its results as well as the most skilful clockmaker. So in all the departments of nature the evidence of design can be judged of by results, without special reference to those recondite subjects that can be understood only by specialists.

The conditions of the problem and the opposing theories of the case may be stated briefly as follows: (1) It is now conceded by all that there was a time when there was no living thing upon the earth. (2) Since plants and animals and men are now here, there must be some cause adequate to produce them. Without any reference to the specific *method* by which the present forms of life have been produced, there seem to be but two hypotheses possible as to their origin: (1) That plants and animals have been produced through the agency of forces eternally inherent in matter; (2) that they have been produced by the design and organizing power of a personal being acting, directly or indirectly, through forces controlled by him. Both of these hypotheses have their supporters, although those who accept the latter by no means agree as to the method in which creative power has been manifested in the production of species. There are those who believe in the independent creation of each species (Agassiz and others), and some who believe in the evolution of species from lower forms according to a plan (Mivart and others).

The *method* of origin is simply a question for scientific investigation; it has, as we have seen, no legitimate bearing upon natural theology, which rests upon *results*, and not upon *methods*. It is certain that the large majority of the students of nature have seen in its different departments such combinations to produce specific results, such likeness to the works of man—contrivances differing from his only in their grandeur and perfection—that they have believed in a being who has originated by some method all the living things upon the earth. The existence of man is taken as proof of the existence of a being like him in the elements of personality, though infinitely above him in wisdom and power. *I am, therefore God is,* may be regarded as the central proposition in natural theology. If one fails to satisfy himself that this is true, it is useless for him to look farther for more convincing proof of the existence of God. All that the study of external nature can do is to multiply evidences of the wisdom, skill, and goodness of that Creator whose personality is revealed only in the creation of man or in the provisions made for him as a personal being.

It is claimed by students of natural theology that belief in the existence of a personal creator is reached in the study of man and nature through the same processes of thought by which every science has been built up and by which all conclusions of common life are reached. The necessary principles of belief, careful investigation of facts, and sound induction, are all relied upon in proving the existence of a personal creator from the works of nature, as the existence and nature of any cause would be proved from its effect. It is also claimed, as a result, that no scientific process has been more legitimate, and no inference in actual life more in accordance with the common-sense wisdom of the world, than the investigations and conclusions reached in natural theology. It claims a place, therefore, among the sciences, in virtue of the methods by which its conclusions are reached. This claim has been admitted by a large majority of the ablest students of nature and of man.

Objections.—That natural theology, as here defined, has any just claim to scientific rank is utterly denied by a class of philosophers (Positivists), who seek to limit all investigation to observed phenomena, denying or ignoring both efficient and final causes. Others, without denying the propriety of investigating final causes, affirm that we have no evidence of final cause in the works of nature. They regard the adaptation which we see in the natural world simply as the result of materials and forces mutually limited in producing the existing forms. The conclusions of such writers are well expressed in the words of Büchner: "Our reflecting reason is the sole cause of this apparent design, which is nothing but the necessary consequence of the combination of materials and forces." (*Force and Matter*, p. 90.)

History of Opinions.—The history of the race shows that there has been at all times, except among the most degraded tribes, some distinct notion of God or gods, or of some supernatural agents to be feared and worshipped. It is claimed by Sir John Lubbock and others that the most degraded tribes are without any notion of a Supreme Being; and it is asserted that deaf mutes are in the same condition till they are instructed. Granting all the observed facts, the conclusions may be fairly questioned. It does not follow that there is no idea of God present in the mind because it has not forced its way up into language, or because it cannot be detected in our imperfect intercourse with degraded savages and uneducated mutes. (*Cousin.*)

So constantly has the belief in the existence of God prevailed in all ages that it has been claimed by some that the *idea* of God is *innate.* This doctrine, at the present time, is accepted only in this modified form, if at all—that the capabilities of the human mind are such that in its perfect development the idea of a God is surely reached in the study of nature and man.

An *a priori* proof for the existence of God has been accepted by some from the supposed power of the human mind to form a conception of a perfect being. The inference is made from this power of the mind that a being must exist to correspond to the conceptions of it. The *a priori* argument in some of its forms has been accepted and enforced by Descartes, Leibnitz, Dr. Samuel Clarke, and other eminent philosophers. As it involves subtle metaphysical distinctions, it is certainly not fitted to impress the popular mind, and it has failed to satisfy some acute metaphysicians who certainly could not be charged with undue skepticism in regard to such proof.

The *teleological* argument may fairly be made to include the study of nature, and also the study of man as a physical, intellectual, and moral being. It is simple in form, readily apprehended, finds its materials in thousands of forms, and has been illustrated and enforced by thinking men in all ages. Socrates and Cicero are well known among the ancients for their treatment of this subject. The Bible appeals to nature for illustrations of the power and goodness of God. In the New Testament especially we have the testimony of Paul to the fulness and value of this proof (Rom. i. 19, 20). Since the time of Paley, whose name is best known of all those who have entered this field, writers in large numbers have appeared who have written treatises professedly on this subject, or have treated it indirectly in connection with scientific discussions. Some of the ablest arguments have been made in this way, and of late years great additions have been made directly and indirectly to such writings.

Objections.—It has been objected to the argument from design drawn from the natural world that at best it only proves the existence of a worker or world-builder—that it is only in the creation of the mind of man that we have proof of the existence of a personal creator. (Pres. Hopkins and others.) It may be added that the creator of man is not necessarily the self-existent God. But the existence of man's creator proves that there must be a self-existent personal God. After we reach the proof that our creator is a personal being, loving justice and truth, we must wait for him to declare whether he is the Almighty or not—whether he shall swear by himself or one greater. Thus we join natural theology to revelation. Natural theology declares a creator of man, of the heavens, and of the earth. He declares himself to be the *Almighty*, which we know from the laws of belief must exist. We seek for a cause of what we see, and cannot stop till we find one adequate and necessarily eternal.

Tendencies of Present Discussions.—As already intimated, positive philosophy, of which Comte was the father, would render the science of natural theology impossible. Natural theology assumes the existence of efficient causes, and rests for proof upon final causes. Both efficient and final causes positive philosophy forbids us to name as having any relation to science. If they exist, they are to be to us as though they were not.

The doctrine of *evolution*, which in some of its forms is now accepted by many, is supposed by some to weaken or destroy the proof for the existence of a personal creator. But such a result can follow only from denying or ignoring the plainest principles of causality. For one who accepts the doctrine of causation belief in the existence and wisdom of a designer cannot be affected at all by the time required or the secondary agencies employed in producing results. The only question that could arise would be in reference to power. When a certain effect is produced, as the production of a tree or animal with all its complex relations, such an effect demands belief in a cause adequate to produce such a result; and if there is evidence of wisdom and skill in it, the evidence is there, irrespective of the time required or the secondary agencies concerned in its production. The belief that a being of low rank can be raised to a higher rank by any process of development or natural selection without the same agency, in kind, as would be required to produce the being of high rank directly, is belief that an effect can be produced without an adequate cause. Whatever may be the final conclusions of science in regard to the origin of species, they cannot affect the argument for design as revealed in the constitution of species, nor materially change the teachings of natural theology. If any difficulty arises, it will be found in harmonizing the teachings of science with the Bible account of creation, as to the mode in which the creative power was manifested.

Natural Religion.—Natural theology and natural religion are sometimes used as synonymous terms. So far as they differ, natural religion relates to the natural proofs of man's immortality and accountability. It seeks for its proof in the religious instincts and capacities of man, and in the history of the race, as revealing the tendencies and results of conduct. While natural theology proper relates to the existence and character of God, natural religion treats of man's relations to God and duties towards him.

Literature.—The Bible enforces its teachings of God by reference to his works: Ps. xix., civ.; Rom. i. 19, 20. Xenophon's *Memorabilia;* Plato, *Laws*, book x.; Cicero, *De Natura Deorum;* Descartes; Leibnitz; Augustine's *Confessions;* Derham, *Physico-Theology;* Nieuwentyt, *Religious Philosopher;* Dr. Samuel Clarke; Paley, *Natural Theology; Bridgewater Treatises;* Chalmers, *Natural Theology;* Brougham's *Discourse;* Tulloch, *Theism;* McCosh and Dickie, *Typical Forms*, etc.; Hitchcock, *Religion of Geology;* Cooke, *Religion of Chemistry;* Agassiz, *Contributions to Nat. Hist. U. S.*, vol. i.; Dana, *Geology*, ch. "Cosmogony;" Chadbourne, *Natural Theology;* Wiseman, *Connection between Science and Revealed Religion.*

P. A. CHADBOURNE.

Na'ture-Print'ing, a process by which flat objects, like ferns, seaweeds, laces, and embroidery, may be used for preparing a plate for printing without executing any engraving, or even drawing. By one method the object to be represented is pressed with great force between a polished plate of copper and one of lead, leaving an impression upon the leaden plate. A copy of this plate is then taken by electrotype, which is used, like any other electrotype plate, for printing. This process was invented by a gentleman named Auer in Vienna about 1853; an Englishman named Aitkin also claimed the invention; and one Peter Kyle of Copenhagen many years before had described a similar process.

Nau'gatuck, New Haven co., Conn. (see map of Connecticut, ref. 6–D, for location of county), on the Naugatuck River and R. R., 27 miles by rail N. by E. of Bridgeport, has manufactures of rubber goods, farming implements, woollens, etc. UNION CITY, 1 mile to the N., is a part of the same town, and has manufactures of malleable iron-castings and other goods. Pop. of tp. in 1870, 2830; in 1880, 4274.

Naugatuck' River rises in Litchfield co., Conn., flows S., and reaches the Housatonic at Birmingham. It affords great water-power.

Nau'heim, town of Hesse-Darmstadt, Germany, 17 miles N. of Frankfort, is noted for its saline springs, which yield annually more than 17,000 cwts. of salt. Of late the waters have also been used with good effect for bathing and drinking, and a handsome watering establishment has been built. Pop. 2517.

Nau'mann (EMIL), b. at Berlin Sept. 8, 1828; studied music under Mendelssohn, made his début as a composer in 1848 by the oratorio *Christus der Friedensbote*, and was appointed director of church music at Berlin in 1853. Among his other compositions are two operas, *Judith* and *Mühlenhexe.* He wrote several works relating to church music, and *Die Tonkunst in der Culturgeschichte* (1870).

Naumann (JOHANN FRIEDRICH), b. Feb. 14, 1780, at Ziebigk, near Köthen, Germany; was educated at Dessau; studied natural science, especially ornithology; became keeper of the ornithological museum of the duke of Anhalt-Köthen, and d. at Ziebigk Aug. 15, 1857. His *Naturgeschichte der Vögel Deutschlands* (12 vols., Leipsic, 1822–44), for which he prepared the plates himself, is very rich in observations and enjoys a great reputation.

Naumann (KARL FRIEDRICH), b. at Dresden May 30, 1797; was educated at Pforta; studied mineralogy and geology at Freiberg under Werner, afterwards at Leipsic and Jena; travelled in 1821–22 in Norway, and wrote *Beiträge zur Kenntniss Norwegens* (2 vols., Leipsic, 1824); was appointed professor of crystallography at Freiberg in 1826, and removed in 1842, as professor of mineralogy and geognosy, to Leipsic, where he d. in Jan., 1874. His principal works are—*Lehrbuch der Mineralogie* (1828), *Anfangsgründe der Krystallographie* (1841), and *Lehrbuch der Geognosie* (2 vols., 1850–53).

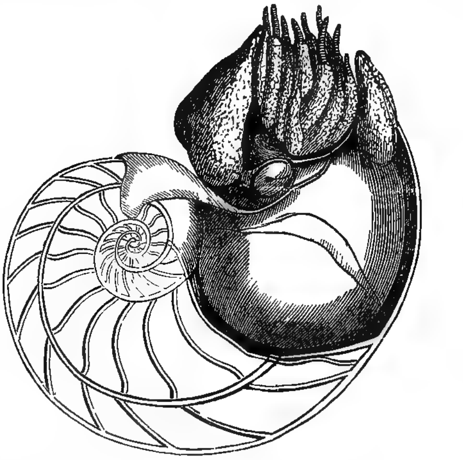
Naum'burg, town of Prussia, province of Saxony, on the Saale, has a fine cathedral, built in 1207, and manufactures of chemicals, champagne, vinegar, tobacco, spirits, linen, and woollen goods. Pop. 15,120.

Nau'plia, or **Napoli di Romania** [so named from its being accessible to ships—*ἀπὸ τοῦ ταῖς ναυσὶ προσπλεῖσϑαι* —*Strabo*, viii. 6, 2], a Peloponnesian city, near the head of the Argolic Gulf. At first it was independent of Argos (6 miles distant), then its port, and in the time of Pausanias (173 A. D.) was deserted (*Itinerary* of Pausanias, ii. 38, 2). Under the Byzantine emperors it revived, and was a place of great importance during the Middle Ages. It was taken by the Turks in 1460, by the Venetians in 1686, and by the Turks again in 1715. It was captured by the Greeks Dec. 12, 1822, and made after a while the capital of their new kingdom till Dec., 1834. Since then its population has declined from 12,000 to 4598 (in 1879). Its splendid harbor is defended by the two citadels of Palamidhi, 720 feet above the city, and Itskali, at the water's edge, making Nauplia the Gibraltar of Greece. (See Leake's *Morea*, ii. 356–363.)

R. D. HITCHCOCK.

Nautical Almanac. See EPHEMERIS, by PROF. J. H. C. COFFIN, LL.D.

Nautil'idæ [from the name of the genus *Nautilus*], the only family represented by existing species of the class of cephalopod mollusks of the order Tetrabranchiata. As limited by some authors (*e. g.* Meek), it includes species whose shell is generally curved and more or less involute upon itself (but often with the whorls free and sometimes spiral), with the outer chamber very large, and the aperture with its outer margin sinuous; the septa are simple, or at most provided with a few simple lateral lobes or flexures, and are convex backward towards the middle; the siphon is variable in position between the dorsal and ventral surfaces, but in the typical forms is nearly central, and is occasionally in some older extinct groups occupied by an internal organic deposit; there are two well-developed shell-layers, and a third incompletely developed one near the aperture. The animal has a mantle with an entire margin which extends about even with the border of the aperture; it also has (1) a circular fleshy lip; (2) numerous labial tentacles combined in four groups, each group having twelve or thirteen; and (3) still further outward are the "arms" or brachial tentacles, about thirty-six in number, and in two rows; of these last, the dorsal pair are extended and combined in a "hood," "which closes the aperture of the shell, except for a small space on each side, which is flat, by a pair of arms. The tentacles are lamellated on their inner surface, and are retractile within sheaths or digitations which correspond to the eight ordinary arms of the cuttle-fishes;" "besides these, there are four ocular tentacles, one behind and one in front of each eye," which seem to be instruments of sensation, and resemble the tentacles of some nudibranchiate mollusks (*e. g. Eolis* and *Aplysia*). On the side of each eye is a hollow oblique process which is not tentaculiferous, and which bears the external ears. The mandibles are to a considerable extent calcified, thus differing from those of the cuttle-fishes. "The shell-muscles are united by a narrow tract across the hollow occupied by the involute spire of the shell, and are thus rendered horseshoe shaped. The siphuncle is vascular; it opens into the cavity containing the heart (pericardium), and is most probably filled with fluid from that cavity." Such are the principal



Section of a Nautilus, showing its interior.

characteristics of the animal, as made known by Prof. Owen and epitomized by Mr. Woodward.

The family is at present represented by a single genus, *Nautilus*, containing several living species, but was formerly developed in numerous types, and has survived from the Silurian epoch to the present time, and, as here understood, embraces fewer genera than often are credited to it, but still has a large number. By Meek the following genera are recognized—viz. *Nautilus*, *Discitus*, *Trematodiscus*, *Temnocheilus*, *Northoceras*, *Pteronautilus*, *Litnites ?*, *Hortolus ?*, *Crytoceras*, *Clymenia*, *Subclymenia*, *Aganides* (= *Aturia*), *Nautiloceras*, *Aploceras*, and *Trochoceras*. Little is known of the habits of *Nautilus*. According to Rumphius (who wrote in 1705), "When the nautilus floats on the water he puts out his head and all his tentacles, and spreads them upon the water, with the poop of the shell above water; but at the bottom he creeps in the reverse position, with his boat above him, and with his head and tentacles above the ground, making a tolerably quick progress." Owen found the crop of a specimen dissected by himself filled with fragments of small crabs. Although the shells of one species (*N. pompilus*) are very common, the animals themselves are very rarely seen. THEO. GILL.

Nautilus Propeller, a system of propelling steam-vessels at sea by means of the expulsion of strong currents of water backward. Many of the lower animals move about in the water in this way. Several steamers for river and ocean use have been successfully built on this principle. A turbine-wheel revolves in an iron cylinder for the purpose of creating the jet which propels the ship. This mode of propulsion has not proved economical or efficient.

Nauvoo, Hancock co., Ill. (see map of Illinois, ref. 5–B, for location of county), situated on the E. bank of the Mississippi River, was founded by the Mormons in 1840, and afterward became the home of a company of French Socialists, under M. Cabet. Its principal business is the growing of grapes. About 100,000 gallons of wine are produced here annually. Pop. of tp. in 1870, 1578; in 1880, 1402.

Nav'ajo Indians, a tribe of the great Shoshone and Apache family. They occupy a reservation of 5,468,160 acres in the N. W. of New Mexico and the N. E. of Arizona. They were long famous for their hostility to the whites, but have now been thoroughly subjected by the U. S. troops. They are industrious, and have adopted some of the arts of half-civilized life from the Pueblo Indians. They numbered 17,200 in 1884, and had 1,000,000 sheep and goats and 35,000 horses. They are celebrated for the manufacture of "Navajo blankets," which are wonderfully warm, durable, and of such excellence as to sell for $50, or even $100.

Na'val Acad'emies. *France.*—Special instruction in the art of war as applied to navies originated in France about the year 1630, and in England about 100 years later. In France the invention of hollow projectiles by Bernard Reynaud (about 1680), and by him first put to practical use at the bombardment of Algiers in 1684, gave a fresh impulse to the cultivation of naval science, and led to the uniform organization of all the schools for naval instruction at that time established in the kingdom. Various decrees under the monarchy, the republic, and the empire improved the existing systems, until their final reorganization in 1825 upon the basis which, with very little modification, exists at the present time. In forty French ports free schools of hydrography are open to sailors of the mercantile marine, in which an annual average of about 400 men are qualified as captains and sub-officers of seagoing or coasting vessels. In 1810 the schools for naval officers were established on shipboard at the ports of Brest and Toulon, and after various modifications—among others, the substitution of a royal marine college at Angoulême in 1816—were finally united in 1827 on board the Orion at Brest. The present school-ship is the Borda, 120 guns, launched in 1847. Admission is gained to this school by a public competitive examination which is held annually. The personal qualifications are French nativity, age between fourteen and seventeen, and good bodily constitution. The mental qualifications comprise a knowledge of arithmetic, algebra, geometry, plane trigonometry, natural philosophy, chemistry, and drawing. Exercises are required in the French and English languages, a translation from the Latin, a geometrical drawing, and a free-hand drawing from a head. The course of instruction consists of navigation and astronomy, analytical and mechanical science, natural philosophy and chemistry, theory and practice of steam-engines and mechanical engineering, naval architecture, seamanship, gunnery, drawing, and the English language. These are supplemented by constant exercises with boats and other material, and an annual seagoing cruise. After two years spent at this school those who are found qualified at the annual examination are transferred to the steam-frigate Flore for a year, when they are considered eligible for active naval service. The School of Naval Architecture (formerly in Paris, transferred to Cherbourg in 1872) is under the management of the corps of marine engineers, which corps has charge of the construction of all ships and engines in the service. It is composed of 1 inspector-general, 11 directors of naval construction, 40 marine engineers, and 73 assistant engineers. Graduates of the Polytechnic School, to the number of about 15 annually, are assigned to the School of Naval Architecture, where they remain two years, spending about eight months each year in theoretical instruction, and the rest of the year in studies in the dockyard at Cherbourg (first year) and in the national works at Indret (second year). The school is commanded by a director of naval construction, who gives instruction, assisted by other members of the corps and special teachers of drawing and languages. The course of instruction consists of—first winter: (1) a course on construction; (2) displacement and stability; (3) strength of materials; (4) marine architectural drawing and freehand drawing. Second winter: (1) a practical course on steam-engines; (2) a theoretical course on steam; (3) applied mechanics and mechanics in general; (4) plan-drawing of ships and engines and free-hand drawing. Third winter: (1) displacement and stability (concluded); (2) naval architecture and naval artillery; (3) technology of workshops; (4) plan-drawing, projects, and designs for ships and engines, and free-hand drawing. At the end of the course an examination is held, and those found qualified are promoted to the corps of marine engineers as assistant engineers of the third class. There are at Brest and at Toulon schools of marine artillery and schools of practice for firing at targets, with guns both afloat and on land. A school for machinists was founded in 1860 at Brest and Toulon. The schools were reorganized in 1862, and in 1881 were united in one greatly improved school at Toulon. A torpedo school was established in 1869 at Bayardville, in the island of Oléron, and reorganized in 1876.

England.—The Royal Naval Academy was established at Portsmouth in 1729. Its course of instruction comprised, besides the elements of a general education, mathematics, navigation, drawing, fortification, gunnery and small-arms, principles of shipbuilding, and practical seamanship in all its branches. The number of cadets was at first limited to 40, but in 1806 it was increased to 70. The academy was abolished in 1837, for in the mean time the old system of admitting midshipmen to the navy still obtained. This was under the patronage of the captains of ships, who had the nomination of an almost indefinite number of young gentlemen, who were received on board without any conditions of previous preparation, and left to their own resources and those of the ship to acquire a knowledge of their profession under the general supervision of the captains. This short and easy method of entering the service was soon changed. The captains were permitted to make only one nomination, the admiralty reserving the rest. The defects of the method, even thus modified, led finally in 1857 to the adoption of a training-ship, first at Portsmouth and afterward at Dartmouth, on board the Britannia. The course of study is limited to two years on board the Britannia and one year's service at sea: the examinations are held twice a year, and if passed satisfactorily at the end of the course, the candidate is rated a midshipman, and is credited with one year's sea-service. To qualify a midshipman for promotion to a sub-lieutenancy he must be nineteen years old, must have passed the half-yearly examinations to which he is submitted during four and a half years' service as midshipman, and must have served five and a half years as a midshipman.

The Royal Naval College was opened in 1839 as a school of gunnery, jointly with a school of gunnery-practice on board the Excellent for the instruction of commissioned officers. It supplied instruction in the theory of artillery, in mathematics, nautical astronomy, steam machinery, and in chemistry. The time allowed at the college was one year. Upon the introduction of steam into the navy officers voluntarily resorted to the dockyards, where instruction and facilities for experiment and study were supplied, as well as opportunities for working in the machine-shops. Most of the officers now in service have certificates of having passed this course. By an order of council dated Jan. 16, 1873, the Royal Naval College at Greenwich is reorganized, to open Feb. 1, 1874, for the instruction of officers of all branches of the naval service, including captains and excluding midshipmen. Full courses are provided in mathematics, mechanics, navigation and astronomy, marine engineering and artillery, naval architecture, drawing, and languages. The time allowed to each grade for study varies, according to the difficulty and importance of the branch studied, from six months to eighteen months. The schools of engineers and of naval architecture at

South Kensington are transferred to this college. A school of gunnery and torpedo-instruction is established at Portsmouth, on board the Excellent and the Vernon. Schools for warrant-officers, seamen, and boys are provided—(1) On all ships having a crew of 300 men, a permanent schoolmaster being generally appointed for the ship; in case the crew is less than 300 men, a petty officer of the ship gives instruction. (2) In schools on harbor-ships; four ships are specially devoted to this purpose—two at Portsmouth and two at Plymouth; boys remain in these ships one year. (3) In four schools in the barracks at Woolwich, Chatham, Portsmouth, and Plymouth, where the royal marines (artillery and infantry) are instructed, as also their children. (4) In schools for apprentices at seven dockyards—viz. Deptford, Woolwich, Chatham, Sheerness, Portsmouth, Devenport, and Pembroke; these last were established in 1840. Admission is gained by competition, and the duration of the course was five years, but in 1859 a supplementary and higher course of two years was added. (5) In the London and Liverpool schools of navigation, supported by the government for the instruction of the commercial marine. The number of training-ships for boys has been gradually increased to twelve, including those for harbor instruction and for practice cruising.

The governments of Austria, Russia, Bavaria, and Italy have establishments for education in naval science, and at St. Petersburg the Russian government has a very large naval academy. The course of instruction in all these resembles closely those already described.

United States.—From the first organization of the navy of the U. S. the system of appointing and training its junior officers was copied from the English navy. Lads of about fourteen years of age were appointed midshipmen and sent to sea in charge of the captains. In 1813 a law was passed authorizing the employment of a schoolmaster for each ship in which there were twelve midshipmen. The establishment of a school for naval science had in 1800 been as strongly urged by the executive department of the government as that of a military school. The latter was created in 1802; the naval school was not founded until 1845. For some years prior to that period midshipmen, at such times as they could be released temporarily from sea-service, prepared themselves for examination, and were examined for promotion at the Naval Asylum in Philadelphia. On Aug. 7, 1845, Mr. George Bancroft, secretary of the navy under Pres. James K. Polk, issued the first instructions to Commander Buchanan for the opening of the school. The war department had already transferred for that purpose the site and buildings of Fort Severn, one of the defences of Annapolis harbor, at the mouth of Severn River, in the State of Maryland. The school was formally opened on Oct. 10, 1845. The first object proposed was "to collect the midshipmen who from time to time are on shore, and give them occupation during their stay on land in the study of mathematics, nautical astronomy, theory of morals, international law, gunnery, the use of steam, the Spanish and French languages, and other branches essential in the present day to the accomplishment of a naval officer." In Jan., 1846, there were present 36 midshipmen appointed in 1840, 13 of the date of 1841, and 7 newly appointed. The latter were to remain at the school at least one year; those of 1840 and 1841 were to be drafted as required for sea-service. The instruction corps consisted of 8 persons. The buildings were found to be sufficient for the purposes of instruction, quarters, and mess. Mr. Bancroft had thus far proceeded under already existing regulations, and with such funds as were legally applicable, without calling upon Congress. The first appropriation ($28,200) was made in Aug., 1846, and a like amount was appropriated in 1847, and in December of that year the number of midshipmen in attendance was 90. In Oct., 1849, a board of officers was convened to reorganize the institution, and to make it conform as nearly as possible to the system pursued at the United States Military Academy at West Point. The course of instruction and the regulations were revised, and the title of the institution was changed from Naval School to United States Naval Academy. The duration of the course of study was fixed at *four years* in Nov., 1851. The corps of instructors was increased to 11, and the sloop-of-war Preble was assigned to the academy as a practice-ship and for the purpose of summer cruising for three and a half months each year. A board of visitors was provided for, who would inspect the academy annually and report upon its condition. Upon the breaking out of the civil war Annapolis became an important military dépôt, and on May 6, 1861, the academy, with all its apparatus and personnel, was transferred to Newport, R. I., where it remained until Sept., 1865. During this period the exigencies of a state of war interfered greatly with the system of graduation, the senior three of the four classes being sent to sea on active service. After the return to Annapolis in Sept., 1865, the programme of studies at the academy was rearranged upon the basis which, with very little modification, exists at present (1885). The course of instruction embraces the following departments: Seamanship, mathematics, gunnery, steam-engineering, astronomy, navigation and nautical surveying, natural and experimental philosophy, including analytical mechanics and chemistry, law, history, and English studies, French and Spanish languages and literature, drawing, art of defence, swimming, and gymnastics. In 1866 two classes of cadet engineers, not to exceed 50 in the aggregate, were added to the body of pupils at the Naval Academy. The duration of their course was until June 1, 1868, two years. By act of Congress approved Feb. 24, 1874, their course was lengthened to four years and the number of classes increased to four. The studies consisted of mathematics, analytical mechanics, theory and practice of steam-engineering, chemistry and physics, the French language, drawing, designing of engines, and practice in the workshops. During the summer months the engineer classes visited the government workshops at the navy-yards. The academic year begins on Oct. 1, and ends May 30 of each calendar year. The summer months are employed in cruising at sea. The year is divided into two academic terms, the first term extending from Oct. 1 to Jan. 30. Each of the classes is divided into a convenient number of sections of 9 to 12 members, and no student is required to attend more than three recitations during the day; so that, besides the evening study-hours, one hour of each period (except drawing) may be devoted to study.

On Mar. 3, 1873, Congress passed a law changing the duration of the course for cadet midshipmen from four years to six years, to apply to the class admitted in 1873 and to all subsequent classes. The additional two years are passed at sea, and at the end of this time the cadets appear before the academic board for final graduation. The system of examinations comprises *monthly, semi-annual*, and *annual* examinations, all of which are conducted *in writing*, the same questions being proposed to each individual of a class of examinees. The relative merit determined by each monthly examination is combined with that denoted by the class-room daily record, and the monthly relative merits of a term are combined to form a term-record, which latter are again combined to form the annual record. Candidates for the classes of cadet midshipmen are nominated by the members of the House of Representatives in Congress (each member being entitled by law to one nomination), and are admitted to the academy between the ages of fourteen and eighteen years, provided they exhibit a good moral standing and sound physical condition. They must also pass a satisfactory examination in algebra, arithmetic, English grammar, U. S. history, geography, reading, writing, and spelling. The examinations of candidates for the classes of cadet engineers were competitive. By an act of Congress approved Aug. 5, 1882, the appointment of cadet engineers ceased, and all undergraduates at the Naval Academy were designated "naval cadets." It was also provided that vacancies in the lower grades of the engineer and marine corps should be filled from those who successfully complete the six years' course at the academy.

On June 1, 1884, the personnel of the academy was as follows: commanding officer and staff, including medical and pay staff and chaplain, 11; instruction staff proper, 62; civil officers, such as secretary, librarian, clerks, etc., 8; officers of the marine corps, 3: total staff of the academy, 76. Number of naval cadets, 196. The list of successive superintendents is as follows: (1) Commander Franklin Buchanan, 1845–47; (2) Commander George P. Upshur, 1847–50; (3) Captain C. K. Stribling, 1850–53; (4) Captain L. M. Goldsborough, 1853–57; (5) Commodore George S. Blake, 1857–65; (6) Vice-Admiral D. D. Porter, 1865–69; (7) Rear-Admiral John L. Worden, 1869–74. In Oct., 1874, Admiral Worden was succeeded by Rear-Admiral C. R. P. Rodgers as the 8th supt.; July 1, 1878, Com. Foxhall A. Parker became 9th supt.; Aug. 2, 1879, Rear-Admiral G. P. Balch; June 13, 1881, Rear-Admiral C. R. P. Rodgers; Nov. 14, 1881, Capt. F. M. Ramsay.

The departments of study are amply illustrated by models and apparatus. The seamanship museum exhibits the rise of naval art and its progress up to the present time, and is very rich in models, the latest one being a fully-equipped model 45 feet long of the second-rate war-steamer Antietam. In the gunnery department every form of great guns and small-arms is displayed. In the department of steam engineering every kind of marine engine is illustrated in detail and by working-models; besides which there is a complete marine engine, with two boilers—one for getting up steam, and a similar one for instruction in detail. This department has also a complete workshop, foundry, and forge, all well supplied with apparatus and tools. The departments of philosophy and chemistry are furnished with the newest apparatus and materials for illustration and analytical study. The observatory contains a large collection of instruments, including an equatorial telescope. The library contains nearly 20,000 volumes, chiefly historical, scientific, and professional. The U. S. wooden sailing-vessels Santee and Dale, the iron-clad Nantucket, and the steam sloop Wyoming, are stationed permanently at the academy for the purposes of instruction during the two academic terms in great guns and in sails, spars, etc. The ship Constellation is commissioned for the summer cruise of the first, third, and fourth classes of the cadets. The second class is quartered on board the Santee for practical instruction until Aug. 30. All the classes are permitted to visit their homes during the month of September.

By an act of Congress approved June 20, 1874, the U. S. government took a very important step towards encouraging popular nautical education. By this law the secretary of the navy is authorized to furnish a suitable vessel of the navy, completely equipped with charts, books, and instruments, to be used for the benefit of any nautical school established at each or any of the ports of Boston, New York, Philadelphia, Baltimore, Norfolk, and San Francisco. The President is also authorized to detail proper officers of the navy as superintendents of, or instructors in, such schools. R. S. SMITH. REVISED BY W. T. BURWELL.

Na'val Administra'tion. The navy department, one of the executive branches of the Federal government, has for its head or chief a civil officer called the secretary of the navy, who receives his appointment from the President, by and with the advice and consent of the Senate, and is a member of the President's cabinet. His salary is $8000 per annum, without allowances of any description. As the President is, under the Constitution, the commander-in-chief of the army and navy of the U. S., the secretary of the navy is in reality his representative in the navy department. He may be called the organ of the President for the business of the government pertaining to that department and to the navy, and, with the exception of cases in which independent powers are specially invested in him by law, his acts are with the authority of the President, are regarded as having his direction and sanction, and have full force and effect as such. In matters of great moment it is not unusual for the President to give special instructions for the secretary's guidance, or for the latter to consult the former and ascertain his views or wishes.

As a separate and independent branch of the government, the navy department was established by an act of Congress approved Apr. 30, 1798. Prior to that time the administration and management of naval and maritime affairs were entrusted to committees, agents, and boards constituted and appointed under resolutions and acts of both the Continental and the Federal Congress, and for nearly ten years to the secretary of war. The protection of the colonies against acts of Great Britain suggested and prompted the first legislation towards the formation of a navy or the creation of a navy department. This provision for naval defence was the passage of a resolution on Oct. 13, 1775, directing the appointment of a committee of three prominent members of the Continental Congress, with authority to fit out two sailing vessels. This committee was on the 30th of the same month increased to seven members, and the number of vessels to four. The next legislation, a resolution of Nov. 10, 1775, directed two battalions of marines to be raised, to be composed of good seamen or persons so acquainted with maritime affairs as to be able to serve to advantage by sea when required, and to continue in service, unless sooner dismissed by order of Congress, during the war between Great Britain and the colonies. About the same time provision was made respecting the seizure and disposition of vessels, men, and materials belonging to Great Britain that should be captured by cruisers operating under commissions from Congress, and rules and orders for the navy of the United Colonies were agreed on. On Dec. 11, 1775, a committee was appointed, composed of one member for each colony, to devise ways and means to furnish the colonies with a naval armament, and to report with all convenient speed. On the report of this committee thirteen vessels were ordered to be equipped at a cost of $866,666⅔. Mar. 23, 1776, still further measures for naval defence were enacted, which authorized the inhabitants of the colonies to fit out armed vessels to cruise on the enemies thereof. Apr. 3, following, resolutions were passed to send to the general assemblies of the colonies blank commissions for private ships of war and letters of marque and reprisal, signed by the president of Congress, to be filled out for those desiring them. By this time or soon after a number of officers of high rank had been appointed, the pay, rank, etc. of the officers of the navy and marine corps had been fixed, also the pay of seamen, bounty for captures, etc., and about twenty-five vessels of different classes were in the course of construction. From these several measures chiefly sprang the navy and private armed vessels which were engaged in the war of the Revolution.

The boards, etc. afterwards successively appointed and established until the organization of a navy department were—I. Nov. 6, 1776, Continental navy board of three persons, to be subordinate to the marine committee of Dec. 11, 1775. II. Oct. 28, 1779, a board of admiralty, to superintend the naval and marine affairs of the U. S., to consist of three commissioners not members of Congress, and two that were. III. Feb. 7, 1781, creating a secretary of marine to execute all the duties and powers specified in the act of Congress constituting the board of admiralty. IV. Aug. 29, 1781, the appointment of an agent of marine, with authority to direct, fit out, equip, and employ the ships and vessels belonging to the U. S., according to such instructions as he should from time to time receive from Congress. Until this agent was appointed the duties assigned to him were devolved upon the superintendent of finance. V. Aug. 7, 1789, the establishment of the department of war, to the secretary of which was entrusted, in addition to the matters pertaining to military affairs, all those respecting naval affairs.

The subject of establishing a navy department and creating a sufficient naval force to protect an active external commerce was repeatedly brought to the attention of Congress about this time. Washington in his annual message (1796) urged that the U. S. should take means and set about the gradual creation of a navy. The elder Adams, a warm advocate of the navy, in a special message to Congress May 16, 1797, strongly recommended naval means of defence against depredations on American commerce, and urged the necessity of equipping the frigates and providing vessels of inferior power. The importance of a separate department and more particular attention to naval interests was recognized in the act of Apr. 30, 1798, establishing an executive department, to be denominated the department of the navy, the chief officer thereof to be called the secretary of the navy, whose duty it should be to execute such orders as he should receive from the President of the U. S. relative to the procurement of naval stores and materials, and the construction, armament, and equipment of vessels of war, as well as other matters connected with the naval establishment of the U. S. It is from this act, through the President, that the general powers of the secretary of the navy are derived. An act of Feb. 7, 1815, added to the navy department a board of commissioners, to be appointed by and with the consent of the Senate, of three officers of the navy not below the rank of post-captain, to be attached to the office of the secretary, and, under his superintendence, to discharge all the ministerial duties of said office relative to the procurement of naval stores and materials and the construction, armament, equipment, and employment of vessels of war, as well as all other matters connected with the naval establishment of the U. S. The act also gave the board authority to prepare rules and regulations so as to secure uniformity in the several classes of vessels and their equipments and in repairing and refitting them, and responsibility in subordinate officers and agents. It also furnished estimates of expenditures. Aug. 31, 1842, the act creating the board of navy commissioners was repealed, and the navy department was reorganized by the establishing of, and attaching to it, five bureaus—viz.—yards and docks; construction, equipment, and repair; provisions and clothing; ordnance and hydrography; and medicine and surgery. The chiefs thereof, appointed by and with the advice and consent of the Senate, were selected, as the law prescribed, from captains for yards and docks and ordnance and hydrography; from the surgeons for medicine and surgery; a skilful constructor for construction, equipment, and repair; while for provisions and clothing no official designation was made. A regular naval constructor was not appointed to the bureau of construction, etc. until the passage of an act providing for it, Mar. 3, 1853. By an act of July 31, 1861, an additional office was created, that of assistant secretary of the navy, the appointment to be made by and with the advice and consent of the Senate, and the duties to be such as the secretary, for whom he should act during his absence, should prescribe. This office was abolished on Mar. 3, 1869. July 5, 1862, the department was again reorganized by creating three additional bureaus and changing the titles of others. That organization is now maintained, the bureaus being yards and docks, equipment and recruiting, navigation, ordnance, construction and repair, steam engineering, provisions and clothing, and medicine and surgery—the new bureaus of equipment and recruiting, navigation, and steam engineering assuming such of the duties pertaining to their respective branches as were formerly under other bureaus. The chiefs of these bureaus are commissioned, by and with the advice and consent of the Senate, for four years, and receive the highest pay of their grades in the navy. For yards and docks, navigation, equipment and recruiting, and ordnance the selection must be from officers of the line not below the grade of commander; for medicine and surgery, from the list of surgeons; and for provisions and clothing, from the list of paymasters of not less than ten years' standing; for construction and repair a skilful naval constructor must be selected, and for steam engineering a skilful engineer from the list of chief engineers. This act provides for an assistant to the bureau of medicine and surgery, and also provided for an assistant to the bureau of ordnance, which latter office was, however, abolished Apr. 17, 1866. An act of Mar. 2, 1865, created an additional office, that of solicitor and judge-advocate-general. June 22, 1870, the office was transferred, under the title of naval solicitor, to the department of justice; a few years afterward it was abolished. June 8, 1880, an act was passed authorizing the appointment of a judge-advocate-general of the navy, by and with the advice and consent of the Senate, from officers of the marine corps or the navy. The judge-advocate-general has charge, especially, of matters relating to courts-martial, and assists the secretary in various ways and in other matters coming before the department; he is to a great extent his law-officer. If appointed from the marine corps, he has the rank and pay of a colonel; if from the navy, that of captain.

The duties of the office of the secretary of the navy are performed under his immediate supervision. There is attached to the office a chief clerk of the department. The chief clerk has the care and custody of the files and records of the office and the general supervision of the duties of the other clerks and the subordinate employés thereto attached. JOHN W. HOGG.

Na'val Architect'ure. The present century will always be distinguished in history for the successful application of philosophical knowledge and the exact sciences to mechanical arts, and for the great benefits that have resulted to all civilized nations therefrom. At the present day a rapid development of new resources is going on in all directions, and the forces of nature are being brought more under man's control, and made available according as the increase of scientific knowledge renders their plan of action and character better known. In the art of naval construction there seems to have been no less advance than in any other, which is due principally to the growth of enlightened ideas and the successful application of abstract science. At the present day nothing will compensate the naval architect for the want of a sound and accurate knowledge of mechanics, and without such knowledge he will only be able to imitate vessels that have had or are in being, more or less approved; and if he attempt to depart from them, he runs a great risk of falling into great, perhaps fatal, errors. Construction by the rule of thumb is nothing more than the adoption of some approved plan with perhaps some slight modification; and while those who resort to this may be, and generally are, on the safe side, and generally obtain very satisfactory results, they add nothing to professional science; and if this course is adhered to, and improvements are not accepted on account of constructors being unable to judge of their merits, the practice of naval construction must come to a standstill; and the nation which allows this state of things to exist must expect to see her ships surpassed by those of others where science is in more request and the highest standard of professional and scientific requirements is required in their naval architect. It is the height of folly to think of building a vessel, especially a war-vessel, without a previous and thorough calculation of her requirements in every respect. During the past sixty years improvements of unparalleled importance and magnitude have been made in the construction of vessels of war, and at the present day naval architects are able to bring to bear the great resources that have grown out of the discoveries that have been made in all branches of science to which the profession is united. It is asserted by Prof. Inman, whose authority none disputes, that "at the commencement of the present century there was hardly an individual in England who knew correctly even the first elements of the displacement of a ship, either loaded or light." What has the world witnessed since then? The sailing qualities of vessels greatly improved; steam applied as a motive or auxiliary power to ships of war and merchant vessels; the old sailing vessels of the navies of the civilized world ignored and steam navies constructed; and, finally, the production of the iron-clad vessels of our own and foreign navies.

A ship must have buoyancy, to enable her to carry the weight intended when immersed to the required depth in the water; stability, that she may tend to "right herself" when inclined from the upright position by some disturbing influence, deviating no farther from that position than is consistent with safety, and that her movements may not be such as to damage the vessel or cargo; speed sufficient to meet the requirements of the owner or owners and the purpose for which she is designed; and, finally, be able to work well under steam or sail. These qualities are mainly dependent on forces that are exerted between the ship and the surrounding fluids—*i. e.* water and air; consequently, the means of obtaining them depend mainly on the principles of "hydrostatics," or the balance of fluids, and hydrodynamics, or the motion of fluids, the applications of which are known by the term "hydraulics." One of the elementary laws of hydrostatics is that no matter what the shape of a body floating *in equilibrio* in a fluid, the weight of the fluid displaced is equal to the weight of the body, and the straight line joining the centres of gravity of the body and fluid displaced is vertical. The quantity of water displaced by a ship is called her *displacement,* and is expressed as being so many tons, a ton being the weight of 35 cubic feet of sea-water or 35.9 cubic feet of fresh water. To find the weight of a vessel by computing the parts comprising it would be a task of great magnitude, but after the vessel is launched, since it is known that her weight is equal to that of the water she displaces, we have only to find the cubic contents of the part immersed, multiply it by a unit of volume of water, and the product is the weight of the ship. It is always possible to find a single point in any body in which the weight or pressure is concentrated: in the case of a body's weight, it is called the *centre of gravity;* in case of pressure, *centre of pressure;* and when the pressure is that of a fluid in which a solid body rests, *centre of buoyancy,* generally known as the *centre of gravity of displacement.*

Next to the determination of the displacement, and the securing that the ship shall float with the proposed draught of water fore and aft, the most important point is the determination of the stability—*i. e.* the measure of the force which tends to bring the vessel back to the upright position when by any cause it has been inclined from that position. Stability is of two kinds—*statical* and *dynamical.* The former measures the force necessary to retain the ship inclined at some finite angle—as, for instance, 7°—or that with which, on any slight displacement, it tends to regain its upright position. Dynamical stability is measured by the number of units of work which are requisite to heel a ship over through a given angle. If, therefore, the work capable of being developed by a sudden gust of wind or blow of a wave, or any cause, be known, it is proposed by dynamical stability to determine the angle through which the vessel will be inclined; and the point in construction would be to determine that in heeling through this angle it does not reach a new position of equilibrium, which would be one of instability, and consequently does not overset. For sailing vessels statical stability is beyond a doubt the most important element, as the chief qualities of the vessel depend on it.

The disturbances in a ship's position called *heeling, pitching,* and *sending* are all disturbances of angular position, and the ship's stability, as opposed to them, depends on similar principles. Stability against heeling is explained as follows: In order that a pair of forces applied to one body may balance each other, they must be equal and opposite to each other, but directly opposed—that is, they must act against each other in the *same* straight line. When a pair of equal forces act in opposite directions in *parallel* though not identical lines, they do not balance each other, but constitute what is called a *couple,* tending to turn the body in a new angular position. When the angular position of such a body as a ship is disturbed, the weight and the supporting pressure, which originally were a pair of directly opposed equal forces, producing balance, become a couple, and the body is stable or unstable according as that couple is a *righting couple* or an *upsetting couple.* Take two blocks having a rounded base, and rest them on a level surface. By placing either of these blocks so that the upward pressure of the surface they rest on, exerted against the point of support, may act in a line passing through the centre of gravity of the block, they may be balanced. If a block with a narrow and sharp curved base is disturbed, the weight, acting through the centre of gravity, and the pressure exerted at the point of support, will form an *upsetting couple,* and make it fall down on its side. If a broader one is disturbed, the weight, acting through the centre of gravity, and the pressure at the point of support, form a *righting couple,* and the block will return to its position of balance. The stability of a ship may be compared to the last illustration.

The stability of a floating body is regarded by some persons as like that of the common pendulum, in which the centre of gravity hangs below the point of support.

As the pendulum swings, the force of gravity, acting vertically downward through the centre of gravity, always tends to make it return to its position of equilibrium. If this were correct, the point of suspension would be represented by the centre of buoyancy, and the centre of gravity of the ship would of course correspond to the centre of gravity of the pendulum. According to this view, the condition of stable equilibrium for every ship would be that her centre of gravity should be below her centre of buoyancy, and the degree of her stability would be in exact proportion to the distance below the centre of buoyancy at which her centre of gravity is situated. To show the incorrectness of this view it is only necessary to point out that no ship in the navy, whether modern iron-clad or old wooden ship, can ever have had her centre of gravity below her centre of buoyancy. The centre of gravity of the unarmored line-of-battle-ship Conqueror was 9 feet above her centre of buoyancy, and by no practicable arrangement could the centre of gravity of a ship of this class be brought below her centre of buoyancy. The armor-plated ship Prince Consort, whose stability is considered to be in excess, has her centre of gravity 8 feet above the centre of buoyancy. The Warrior, the first of the iron-clads, had her centre of gravity 8 feet above the centre of buoyancy. In no one of these cases would it be practicable to bring the centre of gravity below the centre of buoyancy. It is therefore quite clear that the stability of a ship does not depend upon the centre of gravity being below the centre of buoyancy.

There is another erroneous notion, as to the height of the centre of gravity in the iron-clads being excessive, and making it difficult, if not impossible, to give them as much stability as might be desired. This will be seen to be an error when it is remembered that the old line-of-battle-ships were higher by many feet than the modern iron-clads. The iron-clad carries her armor in lieu of the upper decks, with their guns, etc., which were carried by the old wooden three-decker and two-decker; and the armor is lower than the top-weights of the old-fashioned ships, for which, in this sense, it is a substitute. For instance, the Howe had her spar-deck 27 feet above the water. The spar-deck of the Hercules iron-clad is about 18 feet above the water. For this reason we should expect to find the centre of gravity of the Howe higher than that of the Hercules. We do not know the precise position of the centre of gravity of the Howe, but the centre of gravity of the Conqueror was found by experiment to be about 10 inches below the water. In the following iron-clads the centre of gravity is considerably more below the water, as shown against their names:

Warrior	2.285	feet below.	Hercules	1.367	feet below.
Prince Consort	2.15	" "	Bellerophon	2.03	" "
Captain	2.92	" "	Minotaur	1.99	" "

It is quite plain, therefore, that the absolute height of the centre of gravity in the iron-clads can cause no difficulty in the way of giving them sufficient stability. But, further, if the centre of gravity had been higher in the modern ships, there would be no difficulty in giving them the requisite stability (with the usual freeboard), beyond the difficulty there may be in the way of increasing the breadth. The Bermuda dock, when floating without water in its compartments, has its centre of gravity 20 to 30 feet above the water, yet it is by its great breadth made amply stable to carry a ship of the largest size quite up out of the water.

A few illustrations will now be given, independently of the preceding, to indicate the nature of stability, and show how it is secured in ships in which the centre of gravity is always above the centre of buoyancy, which is the point of support. Many find it difficult to understand how this arrangement can exist between the centre of buoyancy and the centre of gravity, because they think only of the pendulum, in which the point of support is a fixed point; in which case, of course, if the centre of gravity is placed above the point of support, the result is a position of instability. The centre of buoyancy is, however, not a fixed point, but it moves from side to side as the ship rolls, in a manner which is governed by her form and dimensions. The case is something like that of a man balancing a pole. The pole can be kept in the upright position if, when the centre of gravity receives any motion, the point of support is dodged beyond in the same direction. A very simple illustration is found in the case of a circular cylinder floating at any water-line, and let it represent a cross-section of a vessel. If the cylinder be homogeneous, its centre of gravity will coincide with its centre of figure. In this case it is sufficiently plain that the centre of buoyancy is in the vertical line through the centre of gravity. And this would continue to be so if the cylinder were made to roll quite round. The line of support, therefore, would always pass through the centre of gravity, and it would float in equilibrium in any position. This kind of equilibrium is what is called *indifferent equilibrium.* It has neither stability nor instability belonging to it. When a small displacement takes place from one position of equilibrium, the upward pressure of the water and the downward pressure of the weight of the floating body always act in opposite directions in the same vertical line, and have, therefore, no tendency to bring the body back to the position from which it started, nor to continue its rotation. But suppose the cylinder to be loaded on one side, so as to bring the centre of gravity out of the centre of figure. Now, if the cylinder be put in the water so that the centre of gravity is vertically below the centre of the figure, it will be vertically over the centre of buoyancy, and the cylinder will float in equilibrium. But now suppose it to be placed in the water so that it has the right displacement, but with the centre of gravity out of the vertical through the centre of the figure. It is then plain that the opposite forces acting through the centre of buoyancy and the centre of gravity, two parallel forces not acting in the same line, will cause the cylinder to revolve until the centre of gravity is in the line joining the centre of buoyancy and the centre of the figure, about which it will oscillate till it settles in the position of equilibrium. This will be a position of stable equilibrium. Again, suppose the cylinder to be placed in the water with the proper amount of displacement, but with the centre of gravity vertically over the centre of the figure. In this case the body would float in momentary equilibrium. But on any slight disturbance taking place the forces acting will cause the body to revolve away from the position of momentary equilibrium till it settles into that position of equilibrium in which the centre of gravity is vertically below the centre of the figure. Hence, the position in which the centre of gravity is unstable vertically over the centre of the figure is one of *unstable equilibrium.* In these cases it will be seen that the centre of gravity is above the centre of buoyancy, and yet the equilibrium may be stable, unstable, or indifferent. These cases, therefore, show that there is very little resemblance between the stability of floating bodies and that of the common pendulum. (See the article on HYDROSTATICS (*Stability of Floating Bodies*) for an illustration of this subject.)

It is clear that the stability of ships bears a very remote resemblance to that of the common pendulum, in which the point of support is fixed and is always above the centre of gravity. In a ship the usual position of the centre of gravity is necessarily above the point of support, and the point of support is a movable and not a fixed point. This kind of stability very nearly resembles that of a circular cylinder loaded on one side and resting on a horizontal floor. This cylinder will be in stable equilibrium when the centre of gravity is vertically below the centre of figure, and therefore vertically over the point of support. It will be seen in this case that any small disturbance from the position of rest causes the centre of gravity to move out of the line of support in such a way as to introduce an unbalanced force, whose tendency is to turn the body back to its position of rest from which it was disturbed. Here the point of contact with the floor, which is the point of support, takes the place of the centre of buoyancy, and the centre of the cylinder corresponds to the meta-centre. The moment of stability in this case is expressed by $W \times CG \sin \phi$.

The foregoing considerations are, we think, sufficient to indicate the mechanical and geometrical principles which are our guides in calculating the stability of ships. The formula for the moment of stability for any angle $\phi = Aa - Dd \sin \phi$, which is of general application, enables us to calculate with accuracy the righting force for any angle of inclination when the position of the centre of gravity is known. But for ships with high freeboard the height of the meta-centre above the centre of gravity is a sufficient guide to their stability. To obtain this height it is necessary to find by calculation the position of three points—the centre of buoyancy, the meta-centre, the centre of gravity. The centre of buoyancy is readily found, as it is the centre of gravity of a homogeneous solid of the form of the immersed portion of the ship. The height of the meta-centre above the centre of buoyancy is found from the formula—

$$\frac{2}{3} \int \frac{y^3 dx}{D},$$

which is derived immediately from the investigation given for the centre of a prismatic form. This determines the position of the meta-centre in the ship, and, if the position of the centre of gravity is known, the height of the meta-centre above the centre of gravity; and to this the gunwale. The only difficulty is to find the centre of gravity of the ship if the design is of a new type. To do this by taking into account the weight and position of every part of the hull, as well as of the equipment and lading, is a very laborious and tedious operation, and would consist of so many parts, and be so liable to error, that we prefer to estimate the centre of gravity of the general framework of the hull by means of a few sections, and then, by a separate calculation, to put in the exceptional parts of the hull (such as armor, etc.) and the lading. But even this mode of calculating the centre of gravity involves considerable time, and it of course requires great care to avoid serious error. These calculations enable us to determine the stability of ordinary ships when inclined in smooth water, and to this extent the results are founded on well-established scientific principles.

If we could calculate the forces which tend to incline a ship with the same accuracy as those which tend to right her, we should have no difficulty in pronouncing on a given design whether the ship had sufficient stability and would be safe or not. But, unfortunately, we have no trustworthy data to enable us to approximate even the amount of upsetting force which the wind exerts on the sails with winds of various intensities and with corresponding different amounts of sail. We have no means of calculating the pressure of the wind when a given ship would carry only double-reefed topsails, nor what proportion of this pressure is effective in inclining the ship, taking into account the bellying of the sails and the degree of sharpness with which the yards are braced up. And we have no definite knowledge of the amplitude through which the given ship would be made to roll under the influence of the waves in which she may find herself in the breeze referred to. Thus science enables us to estimate accurately the righting force which a given design will have under a given angle of inclination in smooth water, but no science that we have ever heard of will enable us to say that this amount of stability is sufficient. Actual trial only can decide this part of the matter.

In the old sailing men-of-war and in the more modern steam navy a type of ship has been settled upon in each class which was well known to have sufficient stability to carry the sail belonging to it, and the naval officers who acquired their experience from service in such ships knew exactly what sail it was proper to carry in all sorts of weather, and knew when and to what degree it was necessary to shorten sail to save their ship or to save their spars. It may be thought that the more stability ships have the safer and better they are. It has, however, been long known that ships having very great stiffness under canvas were immoderate rollers in a sea-way, and the ships which rolled most moderately in a sea-way had the smallest amount of stiffness under sail. Mr. Froude has shown that the ship having very large stability in still water is not only a quick roller, but also, by reason of that quickness, a heavy roller in a sea-way. The rolling of a ship in the trough of the sea depends not upon the impulse of a single wave, but upon the repeated impulses of a succession of waves. Every ship has a certain time of oscillation in accordance with her stability, with her dimensions, and with the amount and distribution of her weights. If the ship is placed in the trough of the sea in a uniform series of waves whose time of passing through the distance from crest to crest is the same as her time of oscillation, she would be caused to roll most heavily, if not to upset altogether, by the action of the waves alone, without the aid of wind or sails. This bad effect would always be produced in a greater or less degree in proportion as the ship's time of oscillation approaches the periodic time of the waves she meets with. To make a ship steady in a sea-way it is necessary to make her time of oscillation as different as possible from the periodic time of the waves she is likely to meet with. The ship with large stability will have a short time of oscillation, while the ship with smaller stability will have a greater time of oscillation. It is, therefore, desirable not to give a ship more stability than is necessary to make her safe under sail in a sea-way, in which her motions will depend upon the combination of the inclination due to the action of the winds on the sails and the rolling caused by the waves. We have already pointed out that our calculations do not enable us to determine what is the minimum amount of stability which is necessary for a ship to render her safe as a seagoing sailing ship. We can merely compare the amount in one ship with that in another. If we know of a ship which has been already tried and found successful, we can design a ship which will have the same amount of stability. Or if the trials of a ship have shown that she has more than enough of stability to carry her sail, and too much for steadiness in a sea-way, we can design a ship with somewhat less stability without much risk. And while the ships have the usual freeboard the simple calculation of the meta-centre is sufficient for making the comparison, because in the case of two such ships, if they have the same righting power at a small angle, they will have the same or nearly so at all angles of inclination.

FIG. 3. FIG. 1.

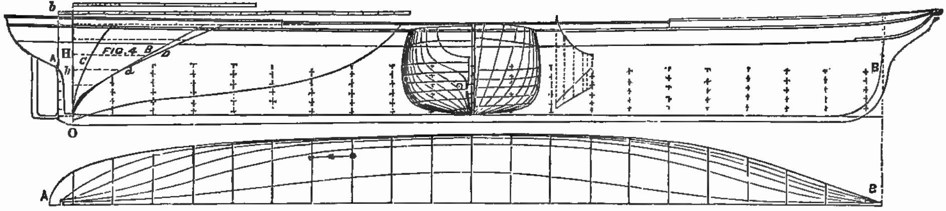


FIG. 2.

Fig. 1. sheer plan.—Fig. 2, half-length plan.—Fig. 3, body plan: ⊙, centre of gravity of displacement.—Fig. 4, scale of displacement: *a*, scale for area of midship section B, and tons per inch of immersion C, in which the large divisions represent 100 tons to one inch; *b*, scale, in which the large divisions represent 100 tons to 200 superficial feet.

The plans made use of, and from which measurements are taken for calculating the displacement and stability of a vessel, are the sheer, body, and half-breadth plans (Figs. 1, 2, and 3). The same kinds of plans are used for laying off the vessel on the mould-loft floor preparatory to making the moulds by which the frame and other timbers are moulded to their proper shape and size, excepting that those used for the measurements for the calculations are made to the outside of the vessel, and the others to the outside of the frame only. The area of any water-line or cross-section of a vessel is found by measuring a sufficient number of parallel and equidistant ordinates, conceiving the figure to be divided by certain of those ordinates into figures of the parabolic kind, computing the areas of these figures, and adding them together.

Conceive Fig. 2 to be divided into twelve equal intervals, to which either of the rules given below can be applied. The ordinates into which the figure is divided will be called dividing ordinates, and all others, except the first and last, intermediate ordinates.

Trapezoidal Rule.—Here all excepting the first and last ordinates are dividing ordinates. Add together all the dividing ordinates, and one-half of the first and last ordinates; multiply the sum by the common interval, and the product will be the required area, nearly.

Simpson's First Rule.—The number of intervals must be even, therefore the dividing ordinates are 2, 4, 6, 8, etc., and the intermediate ordinates 1, 3, 5, etc. Add together the first and last ordinates, doubling the dividing ordinates (and four times the intermediate ordinates), multiply the sum by one-third of the common interval; the product will be the required area, nearly. This is the rule generally made use of, and can be made as accurate as required by placing the ordinates closer together.

Simpson's Second Rule.—In this the number of intervals must be a multiple of three, being marked 3, 6, 9, etc., and the intermediate ordinates, 1, 2, 4, 5, etc. Add together the first and last ordinates; double the dividing ordinates and three times the intermediate ordinates; multiply the sum by three-eighths of the common interval; the product will be the required area, nearly.

In the sheer, body, and half-breadth plans (Figs. 1, 2, and 3) the water-lines are drawn to the outside of plank. The sixth water-line is the *load water-line.** The depth between the top of the keel and the load-line is divided into a number of equal intervals by other water-lines, which may be numbered 1st W. L., 2d W. L., 3d W. L., etc. As a starting-point or base-line for all the measurements, there is taken the centre line of the load or 6th W. L., marked B A in the sheer and half-breadth plans (Figs. 1 and 3). It extends from the fore edge of the rabbet of the stem at B to the after edge of the rabbet of the stern-post at A; and that distance is divided up into a sufficient number of equal intervals. The relative capacities of the fore and after bodies may be calculated separately if their relative capacities are required, but in the calculations appended this has not been done. The ordinates of a ship are all half-breadth measurements, taken from the plane traversing the axis A B to the outside surface of the plank of the ship. Each ordinate belongs at once to the water-section and to the vertical section of which it is the intersection, and has therefore two multipliers by Simpson's rules, according as it is to be used in computing the area of the water-section or that of the vertical section. There are *two* processes of computing the displacement—one by *vertical sections*, and the other by *water-sections*. Both are necessary in the subsequent operations of finding the centre of buoyancy, and should be gone through with, because independent of this their final results are a check on the accuracy of the calculations, both results having to agree. The area of a given water-section represents the displacement in cubic feet per vertical foot of immersion, and this being divided by 12, gives the displacement in tons per inch immersion. Referring to the scale of displacement (Fig. 4), the displacements corresponding to the different draughts of water are laid down as the horizontal ordinates of a curve, O *d* D. The ordinate H D represents the load displacement, and the ordinate *h d* the displacement at the draught O *h*. A scale of tons is marked above the ordinate, H D. As the vertical cross-sections consist of two halves similar in form, the computations are made for the half areas, and the results multiplied by 2 to obtain the whole. In a similar manner the half areas of water-sections are computed first, and finally multiplied by 2. The computations for the load-displacement are performed by treating the areas of the water-sections just the same as the ordinates are treated in computing the areas of the cross-sections, the series of multipliers being the same as was then used. In computing the series of displacements up to the other water-sections the rule must be varied to suit the circumstances of the particular calculation. The volume of any even number of equally deep areas can be computed by Simpson's first rule, and, if three equally deep layers are required, by Simpson's second rule. The volume of the keel, stem, and stern-post, known as appendages, must be separately calculated and added to the main part of the displacement, but as this is of little account, it is often omitted. As the immersed portion of the vessel floating upright consists of two symmetrical halves, one on each side of the plane which traverses B A, it necessarily follows that the centre of buoyancy of the ship when floating upright must be in that plane; in order to find the position of that centre, it is necessary to find its horizontal distance from the forward perpendicular (in the case in point) through B and its vertical distance below the load-line. To find its horizontal distance from the transverse vertical plane through B, the area of each cross-section is to be multiplied by its distance from B, and the products treated as the ordinates of a new curve. The moment thus found, divided by the volume of the displacement, gives the distance required. The depth of the centre of buoyancy below the load-line is found by computing the moment of the volume of the displacement relatively to the plane of that section; or, in other words, the area of each water-section is multiplied by its depth below the load water-section, and the products treated as the ordinates of a new curve. The moment thus found, divided by the volume of the displacement, will give the depth required. Time is saved in the above calculations by not multiplying by the leverages themselves, but by the number of intervals to which these intervals are proportional, and afterwards performing a multiplication by the common interval after the addition is made; and in the appended calculations for displacement and centre of buoyancy this has been done.

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* Outer line of all from centre line.

The calculations of displacement, and of the positions of the centre of buoyancy and meta-centre, can be conveniently combined in one tabular arrangement for practical purposes. The methods of doing this are, of course, all identical in principle, but during the progress of naval architecture they have varied considerably in detail, and have been from time to time rendered more simple and concise. The arrangement adopted in this calculation is the most simple and concise yet known.

The cross-sections are numbered from 1 to 21, commencing at the bow. The ordinates or half-breadths at the intersections of the cross-sections and water-sections having been measured, are set down in the table given on the next page. The column on the extreme left of that table contains the numbers of the cross-sections, 1, 2, 3, 4, etc. The next column contains Simpson's multipliers in their order, agreeably to the rule. Then follow the columns containing the ordinates. Of these columns there are as many as there are water-sections; that is, in the present case, seven, including the base-line. The columns containing ordinates are headed at the top with the numbers of the water-sections, and immediately below these with Simpson's multipliers. The ordinates are ranged in as many lines as there are cross-sections; that is, in the present case, twenty-one, being at whole intervals apart.

*Arrangement of Results of Calculation.**—Immediately *to the right* of each ordinate is written, in differently-sized figures, its product by the Simpson's multiplier proper to the *line* to which the ordinate belongs. Immediately *below* each ordinate is written, in differently-sized figures, its product by the Simpson's multiplier proper to the *column* to which the ordinate belongs. For example, at the intersection of the line belonging to the cross-section 3 (for which the Simpson's multiplier is 2) and the column belonging to the water-section 3 W. L. (for which the Simpson's multiplier is 4) is the ordinate 3.83. Immediately to the right of that ordinate is written its product by the multiplier 2—viz. 7.66; and immediately below it is written its product by the multiplier 4—viz. 15.32. The products written *below* the ordinates are added in *lines;* and the sum of each line of products is written in the column headed "Half-areas $\div \frac{\text{V.I.}}{3}$," under the general heading "Vertical sections." The numbers in this column are proportional to the areas of the several vertical cross-sections; but to give the absolute values of those areas they still require to be multiplied by 2 and by one-third of the vertical interval of the ordinates (abbreviated into $\frac{\text{V. I.}}{3}$). Each of those numbers proportional to the areas of the cross-sections is then multiplied by the proper Simpson's multiplier, found in the second column from the extreme left of the table, and the products are written in the column headed "Multiples of areas." These multiples being added up, their sum (viz. 8766.98) is written at the foot of the column. It is then multiplied successively by one-third of the vertical interval $\left(\frac{\text{V. I.}}{3} = \frac{2.}{3}\right)$, and by one-third of the horizontal interval $\left(\frac{\text{H. I.}}{3} = \frac{9.08}{3}\right)$. The product (17689.8073) is one-half of the load-displacement in cubic feet, which, being multiplied by 2, gives 35379.6146 cubic feet, the *whole load-displacement;* and this, being divided successively by 7 and by 5, gives 1010.8461, the load-displacement in tons. Each of the numbers in the column headed "Multiples of areas" is next multiplied by the proper "multiplier for leverage," contained in the column on its right. The multiplier for leverage for a given cross-section is the number of intervals by which that cross-section is distant from the first cross-section or commencement of the base-line. The products are set down in the column headed "Moments;" and having been added up, their sum (89580.72) at foot of column is multiplied by the horizontal interval (H. I. = 9.08). The product (813392.9376) is not the absolute value of the moment of the displacement relatively to the first cross-section, but it bears the same proportion to that moment which the sum of the column headed "Multiples of areas" (8766.98) bears to the displacement. Dividing, therefore, that product by that sum, the quotient (92.77 feet) is *the horizontal distance in feet of the centre of buoyancy abaft the first cross-section*, or No. 1.

Returning to the columns containing the ordinates, the products written immediately to the *right* of the ordinates are added in *columns*, and the sum of each column of products is written at the foot of the column, in the line marked "Half water-sections $\div \frac{\text{H. I.}}{3}$." The numbers in this line are proportional to the areas of the several water-sections; but to give the absolute values of those areas they still require to be multiplied by 2, and by one-third of the horizontal interval between the ordinates (here abbreviated into $\left.\frac{\text{H. I.}}{3}\right)$. Each of those numbers proportional to the areas of the water-sections is then multiplied by the proper Simpson's multiplier, as written in the line below it. The products are written in the next line again, marked "Multiples of water-sections," and being added together, their sum (8766.98) is written to their left. If the calculations have been correctly made, that sum ought to agree *exactly* with the sum of the column headed "Multiples of areas."

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* This method was devised by the late Mr. John Wilson, chief draughtsman in the surveyors' department of the English admiralty.

No. of cross-sections.	Simpson's multipliers.	Keel.			1st water-line.			2d water-line.			3d water-line.			4th water-line.			5th water-line.			6th water-line.			Half areas ÷ V. I./3	Multiples of areas.	Multiples for leverage.	Moments.	Cubes.	Multiples of cubes.
		Number of water-sections.																					Vertical sections.				Meta-centre.	
		Simpson's multipliers.																										
		1			4			2			4			2			4			1								
1	1	.00	**.00**	.00	.00	**.00**	.00	.00	**.00**	.00	.00	**.00**	.00	.00	**.00**	.00	.00	**.00**	.00	.54	**.54**	.54	.54	.54	0	……..	.15	.15
2	4	.38	**.38**	1.52	.54	**2.16**	2.16	1.12	**2.24**	4.48	1.79	**7.16**	7.16	2.39	**4.78**	9.56	3.00	**12.00**	12.00	3.58	**3.58**	14.32	32.30	129.20	1	129.20	45.83	183.32
3	2	.54	**.54**	1.08	.54	**2.16**	1.08	2.37	**4.74**	4.74	3.83	**15.32**	7.66	5.00	**10.00**	10.00	6.00	**24.00**	12.00	6.83	**6.83**	13.66	63.59	127.18	2	254.36	318 61	637.22
4	4	.54	**.54**	2.16	.79	**3.16**	3.16	4.29	**8.58**	17.16	6.45	**25.80**	25.80	7.95	**15.90**	31.80	9.06	**36.24**	36.24	9.87	**9.87**	39.48	100.09	400.36	3	1201.08	961.50	3846.00
5	2	.54	**.54**	1.08	1.45	**5.80**	2.90	6.79	**13.58**	13.58	9.16	**36.64**	18.32	10.60	**21.20**	21.20	11.54	**46.16**	23.08	12.16	**12.16**	24.32	136.08	272.16	4	1088.64	1798.04	3596.08
6	4	.54	**.54**	2.16	2.33	**9.32**	9.32	9.16	**18.32**	36.64	11.39	**45.56**	45.56	12.58	**25.16**	50.32	13.25	**53.00**	53.00	13.62	**13.62**	54.48	165.52	662.08	5	3310.40	2526.56	10106.24
7	2	.54	**.54**	1.08	3.41	**13.64**	6.82	10.87	**21.74**	21.74	12.89	**51.56**	25.78	13.79	**27.58**	27.58	14.20	**56.80**	28.40	14.37	**14.37**	28.74	186.23	372.46	6	2234.76	2967.36	5934.72
8	4	.54	**.54**	2.16	4.60	**18.40**	18.40	11.91	**23.82**	47.64	13.79	**55.16**	55.16	14.50	**29.00**	58.00	14.70	**58.80**	58.80	14.81	**14.81**	59.24	200.53	802.12	7	5614.84	3248.36	12993.44
9	2	.54	**.54**	1.08	5.79	**23.16**	11.58	12.58	**25.16**	25.16	14.20	**56.80**	28.40	14.79	**29.58**	29.58	14.95	**59.80**	29.90	15.06	**15.06**	30.12	210.10	420.20	8	3361.60	3415.66	6831.32
10	4	.54	**.54**	2.16	6.58	**26.32**	26.32	12.83	**25.66**	51.32	14.29	**57.16**	57.16	14.85	**29.70**	59.40	15.04	**60.16**	60.16	15.12	**15.12**	60.48	214.66	858.64	9	7727.76	3456.64	13826.56
11	2	.54	**.54**	1.08	6.83	**27.32**	13.66	12.87	**25.74**	25.74	14.25	**57.00**	28.50	14.79	**29.58**	29.58	15.00	**60.00**	30.00	15.08	**15.08**	30.16	215.26	430.52	10	4305.20	3429.28	6858.56
12	4	.54	**.54**	2.16	6.62	**26.48**	26.48	12.66	**25.32**	50.64	14.12	**56.48**	56.48	14.66	**29.32**	58.64	14.83	**59.32**	59.32	15.08	**15.08**	60.32	212.54	850.16	11	9351.76	3429.28	13717.12
13	2	.54	**.54**	1.08	6.16	**24.64**	12.32	12.35	**24.70**	24.70	13.89	**55.56**	27.78	14.45	**28.90**	28.90	14.62	**58.48**	29.24	14.70	**14.70**	29.40	207.52	415.04	12	4980.48	3176.52	6353.04
14	4	.54	**.54**	2.16	5.50	**22.00**	22.00	11.72	**23.44**	46.88	13.50	**54.00**	54.00	14.16	**28.32**	56.64	14.37	**57.48**	57.48	14.45	**14.45**	57.80	200.23	800.92	13	10411.96	3017.19	12068.76
15	2	.54	**.54**	1.08	4.58	**18.32**	9.16	10.62	**21.24**	21.24	12.83	**51.32**	25.63	13.70	**27.40**	27.40	14.06	**56.24**	28.12	14.14	**14.14**	28.28	189.20	378.40	14	5297.60	2827.14	5654.28
16	4	.54	**.54**	2.16	3.52	**14 08**	14.08	8.75	**17.50**	35.00	11.60	**46.40**	46.40	13.04	**26.08**	52.16	13.58	**54.32**	54.32	13.72	**13.72**	54.88	172.64	690.36	15	10358.40	2582.63	10330.52
17	2	.54	**.54**	1.08	2.43	**9.72**	4.86	6.25	**12.50**	12.50	9.62	**38.48**	19.24	11.87	**23.74**	23.74	12.79	**51.16**	25.58	13.20	**13.20**	26.40	149.34	298.68	16	4778.88	2299.96	4599.92
18	4	.54	**.54**	2.16	1.50	**6.00**	6.00	3.85	**7.70**	15.40	6.87	**27.48**	27.48	9.87	**19.74**	39.48	11.62	**46.48**	46.48	12.41	**12.41**	49.64	120.35	481.40	17	8183.80	1911.24	7644.96
19	2	.54	**.54**	1.08	.95	**3.80**	1.90	2.14	**4.28**	4.28	3.72	**14.88**	7.44	6.66	**13.32**	13.32	9.58	**38.32**	19.16	11.25	**11.25**	22.50	86.39	172.78	18	3110.04	1423.82	2847.64
20	4	.54	**.54**	2.16	.70	**2.80**	2.80	1.08	**2.16**	4.32	1.75	**7.00**	7.00	2.54	**5.08**	10.16	5.37	**21.48**	21.48	8.85	**8.85**	35.40	47.91	191.64	19	3641.16	693.15	2772.60
21	1	.54	**.54**	.54	.54	**2.16**	.54	.58	**1.16**	.58	.91	**3.64**	.91	.87	**1.74**	.87	.54	**2.16**	.54	.54	**.54**	.54	11.94	11.94	20	238.80	.15	.15

	Keel.	1st water-line.	2d water-line.	3d water-line.	4th water-line.	5th water-line.	6th water-line.
Half water-sections…….	31.22	195.54	463.74	571.89	638.33	685.30	720.70
H. I./3							
Simpson's multipliers….	1	4	2	4	2	4	1
Multiples for water-sections, sum, 8766.98	31.22	782.16	927.48	2287.56	1276.66	2741.20	720.70
Multiples for leverage…..	6	5	4	3	2	1	0
Moments. Sum, 19965.24	187.32	3910.80	3709.92	6862.68	2553.32	2741.20	0

V. I. = 2.
8766.98)39930.48
4.55
Centre of buoyancy below load water-line.

7.45
4.55
2.90 feet.
Meta-centre above load water-line.

31 22
782.16
463.74
1277.12
V. I. = 2.
3.)2554.24
851.41
H. I. = 9.08
681128
766269
3.)7730.8028
2576.9342
2.
35.)5153.8684 cubic ft.
147.2533 tons.
Displacement to 2d water-line.

463.74
2287.56
638.33
3389.63
V. I. = 2
6779.26
2554.24
3.)9333.50
3111.16
H. I. = 9.08
2488928
2800044
3.)28249.3328
9416.4442
2.
35.)18832.8884 cubic ft.
538.0825 tons.
Displacement to 4th water-line.

638.33
2741.20
720.70
4100.23
V. I. = 2.
8200.46
9333.50
3.)17533.96
5844.65
H. I. = 9.08
4675720
5260185
3.)53069.4220
17689.8073
2.
35.)35379.6146 cubic ft.
1010.8461 tons.
Displacement to 6th water-line.

	2d water-line.	4th water-line.	6th water-line.
Displacement per inch at lines….	12.27	44.84	84.23
Middle section at lines……. ….	54.30	167.18	287.00

8766.98
V. I. = 2.
3.)17533.96
5844.65
H. I. = 9.08
4675720
5260185
3.)53069.4220
17689.8073
2.
7.)35379.6146 cubic ft.
5.)5054.2306
1010.8461 tons.
Displacement to load water-line, or to a mean draught of 12′ 3″ above base-line or lower side of keel.

215.26
2
3.)430.52
143.50
2
287.00 sq. ft.
Area of midship section to load water-line.

89580.72
H. I. = 9.08
71664576
80622648
813392.9376

$$\frac{813392.9376}{8766.98} = 92.77 \text{ ft.}$$

Centre of buoyancy aft, of section No. 1.

720.70
H. I. = 9.08
576560
648630
3.)6543.9560
2181.3186
2.
4362.6372 sq. ft. Area of load water-section.

130802.80
H. I. = 9.08
104642240
117722520
3.)1187689.4240
395896.4746
2
3.)791792.9492
263930.9830

$$\frac{263930.98}{35379.61} = 7.45 \text{ feet.}$$

Meta-centre above centre of buoyancy.

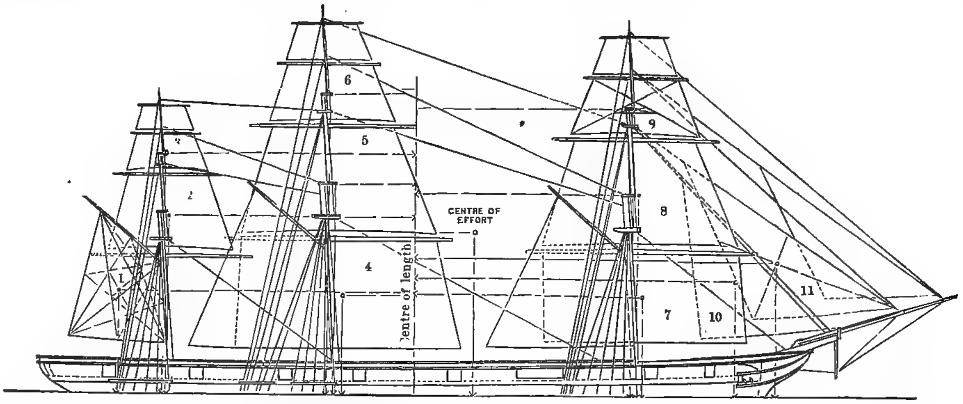
Each of the numbers in the line of "Multiples of water-sections" is next multiplied by the proper "Multiplier for leverage" contained in the line immediately below. The multiplier for leverage for a given water-section is the number of intervals by which that water-section is below the load water-section. The products are set down in the line marked "Moments;" and having been added together, their sum (19965.24) at the left end of the line is multiplied by the V. I. = 2. The product (39930.48) is not the absolute value of the moment of the displacement relatively to the load water-section, but it bears the same proportion to that moment which the sum of the line marked "Multiples of water-sections" (8766.98) bears to the displacement. Dividing, therefore, that product by that sum, the quotient (39930.48 ÷ 8766.98 = 4.55) is *the depth, in feet, of the centre of buoyancy below the load water-section.*

Below the calculations of moments just described are written the calculations of the *displacement up to the several water-sections* between the load water-section and the keel. The calculator here employs various rules according to his judgment, so as to save labor as much as possible. In the present case the displacement up to the second, fourth, and sixth water-sections is computed by Simpson's first rule. The area of each water-section in square feet being divided by 35, gives the *tons displacement per foot of immersion,* which is divided by 12 for the *tons displace-*

ment per inch of immersion. The *areas of the midship-section* (No. 11) up to the several water-lines are computed from its ordinates, just as the displacements are computed from the water-sections, and those areas are written at the foot of the table. The two columns at the right-hand side of the table headed "Meta-centre" contain the *calculations of stability,* estimated from the expression $\frac{2}{3}\int\frac{y^3dx}{D}$, in which $y =$ the ordinates of the half-breadth, load water-section; $dx =$ the increment of the length of the load water-section; $D =$ displacement of the immersed portion of the body in cubic feet.

The first of those columns headed "Cubes" contains the cubes of the ordinates or half-breadths of the load water-section. Each of those cubes is multiplied by the proper Simpson's multiplier (found in the second column from the left of the table), and the products are written in the column headed "Multiples of cubes." Those products having been added up, their sum (130802.80) is multiplied by one-third of the horizontal interval $\left(\frac{\text{H. I.}}{3} = \frac{9.08}{3}\right)$, giving the area of the curve whose ordinates are the cubes of the half-breadths (395896.4746). Two-thirds of that area is the *coefficient of surface stability* (263930.9830); which, being divided by the displacement in cubic feet (35379.61), gives the *height of the meta-centre above the centre of buoyancy* (7.45 feet). From that height, at the lower left-hand corner of the table, is subtracted the depth of the centre of buoyancy below L. W.-L. (4.55 feet); leaving the *height of the meta-centre above* L. W.-L. (2.90 feet).

FIG. 5.



Calculations for Determining the Position of the Centre of Effort of the Sails of a U. S. Steam Sloop-of-War (Fig. 5). *Areas and Position of the Centre of Gravity and Moments of Sail.*

No. on Plan.	Species of sails.	In relation to the load water-line.			In relation to a section passing through the centre of the load water-line.		
		Areas.	Height of centre of gravity.	Moments.	Distance of centre of gravity from the centre in feet.	Moments before.	Moments abaft.
1	Spanker	631.41 ×	28.33 =	17887.8453	79.08*a*	....	49931.9028
2	Mizzen topsail	573.08 ×	48.41 =	27742.8028	65.33*a*	....	37439.3164
3	" top-gallant sail	187.50 ×	64.83 =	12155.6250	66.50*a*	....	12468.7500
4	Main sail	1615.44 ×	27.58 =	44553.8352	18.66*a*	....	30144.1104
5	" topsail	1232.15 ×	56.83 =	70023.0845	20.75*a*	....	25567.1125
6	" top-gallant sail	424.40 ×	80.41 =	34126.0040	22.33*a*	....	9476.8520
7	Fore sail	1259.88 ×	27.83 =	35062.4604	60.16*b*	75794.3808	
8	" topsail	1221.62 ×	54.33 =	66370.6146	58.58*b*	71562.4996	
9	" top-gallant sail	440.43 ×	77.41 =	34093.6863	57.66*b*	25395.1938	
10	Jib	680.00 ×	32. =	21760.0000	85.16*b*	57908.8000	
11	Fore topmast staysail	844.67 ×	37.41 =	31599.1047	95.66*b*	80801.1322	
	Totals	9110.58	....	395375.0628	....	311462.0064	165028.0441

$$\text{Height of the centre of effort above the load water-line} = \frac{395375.0628}{9110.58} = 43.39 \text{ feet.}$$

$$\text{Centre of effort before the centre of the load water-line} = \frac{146433.9623}{9110.58} = 16.07 \text{ feet.}$$

Experience has proved that the best fore-and-aft position for the centre of pressure of the wind on the sails of a ship is that which will tend slightly to make her fly up in the wind when sailing with the wind before the beam. The course taken by a ship when sailing with the wind before the beam is necessarily at an angle with the line of her keel, the pressure producing a motion which tends to drive her bodily to leeward as well as ahead. This angle, called the angle of leeway, depends on the form below water and the bracing of the yards. In order that this point may be in the best fore-and-aft position for sailing, it is usual in designing ships to arrange the sail-plan so that the point on it known as the *centre of effort,* which is taken as an approximation to the centre of pressure of the wind on the sails, shall be a certain distance before the centre of gravity of the immersed longitudinal section, usually called *centre of lateral resistance.* To secure *handiness* under sail, in addition to the centre of effort being properly located, it is necessary that the masts should occupy certain positions with regard to the length of the ship, and the sail be duly proportioned on them. But as no definite or correct rule can be given for their position, we are obliged to be guided by the arrangements existing in ships of known good qualities, and to change the positions from those which have shown bad qualities, so as to remedy the fault complained of. In our old sailing ships the foremast was much farther forward and the mizzenmast much farther aft than in our present steam navy. The masts of most of our sharp vessels have to be placed nearer amidships on account of the fineness of the extremities; and where the bow is very sharp the foremast has to be kept well out of the bow; this often renders the sail less effective on this mast, especially in wearing ship; and the only way to remedy this, and at the same time secure a good balance of sail for keeping steadily on a course, is to trim the vessel by the stern. The working qualities of the ship are materially affected by her trim or the position in which she floats. Every one of the qualities sought in a ship is more or less affected by every circumstance in the model and dimensions of the ship, the way in which her weights are distributed, and the means of her propulsion; and the constructor must bear all these qualities and circumstances in mind in making the designs for any vessel, and he must demand the fullest information which his design is required to fill. No ship can be properly designed unless the guns of which it is to be the floating carriage and the work which it is expected to perform be definitely settled. The question as to the number of guns, distance of the ports apart, speed required, and whether steam or sail is to be the auxiliary power, being settled, and if steam, how many days' coal are to be carried, the designer is prepared to go to work on his design.

Having made the principal calculations on the immersed portion of the ship or her displacement, the quantity of sail and its distribution, or the moving force required with relation to the form of the vessel, is the next subject that demands attention. A plan of the sails having been drawn (Fig. 5), the areas of the several sails, centres of gravity, and centre of effort, or the centre of pressure of the wind on them, must be obtained. The rules for obtaining the areas are as follows: *Square Sails.*—Multiply the depth by half the sum of the breadths at the head and foot. *Triangular Fore-and-Aft Sails.*—Multiply any side by half its perpendicular distance from the opposite corner. *Four-Sided Fore-and-Aft Sails.*—Multiply either diagonal by the half sum of its perpendicular distance from the opposite corner. The centre of each sail is then found, as shown in Fig. 5. The areas of the sails and their centres having been determined by the above rules, the centre of effort of them is found by assuming an initial plane passing through the centre of the length of the load water-line, which will be seen represented in Fig. 5. From this plane the distances are measured by a scale rule to the centres of the respective sails shown on the plan, which distances, when multiplied into the respective areas of the sails, give the moment of the sail from the assumed plane; the difference in the moments of those that are before and those that are abaft the initial plane, divided by the total area of the sails, will give the distance of the common centre of gravity of the sails from it. This gives the position of the centre of effort with relation to the length of the load water-line. To find its height from the load water-line, the height of each sail's centre is taken from the load-line; this distance, multiplied by the area of the same, will give its moment of height from that line; and the sum of all the moments being divided, as before, by the total area of sail, will give the height of the centre of gravity of them from the load-line. The position of the centre of effort of them will thus be fixed. (See table of calculations for a U. S. sloop-of-war on previous page.) As a rule, there should be given about 36 square feet of plain sail to every square foot of midship section.

Calculations for Position of Centre of Weights made for U. S. Steam Sloop-of-War of 1238 tons.—Figs. 6, 7.

No. to be referred to on plan.	Species of weights.	Weights.	Distance of weights from the forward perpendicular.	Moments.
		lbs.	feet.	
1	General stores, berth-deck....	3,920	13.	50,960
2	" " hold.....	4,015	19.	76,285
3	Two (2) anchors on bow........	4,360	28.5	124,260
4	Sails, hold........................	3,850	29.25	112,612
5	Provisions, stores, cables, etc., hold........................	42,326	42.5	1,798,855
6	Sheet anchor in fore-hatch...	2,180	46.	100,280
7	Shot, grape, etc. on berth-deck	7,020	47.	329,940
8	Men and their effects...........	24,560	49.	1,203,440
9	Tanks and water in hold......	22,759	53.25	1,211,916
10	Chain cables.......................	36,980	58.41	2,160,001
11	Tanks, powder, etc., magazine	12,559	64.75	813,195
12	Boat-ammunition and ordnance stores......................	2,500	70.	175,000
13	Shell in shell-room..............	26,536	72.5	1,923,860
14	100-pdr. pivot gun and gear...	20,865	73.75	1,538,793
15	Coals in forward bunker.......	147,840	89.	13,157,760
16	2 VIII.-inch broadside guns and gear...........................	16,860	103.25	1,740,795
17	1 26-foot cutter, stowed in the waist...............................	2,000	108.25	216,500
18	1 30-foot launch, stowed do...	4,000	110.25	441,000
19	Boilers, water, sm.-stack, etc.	275,363	114.	31,391,382
20	2 VIII.-inch guns, broadside, and gear..........................	16,860	129.25	2,179,155
21	Coals over the boilers............	305,880	129.75	39,687,930
22	Engine, etc..........................	164,578	149.	24,522,122
23	1 24-foot cutter.....................	1,500	158.25	237,375
24	2 VIII.-inch guns, broadside, and gear..........................	16,860	159.	2,680,740
25	1 26-foot cutter.....................	2,000	159.	318,000
26	Engineer's stores..................	16,860	161.5	2,722,890
27	Stores in after-hold..............	12,043	172.	2,071,396
28	Paym'ster's stores, berth-deck	1,418	179.	253,822
29	Sails, " " ..	5,432	181.	983,192
30	Paymaster's stores, hold........	2,280	183.5	418,380
31	Officers and effects...............	6,400	184.	1,177,600
32	Shaft-alley, pillow-blocks, shaft, etc............................	28,426	185.	5,258,810
33	Stores, berth-deck................	5,300	188.	996,400
34	Whaleboat and gig...............	2,400	192.25	461,400
35	Bread, etc............................	12,319	197.5	2,433,002
36	Cabin stores.........................	800	207.	165,600
37	Propeller.............................	5,100	218.5	1,114,350
38	Metal rudder and gear..........	6,267	223.	1,397,541
	Totals................................	1,273,216	......	147,645,539

147645539 ÷ 1273216 = 115.95 distance in feet of the centre of weights from the forward perpendicular.

Number of areas..........			15 or aft.		14		13		12		11		10			
Depth....................			0		7.90		12.28		13.19		13.40		13.32		13.30	
Common interval between the breadths...........			0		1.97		3.07		3.29		3.35		3.33		3.32	
	Num-ber-	Mul-tiple.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.
	1	1	0 0	0 0	8.59	8.59	10.55	10.55	11.85	11.85	12.79	12.79	13.55	13.55	13.90	13.90
	2	4	0 0	0 0	7.30	29.20	9.48	37.92	11.28	45.12	12.58	50.32	13.59	54.36	14.15	56.60
	3	2	0 0	0 0	4.70	9.40	6.80	13.60	9.70	19.40	11.68	23.36	13.04	26.08	13.80	27.60
	4	4	0 0	0 0	2.55	10.20	3.32	13.28	6.12	24.48	8.87	35.48	11.30	45.20	12.55	50.20
	5	1	0 0	0 0	.82	.82	.88	.88	1.15	1.15	1.40	1.40	1.65	1.65	1.70	1.70
Sum of products..........			....			58.21		76.23		102.00		123.35		140.84		150.00
½ common interval......			....			.66		1.02		1.09		1.12		1.11		1.11
						34926		15246		91800		24670		14084		15000
						34926		76230		102000		12335		14084		15000
												12335		14084		15000
						38.4186		77.7546		111.1800		138.1520		156.3324		166.5000
						2.		2.		2.		2.		2.		2.
Areas......................			....			76.8372		155.5092		222.3600		276.3040		312.6648		333.0000

Number of areas..........	8		7		6		5		4		3		2		1	
Depth....................	13.40		13.48		13.60		13.85		13.96		13.92		13.18		0	
Common interval between the breadths...........	3.35		3.37		3.40		3.46		3.49		3.48		3.29		0	
	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.	Ordi-nate.	Prod-uct.
1	14.05	14.05	13.69	13.69	13.10	13.10	11.96	11.96	10.20	10.20	7.85	7.85	4.70	4.70	0 0	0 0
2	14.25	57.00	13.89	55.56	13.05	52.20	11.68	46.72	9.65	38.60	7.09	28.36	3.86	15.44	0 0	0 0
3	13.95	27.90	13.50	27.00	12.40	24.80	10.84	21.68	8.65	17.30	5.90	11.80	2.94	5.88	0 0	0 0
4	12.80	51.20	12.08	48.32	10.42	41.68	8.38	33.52	6.18	24.72	3.90	15.60	1.88	7.52	0 0	0 0
5	1.75	1.75	1.70	1.70	1.60	1.60	1.45	1.45	1.30	1.30	.70	.70	.50	.50	0 0	0 0
Sum of products..........		151.90		146.27		133.38		115.33		92.12		64.31		34.04		
½ common interval......		1.11		1.12		1.13		1.15		1.16		1.16		1.09		
		15190		29254		40014		57665		55272		38586		30636		
		15190		14627		13338		11533		9212		6431		34040		
		15190		14627		13338		11533		9212		6431				
		168.6090		163.8224		150.7194		132.6295		106.8592		74.5996		371036		
		2.		2.		2.		2.		2.		2.		2.		
Areas......................		337.2180		327.6448		301.4388		265.2590		213.7184		149.1992		74.2072		

In order to calculate the position in which a ship will trim, it is necessary to ascertain the common centre of gravity of all the weights in a fore-and-aft direction. The weights of all the objects she is designed to carry are ascertained, and their individual centres of gravity of weight marked upon a plan in the position in which they are to be placed or permanently located when the vessel is fully equipped for service. As these weights act at detached points, their common centre of gravity can be found by choosing a fixed vertical plane to which to refer the position of the weights. Measure the distance of each weight's centre from this plane, and multiply the weight by its distance, which will give its moment; divide the sum of the moments by the sum of the weights, and the quotient will be the common centre of gravity from the fixed plane. To find what would be the effect upon the position of the centre of gravity of a set of weights of shifting one of those weights into a new position, the distance through which the weight has been moved multiplied by the weight, and divided by the sum of all the weights, will give the distance through which the centre of gravity has been shifted in a direction parallel to that in which the weight is moved. If it is only desired to find how far a single weight must be moved to move the common centre of gravity through a given distance, multiply the sum of the weights by the distance through which their common centre of gravity is to be moved, and divide by the single weight.

Statement of Dimensions, Weights, etc., for a Wooden Screw Sloop-of-War of 1238 tons.

Length between perpendiculars	216 ft. 0 in.
Breadth moulded	30 "
" extreme	30 " 10 "
Depth in hold	13 " 8½ "
Burden in tons	1238
Area of the midship section in square feet	321
Height of midship port-sill	5 " 0 "
Engines, 36-inch cylinders, 36-inch stroke.	
Revolution	70
Cut-off at two-thirds of the stroke.	
Steam pressure	30 lbs.
Maximum horse-power	1000
No. of tons of coal carried	200
Complement of men	160
Diameter of the propeller	12 ft. 3 in.
Pitch of propeller, expanding 21 to 23 feet.	
Provisions for three months.	
Armament, 6 VIII.-inch shell guns, 1 100-pdr. Parrott rifle (pivot).	
Draught of water ready for sea { forward	12 " 3⅓
Draught of water ready for sea { aft	13 " 3

In every registered U. S. ship or vessel the number denoting the total registered tonnage in tons of 100 cubic feet shall be deeply carved or otherwise permanently marked on the face of the beam in the main hatch, and shall be so continued; and if at any time it cease to be so continued, such vessel shall no longer be recognized as a registered U. S. vessel. Figure 7 shows the dimensions as taken and the calculations for the register tonnage computed for a sailing-vessel, in accordance with the act of Congress passed May 6, 1864.

FIG. 6.

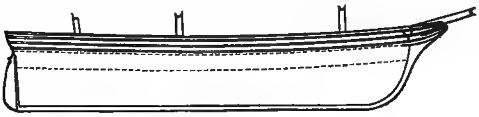
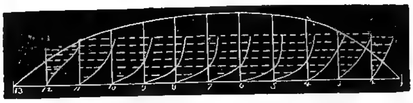


FIG. 7.



Areas of sections below tonnage deck.

Merchant Vessel (three decks).	Feet.
Length on tonnage deck from outside of planking at the bow to centre of rudder-post	179.58
Extreme breadth from outside of plank to outside of plank	42.
Hold from outside of tonnage deck to timber strake (6 inches allowed)	20.58

Dimensions for Calculations under Tonnage Deck.

Length from the inner planking at the bow to the inside of inner planking at the stern	176.83
This length divided into 12 equal parts (*Class IV.*), the common interval between areas will be	14.73
The middle depth exceeding 16 feet, the depth will be divided into 6 equal parts.	

Dimensions for Calculations above Tonnage Deck.

Mean length from inside of inner planking at the bow to inside of inner planking at the stern	179.16
Common interval between areas	14.93
Height between decks	6.67

The U. S. tonnage law approved May 6, 1864, is modified by Act of Congress, Aug., 1882, wherein reductions are to be made from the gross tonnage of 5 per cent. for crew spaces, and 75 per cent. of space or spaces for the proper working of the engines, boilers, and shaft passage in propellers, and 50 per cent. in side-wheel steamers. The sums of the reductions are taken from the gross tonnage if not exceeding 50 per cent. of the gross tonnage; the remainder is to be the net tonnage of such vessel.

Cubic Contents and Register Tonnage.

TONNAGE UNDER TONNAGE DECK.

Number of ordinate.	Multiplier.	Areas brought forward.	Product.
No. 1 or Bow.	1	0	0
2	4	262.7316	1050.9264
3	2	493.8064	987.6128
4	4	604.2114	2416.8456
5	2	641.0904	1282.1808
6	4	654.7072	2618.8288
7	2	645.9712	1291.9424
8	4	631.2992	2525.1968
9	2	590.7188	1181.4376
10	4	524.8172	2099.2688
11	2	418.3080	836.6160
12	4	251.6208	1006.4832
13 or Stern.	1	0	0
Sum of the products			17297.3392
Multiply by ⅓ common interval			4.91
			17297.3392
			1556760528
			691893568
Cubic contents			84929.935472
Divide by 100 =			849.29 tons.
Add tonnage above tonnage deck			386.23 "
Total tonnage (gross)			1235.52 tons.
Deduct 5 per cent. for crew space, Act Aug., 1882.			19.31
Net tonnage			1216.21 tons.

ABOVE TONNAGE DECK.

Mean length	179.16
Common interval bet. breadths	14.93
Height bet. decks	6.67

Number.	Multiplier.	Ordinate.	Product.
No. 1 or Bow.	1	.68	.68
2	4	29.25	117.—
3	2	34.50	69.—
4	4	36.—	144.—
5	2	36.58	73.16
6	4	36.83	147.32
7	2	36.83	73.66
8	4	36.58	146.32
9	2	35.83	71.66
10	4	34.83	139.32
11	2	33.—	66.—
12	4	29.25	117.—
13 or Stern.	1	0	0
Sum of the products			1165.12
Multiply by ⅓ common interval			4.97
			815584
			1048608
			466048
			5790.6464
Multiplied by height bet. decks			6.67
			405345248
			347438784
			347438784
Cubic contents above tonnage deck			38623.611488
Divide by 100 =			386.23 tons.
Gross tonnage			1235.52 tons.
Deduct 5 per cent. for crew space, as per Act of Aug., 1882			19.31 "
Net tonnage			1216.21 tons.

A knowledge of the position of the centre of gravity of a ship when fully equipped for service is of great importance. In any questionable or very novel design, in order to arrive at any conclusion as to the qualities of the vessel, the approximate position of the centre of gravity should be ascertained by calculation. The centre of gravity of any vessel may be found by experiment by altering *the line of support*—*i. e.* the vertical line through the centre of gravity and buoyancy—and obtaining the point in which two such lines intersect. (For rationale of this method of conducting the experiment see *Annual of Naval Institute* for 1874, it having been tried on the U. S. steamer Shawmut by the writer.) (See SHIPS OF WAR.) T. D. WILSON.

Na'val Sig'nals. It is a curious fact in relation to the general subject of signals that God himself deigned to prescribe a regular code for the Israelites. He said unto Moses, "Make thee two trumpets of silver, for the calling of the assembly." "And if they blow but with one trumpet, then the princes of thousands [generals of divisions] shall gather themselves unto thee. When ye blow an alarm, the camps that lie on the east parts shall go forward. When ye blow an alarm the second time, the camps that lie on the south side shall take their journey," etc. (Num. x.). For night-signals the Jews had an iron framework surmounting a pole. In this, as in a sort of chafing-dish, they used fire. (See Calmet, *Dict. of Bible.*) To signals made by these means, the trumpet and the fire signal, constant reference is made throughout the sacred writings. Beginning with the earlier profane historians, we find frequent mention made of signals used in the fleets of the ancients. (See Herodotus and Thucydides.) The emperor Leo VI. (A. D. 900), in his chapter on naval tactics (ch. xix.), describes almost exactly Myer's army code, concluding with the remark, "as the ancients did." None of the ancient writers describe their method of signalling by day. Flags were used by the Romans for making signals, but the signal code in which flags of various shapes and colors take part was first regularly systematized about the time of George III.

The code of day and night signals used in the U. S. navy is contained in two volumes—the *General Signal-book*, and the *Tactical Signal-book*. The first contains about 7000 words and sentences arranged alphabetically and regularly numbered. Resort is had also to a vocabulary of some 10,000 conversational words, to which is added an alphabet and a geographical list of nearly 11,000 places, each letter and word having its appropriate number. The *Tactical Signal-book* relates to the tactical formations of a fleet or squadron. Now, every vessel in the navy having a set of these books, it is only necessary, in order to signal a message from one ship to another, to indicate the volume and the number in that volume corresponding to the required words or sentences. To do this there are nine rectangular signal-flags representing the digits, one to stand for zero or ten, and three triangular pennants called *repeaters*, wherewith to make duplicate numbers. The sentence, for example, "Anchor in the order of sailing," may stand opposite No. 112 in the signal-book. To make this we first bend on signal-flag No. 1, next the first repeater, and lastly No. 2. Had the signal been No. 122, we should first bend on signal-flag No. 1, then No. 2, and lastly the second repeater, because the second number in the hoist is to be repeated; and so on. The lowest flag in the hoist represents the units. Besides the above-named flags there are the "cornet," the "danger-signal," the "guide-flag," the "annulling flag," the "telegraph flag," the "despatch," "quarantine," and "convoy" flags; also the "answering" pennant, the "preparatory," "interrogatory," "numeral," "geographical," and "position" pennants, their names suggesting their uses, save the cornet, which indicates a vessel's number in one case, and serves as a "recall" in another. *Night-signals* are made according to the system of Lieut. E. W. Very, U. S. N., by which fire balls or stars are shot to a height of about 400 feet. Only two colors are used, red and green, with which any desired signal may be made, a rocket being used to indicate a ship's number and as a signal of execution. *Fog-signals* are made by firing guns, blowing horns, the steam-whistle, and by sounding the ship's bell. The long and short blasts of the steam-whistle, by representing the two elements of the army code, furnish the means of signalling in thick weather.

The army code, as it is generally called, invented by Gen. A. J. Myer, U. S. A., has been adopted as part of the naval signal system. By this method the signalman spells each word of the message, shortening the process by abbreviations. The letters of the alphabet are represented by signs, each sign and its corresponding letter having an arbitrary number assigned to it. A, for example, may be represented by 22, B by 2112, C by 121, etc. The usual manner of making these numbers is by a flag attached to a staff and waved by the signalman. At night the staff is surmounted by a torch. The signalman, facing the point of communication and holding the staff in a vertical position to his front centre, dips his flag to the right to represent 1, to the left for 2, and to his front for 3, each dip describing the quadrant of a circle. Nos. 1 and 2 are made in a vertical plane at right angles to the line of communication; No. 3 in a vertical plane in that line. All the letters of the alphabet are made up of combinations of 1 and 2, No. 3 being used to mark the end of a word, and when repeated the end of a sentence or message. Two practised signalmen can communicate freely by this method, transmitting with accuracy and expedition long messages. Its great advantage consists in not requiring any apparatus or signal-book.

The International code of signals furnishes a species of universal language to the entire maritime world. One system of flags having been adopted by all nations, and each one having a signal-book common to all, printed in its own language, it is plain that on the meeting of two ships at sea signals may be made and understood whatever their respective nationalities. A full explanation of the system may be found in the preface of *International Code*, together with a description of "distance signals," "semaphore," "boat," and "weather" signals. S. B. LUCE.

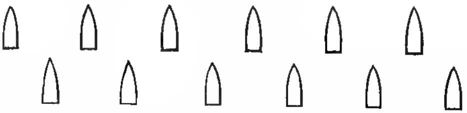
Na'val Tac'tics is the art of bringing ships into action or of moving them in the presence of the enemy. The subject may be divided into grand tactics, or the tactics of battles, and elementary tactics, or the tactics of instruction. The history of naval tactics can very properly be separated into three grand divisions. The first, which we may call the *oar period*, commences where tradition merges into authentic history, and ends about the time of the battle of Lepanto (1571), covering a period of about 2000 years. The second, or *sail period*, may be said to be embraced between Lepanto and the battle of Lissa (1866), lasting only 295 years, since which time we have known only the *steam period*, which is yet in its infancy. The sail period having completely passed away, and the tactics under oars being based upon the same general principles as steam tactics, we shall refer to the latter alone.

The key to any system of naval tactics is the line of battle. If in the line of battle the vessels are all "in line"—or, as it was called in the tactics under sail, "line abreast" and heading towards the enemy—we have the line of battle of the oar period, when war-galleys were armed at the bow with a spur (*rostrum*), and depended for success in battle on ramming and sinking the galleys of the enemy. This formation gives us also the line of battle of modern fighting ships when their principal offensive power lies in their ram (the *rostrum* of the ancients). If, however, the power of the ship lies in her broadside (artillery placed on the side of the ship), it is obvious that such ship must present her broadside to the enemy, in which case the line of battle must be the "line ahead," or, as it is now properly called, in "column." In addition to the above, there are certain "orders" in which it is convenient for a fleet or squadron to navigate the sea, to go in and out of port, to anchor, and to get under way. To change from one of these orders to another, or to change from any given order of steaming to the order of battle, constitutes elementary tactics. The following definitions have been adopted with a view to securing uniformity of movement in tactical evolutions: *the coefficient of speed* is the ratio between the number of revolutions per minute of the engines of a given ship and those of the flag-ship, when the speed of both is the same; *the coefficients of helm* are the ratios between the angles of a given ship's helm and those of the flag-ship's helm when describing the same circle.

Fleet Tactics under Steam.—Avoiding details, it may be stated briefly that an assembly of twelve or more ships of the line, or vessels of equal military value, takes the name of fleet, and is separated into three divisions of one, two, or three squadrons each, each squadron comprising not less than four vessels. The commander-in-chief commands the entire fleet; the second in command, the van division (or right when in line); the third, the rear division (or left when in line); and the fourth, the centre.

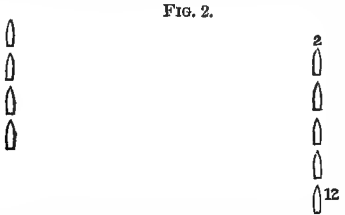
The line, the order of battle for iron-clads, rams, and torpedo-vessels, is formed as in Fig. 1.

FIG. 1.



Column, the order of battle for vessels whose power is in their broadside batteries. (Fig. 2.)

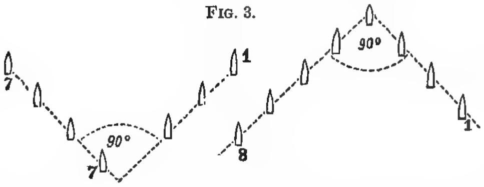
FIG. 2.



Double échelon orders offensive (salient angle) and defensive (re-entrant angle) for vessels for all descriptions. (Fig. 3.)

Vessels are said to be in direct single échelon when, steering the same course, each bears from its next astern at an

FIG. 3.



angle of 45° (four points) from the course; consequently the wings of a fleet in double échelon form a right angle. One vessel should always be designated by signal to act as guide, by which the movements of the other vessels are to be governed, and should wear a guide-flag at the main. When manœuvring, the vessel upon which a formation is made must necessarily be the guide. When the fleet is "in line" in natural order, the van squadron is on the right. (Fig. 4.) This was the line of battle formed by Callicratidas, the Spartan, at the battle of Arginusæ, his fleet being composed of 300 galleys. The fleet in column is in the natural order when the van squadron is leading.

FIG. 4.

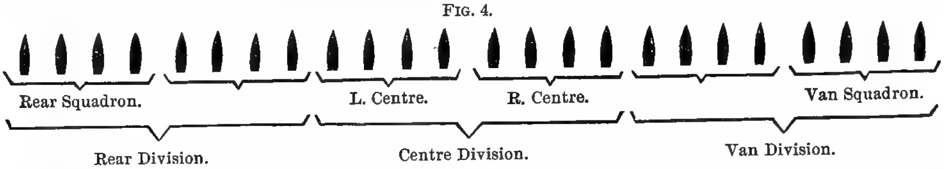
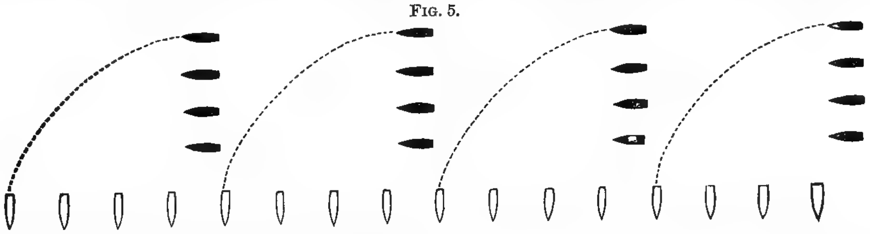


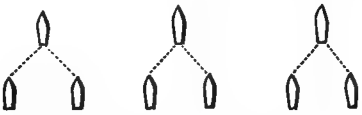
Fig. 5 exhibits the fleet in "column of squadrons" or of "fours." Should Signal No. 419, "By fours, left wheel," be made, each squadron on coming into line must find its place in the line without crowding or confusion. It was this evolution that was performed by Cnemus, commander of the Lacedæmonian fleet, in the battle in the Crisean bay, when he engaged the force under the skilful Athenian tactician, Phormio, then guarding Naupactus, the modern Lepanto. These two illustrations show how closely the fleet tactics of the oar-period resemble those of the steam-period. The single line, as in Fig. 4, is easily shattered or doubled up. It should therefore be re-enforced as in Fig. 1. As the single column may be broken and the rear-ships cut off, it, too, should be re-enforced as in Fig. 2. In any case, there should be a reserve (R, Fig. 2), ready to succor any portion of the fleet that may need it.

FIG. 5.



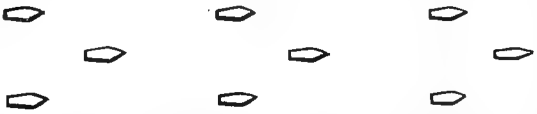
A strong order of battle is the French *peloton* formation, for facility of manœuvering, affording mutual support, etc. Three vessels act together as a unit. Thus, in Fig. 6, we have the *peloton* in line, and in Fig. 7 the column of *pelotons*. The *pelotons* may be formed in échelon also.

FIG. 6.



The simple orders are the line, column, and échelon; compound orders are those wherein the squadrons or divisions, considered as units, are ranged on one of the simple orders. (See *Naval Tactics*, by J. H. Ward, U. S. N.; *Fleet Tactics Under Steam*, by Com. F. A. Parker, U. S. N.; *Naval Warfare with Steam*, by Sir Howard Douglas; *Tactique Navale*, etc.) (See SHIPS OF WAR.)

FIG. 7.



S. B. LUCE.

Naval War College, established by order of the secretary of the navy, Oct. 6, 1884. The principal building on Coaster's Harbor Island, near Newport, R. I., has been assigned to its use. A course of study embracing the higher professional branches has been arranged, the principal of which are the science and art of naval warfare and international law. It is designed to make it a school of application also, where naval officers may practically apply those rules the theory of which they have acquired at the Naval Academy. This applies more particularly to ordnance, under which is included the manufacture of explosives, the use of torpedoes, and the management of torpedo-boats; navigation, nautical astronomy, and hydrography, and the use of the instruments belonging to those branches; and the practice of naval tactics. One of the objects of the war college will be the formation of a naval staff—a *corps* rendered necessary by the military character of modern naval warfare. S. B. LUCE.

Navari'no, a small town of Greece, in the province of Messenia, Morea, on the Bay of Navarino. Here the allied Russian, French, and English fleets utterly defeated the Turkish and Egyptian fleets on Oct. 20, 1827. Pop. about 2000.

Navarre', province of Spain, bounded N. by the Pyrenees, which separate it from France, E. and S. by Aragon, and W. by the Biscays. Area, 4069 square miles. Pop. 318,687. The whole country is mountainous, traversed by branches of the Pyrenees, whose tops generally are bare and naked, while their sides are covered with forests of beech trees or afford excellent pastures where numerous cattle and sheep are reared. The mountains, which contain much iron and salt, enclose many beautiful and fertile valleys, such as that of Roncesvalles and Roncal, which produce wheat, olive oil, figs, grapes, walnuts, and many varieties of fruits and legumes. The inhabitants are an almost pure Basque race, speaking the Basque language, and very jealous of their old customs and privileges; they are a hardy, industrious, hospitable, and honest people. Besides agriculture, cattle breeding, and manufactures of iron, glass, paper, and soap, they are much engaged in hunting and smuggling, the mountain-forests abounding in bears, wolves, deer, and all kinds of game, and the dangerous, almost inaccessible, passes which connect the country with France offering too alluring opportunities for this kind of mercantile enterprise. Navarre, which successfully resisted the invasions of the Saracens, formed an independent kingdom until Ferdinand and Isabella conquered it in 1512 and annexed it to Aragon; it still preserves many peculiar privileges, however.

Navarre'te, de (DOMINGO FERNANDEZ), b. at Peñafiel, Spain, in 1610; became a monk of the Dominican order; went to the Philippine Islands in 1647; became instructor in theology at Manila; went to China in 1659 as superior of his order, and penetrated into the interior, but was arrested during a persecution and taken to Canton, whence he escaped to Macao; sailed for Europe 1673, and immediately proceeded to Rome and entered complaint to the papal court against the practice of the Jesuits in China of accommodating the Christian religion to the beliefs and superstitions of the natives. He published a valuable work, *Historical, Political, Ethical, and Religious Treatises upon the Chinese Monarchy* (Madrid, 1676), of which two other volumes were written, but never allowed to appear; was appointed archbishop of Santo Domingo 1678, and d. there in Dec., 1689. An English translation of his *China* appeared in Churchill's *Collection of Voyages and Travels* (1704).

Navarrete, de (Martino Fernandez), b. at Abalos, Spain, Nov. 9, 1765; entered the Spanish navy 1780; participated in the attack upon Gibraltar Sept., 1782; served against the Moorish and Algerine pirates, and subsequently against the French naval forces in the Mediterranean; was in 1797 appointed to an office in the ministry of marine, and spent many years in collecting documents illustrative of the early annals of Spanish maritime discovery. His labors resulted in the publication of an important work, *Coleccion de los Viajes y Descubrimientos que hicieron por mar los Españoles desde fines del Siglo XV.* (5 vols., 1825–37), of which the first two volumes were the basis of Irving's *Life of Columbus.* Navarrete was a distinguished member of the Spanish Academy, and devised the system of orthography adopted by that body in its dictionary. D. at Madrid Oct. 8, 1844. Among his other works were a treatise on Spanish discoveries on the Pacific coast of North America, prefixed to the *Voyage of the Sutil and Mexicana on the Coasts of California* (1802), a *Life of Cervantes* (1819), a *Dissertation on the History of Spanish Navigation* (1846), and *Spanish Maritime Library* (2 vols., 1851), the two latter works posthumous; and was the projector and first editor of the valuable series, *Collection of Unpub. Docs. for the History of Spain,* of which 5 vols. appeared 1842–44, and which has been extended since his death to many volumes.

Navaso'ta, R. R. junction, Grimes co., Tex. (see map of Texas, ref. 4–I, for location of county), on the Houston and Texas Central R. R., 70 miles N. of Houston, has an academy, a seminary and several good schools, a number of cotton-warehouses, flouring-mill, cotton-seed oil-factory, carriage and wagon factory. Pop. in 1870, 1509; in 1880, 1611.

Na'vesink (or **Neversink**), **Highlands of,** a range of hills on the S. side of Sandy Hook Bay, in Monmouth co., N. J. They are important landmarks to ships approaching New York. The highest point, Mount Mitchell, is 282 feet high. Two first-class lighthouses, 53 feet high, stand 100 feet apart on ground 195 feet high. The south-easternmost tower is in lat. 40° 23′ 43″ N., lon. 73° 58′ 49″ W. Both show fixed white lights.

Na'veu, a strongly-marked variety of the turnip, having a white, parsnip-shaped root and a strong flavor. It is common in cultivation in some parts of Europe, but is seldom seen in the U. S. or in Great Britain.

Navigable Streams. See International Law, Summary, by Pres. Theodore D. Woolsey, S. T. D., LL.D.

Naviga'tion [Lat. *navigare,* "to sail"], the art which instructs the mariner how to proceed from port to port and across the ocean with safety and despatch. To ancient Sidon belongs the credit of having been the pioneer in this important branch of human knowledge; but, passing over the history of its development to its present advanced state, this article simply proposes to show how a vessel is navigated in our day, referring the reader who desires a complete understanding of the theory and practice of navigation to Bowditch's *Navigator,* Chauvenet's *Spherical and Practical Astronomy,* and Coffin's *Navigation and Nautical Astronomy.*

Before going to sea care should be taken that the ship is provided with a good reflecting instrument (a sextant or octant), a chronometer whose error and rate are carefully determined, a compass fitted with attachments for observing the azimuth of the sun, a nautical almanac for the current year, and a chart of the ocean to be traversed. When the cargo is on board and stowed, and the compass is mounted in the position in which it is to remain while in use, the ship should be *swung* for the local deviation of her compass, full directions for which will be found in the admiralty *Manual of Compass Deviation.* Then, when passing from the bay or harbor into the ocean, the bearings of two landmarks whose positions are noted on the chart are taken with the compass, and these compass-bearings having been corrected for both local deviation and variation, the true bearings are laid down on the chart, the lines passing through the points observed. The intersection of these two lines gives the position of the ship for the instant when the bearings were noted. This is called taking *a departure.* The course is shaped, and upon the log-slate is recorded for every hour the compass-course steered, the rate of the ship found by the *log,* and the amount of leeway made. We will suppose it now to be daybreak. At or about 8 A. M., or better still when the sun is on or nearest to the prime vertical (that is, bears most nearly E.), and yet has sufficient altitude, say 10°, to avoid the irregular refraction near the horizon, its altitude is observed with the sextant, and the instant of observation is noted by the chronometer or by a watch carefully compared with the chronometer. Then, with the ship's latitude and longitude at the time of taking the departure, and with the courses and distances sailed corrected for variation, leeway, and deviation up to the time of taking the observation, the ship's position by *dead reckoning* is found. Now, from the observation we have the altitude of the sun, from the nautical almanac its declination, and from the dead reckoning the approximate latitude, data which give the three sides of the astronomical triangle and the hour-angle of the sun or the local apparent time may be readily computed. By comparing the local with the Greenwich time, as given by the chronometer, the longitude *by observation* is obtained. At the same time at which the observation is made the bearing of the sun by the compass should be noted, and with the same data as above its *true* bearing may be computed; and by comparing the compass-bearing with the true the combined variation and deviation of that compass for that particular heading of the ship is obtained.

Near noon the observer commences to observe again the altitude of the sun, and continues to do so as long as the altitude increases, and notes the maximum altitude which it attains. In technical language the body is said to *dip* when its altitude commences to decrease. The maximum altitude is assumed to be the meridian altitude, which is correct to within very small limits. With this meridian altitude (corrected as altitudes taken at sea have to be for semi-diameter, parallax, dip, refraction, and index error), and with the declination of the sun for that instant, the declination of the zenith is readily found, which is the latitude of the place. The reckoning worked from the departure gives the latitude and longitude by dead reckoning; from the time of the A. M. sight, gives the longitude observed; and the meridian altitude gives the latitude observed. If there is any difference between the ship's position by observation and dead reckoning, it is ascribed to current, and its amount and direction are found by computing the bearing and distance of the position by observation from the position by reckoning. From the latitude and longitude observed as worked up to noon the reckoning begins again. In the afternoon the observation for longitude and for variation is repeated, and these operations continue throughout the voyage.

But should the ship be a long time out of sight of land, or should any accident befall the chronometer, then the longitude is obtained by a "*lunar.*" The moon's angular distances, as seen from the earth's centre, from the sun, from the principal planets, and from several selected stars, are given in the nautical almanac for every three hours of Greenwich mean time. If, then, we measure with our sextant carefully any of these angular distances, we find by appropriate reductions what that angle would have been had we been at the centre of the earth. Then, if we compare our reduced angle with the one given for that body observed in the almanac, we find the Greenwich mean time; and having at the same time taken the observation for the local time, the difference between the two times is the longitude in time from Greenwich. The calculation for time by a "lunar" is long and laborious; the several corrections have to be made with great refinement, and the observation with great accuracy; so that "at the present time lunar distances are used not so much for finding the longitude as for finding the Greenwich mean time with which to compare the chronometer. They may thus serve as checks upon it, which in protracted voyages may be much needed. If the chronometer correction thus determined agree with that derived from the original correction and rate, the chronometer has run well, and its rate is confirmed; if otherwise, more or less doubt is thrown upon the chronometer according to the degree of accuracy of the lunar observation itself. If the discordance is not more than twenty seconds of time, it is well still to trust the chronometer, as the best observed single set of distances may give a result in error to that extent. If it is larger, then by repeated measurements of lunar distances, differing in magnitude, and especially on both sides of the moon, and carefully reduced, the chronometer correction can be found quite satisfactorily."

Should the sun be obscured, the stars or the planets can be resorted to for determining the longitude by chronometer, and the latitude; but the difficulty of seeing the sea-horizon at night throws more or less doubt on all observations made after dark. And further, as the body observed for latitude may just at the time of its meridian passage be obscured by clouds, it is often necessary to resort to another method than the one noticed for finding the latitude; and appropriate formulæ have been deduced for this by considering in the astronomical triangle the co-altitude, the co-declination, and the hour-angle, the last of which at sea is always in more or less doubt; but small errors in the hour-angle when the angle itself is small producing but slight errors in the latitude, good results can be obtained by taking, under most circumstances, the observation within an hour of the time of transit.

So far we have treated of the methods of finding the position of a point on the earth's surface by the two coordinates, *latitude* and *longitude;* and therefore in these methods the required position is determined by the intersection of two circles, one a parallel of latitude and the other a meridian. This position can be determined by circles oblique to the parallels of latitude and the meridians by a method which, while long known in principle, owes its value as a nautical method to Capt. Thomas H. Sumner, who published a book on the subject in Boston in 1843, and is now known as "Sumner's Method." It is, that if an altitude of the sun or any heavenly body be observed and reduced to the *true* altitude, and the Greenwich time noted, and if the position of the body at that time be plotted by its hour-angle from Greenwich and declination on a globe, and if from this as a centre a circle be described with a radius equal to the body's zenith distance, then the observer is situated at the instant of observation somewhere on this circle, and his place is as well determined as if either his latitude or longitude was alone known. Now, if some time after, the observer remaining stationary, the same body be again observed, and a second circle be plotted as before, then, as he is now at the same time on the circumferences of two circles, he must be at one of their intersections. As the observations are so taken as to make these intersections far apart, no difficulty is experienced in knowing at which intersection the observer is situated, and his position is well determined. Should the observer have changed his position between the sights, his first zenith distance can, by appropriate reductions, be changed to what it would have been had it been taken from the same position as the second, and the intersection is then his place at the time of the second observation. Instead of observing the same heavenly body at different times, two bodies may be observed at the same time. The scale upon which the largest globes are constructed is much smaller than that of the working charts used by navigators. But on a Mercator's chart the circle of position will be distorted by the character of that projection, and can only be laid down by points; and as the line in practice is projected on these charts instead of on globes, it is necessary to select that part of the circle which embraces the ship's latitude. Then, by assuming latitudes embraced within this belt, and computing as in the sight above noticed the corresponding longitudes, the points of the circle of position where it crosses these assumed latitudes are fixed; and when plotted on the chart a line called the *line of position* may be traced through them. Should this be done with the second circle, it would give a second *line of position*, and their intersection when prolonged, if necessary, would be the position of the ship at the second observation. In practice, it is customary to select two latitudes only, embracing between them the ship's probable position, and to find two points of the circles of position as above, and to project them on the chart. Each pair of points being joined by a straight line, the intersection of the two lines is very nearly the ship's position. It is evident that the point of intersection is most accurately determined when the direction of the two lines is most nearly at a right angle to each other; and as the *heavenly body's bearing is at right angles to the line of position*, the second observation should, if possible, be taken when the body has changed its azimuth about 90°.

The most useful application of the *line of position* is in finding the bearing of the port in approaching land. For instance, suppose that a single line has been determined as above and plotted on the chart, and that it passes 20 miles N. of the port which you wish to enter. Now, the ship is somewhere on this line, but the distance from the port may be unknown. Let us sail due S. for 20 miles, and through the ship's new position draw a line parallel to the first. As the magnetic direction of the two lines will be the same, and as the second line passes through the port, the course to the port from the ship is known, and from the character of the bottom or the depth of water obtained by the lead the distance may perhaps be settled.

In complying with the requirements of *speed* in making passages it is necessary to consider the winds and currents to be encountered by the way. "These control the mariner in his course, and to know how to steer his ship on this or on that voyage so as always to make the most of them is the perfection of navigation." The voluminous works of Horsburgh, Findlay, Kerhallet, and Maury furnish this information, and especially the wind-charts of the latter, which, with their accumulation of data, the result of persistent industry continued through many years, have now been graphically represented by the British board of trade, and leave but little to be desired in that direction. ALEXANDER H. MCCORMICK.

Navigation, Freedom of. While the jurisdiction over the sea, near the land, and within bays and gulfs enclosed within not very remote headlands, is conceded to the territorial sovereign, it is admitted now on all hands that the open or high sea is common to all nations. Yet this rule has not always been admitted. Thus, Portugal claimed the exclusive use of the African seas, together with the empire of Guinea, under a bull of Pope Nicholas V., given out in 1454. The pope's claim to do this seems to have been connected with his being the vicar of Christ, to whom the heathen were given "as an inheritance and the uttermost parts of the earth as his possession." The bulls of Alexander VI., issued in 1493, soon after Columbus had discovered America, carried out this assignment of parts of the world still farther. One of them granted to Spain the lands lying W. of a meridian drawn 100 leagues W. of the Azores, and another divided the occupation of the seas between Spain and Portugal. Other nations, especially Protestant ones, paid no regard to these grants, but the English in the seventeenth century claimed property in the narrow channels adjoining Great Britain, and on that account demanded that especial respect should be paid to their flag. This brought on war with Holland. In the peace of 1674 it was stipulated that even fleets should furl the flag and lower the topsails in honor of any English vessel of war between Cape Staten in Norway and Cape Finisterre in North Spain—quite beyond the claim of jurisdiction. Russia at a much later date claimed exclusive jurisdiction to the Pacific, N. of the 51st degree of latitude, on the ground that its territory, and no other, bordered on the ocean beyond that line. But this claim was abandoned in treaties made with the U. S. in 1824, and with Great Britain in 1825. All such claims may be considered as being now mere matters of history. THEO. D. WOOLSEY.

Navigation, Inland (Canals). Among the ancients, when civilization was confined almost entirely to the neighborhood of the ocean, inland navigation was very limited, and means of overcoming differences of elevation were unknown. The first canals were built for purposes of irrigation, and their enlargement to form navigable channels was an afterthought. The royal canal of Babylon, so enlarged about 600 B. C., is among the earliest recorded. Among the projects for connecting rivers and oceans by canals among the Egyptians, Greeks, and early Romans, we may mention the canal of Marius (B. C. 102; see FOSSA MARIANA), connecting the lower Rhone with the Mediterranean; the canal of Alexandria (B. C. 332), by which the port of the new city founded by Alexander was put in navigable communication with the Nile, all the mouths of which were obstructed by impassable bars. About the Christian era the emperor Claudius, on account of the obstruction of the port of Ostia, connected the Tiber with the Mediterranean by a short canal, and the new ports of "Claudius" and of "Trajan" were made at its termini. About the fourth century the Romans made improvements connecting rivers in Lombardy, and in the fifth century Odoacer built a canal from the sea to the Mentone, above Ravenna. Charlemagne in the eighth century began canals joining the Main and the Rhine with the Danube, and the ocean with the Black Sea. In China the Grand Canal, joining the Pei-Ho and the Yang-tse-Kiang, 500 miles apart, was built in the eighth century. This great work, itself about 650 miles long, makes, with its connecting rivers, an inland navigation of nearly 1000 miles. Its depth is 5 to 6 feet. Changes of level are surmounted by drawing the boats up inclined planes. The boats are either rowed or dragged by hand. Several canals were built in Holland and in Italy from the eleventh to the fifteenth century. About 1400 A. D., in Spain, the Moors built a canal from Granada to Cadiz, but after their expulsion internal improvements languished. In the early part of the sixteenth century the Ebro and Castile canals were partly built, but not completed. The spirit which dominated this nation is thoroughly exemplified in a decree of the council about 1680 regarding a project for improving certain rivers, which stated that "if it had pleased God that these rivers should have been navigable, he would not have wanted human assistance to have made them such; but that, as he has not done it, it is plain that he did not think it proper that it should be done. To attempt it, therefore, would be to violate the decrees of his providence and to mend the imperfections which he designedly left in his works." In 1570 the Spaniards began a canal in South America, from Cartagena to the river Magdalena, 87 miles, including various lagunes on its route, and 14 miles of bay and harbor. It has been badly neglected, but efforts are making to repair it.

In 1481 the invention of locks for passing from one elevation to another rendered canal navigation much more generally available. This invention, made by two engineers of Viterbo in Italy, at once gave an impetus to canal construction. Several important channels of communication were opened in Italy. The first French canal was that of Briare, built 1605–42. The Orleans canal was built in 1675. The greatest work of that age was the Languedoc canal, from Narbonne to Toulouse, 150 miles, its summit-level being 500 feet above the sea (built 1667–81). In 1700, Peter the Great began the immense system of canal navigation in Russia which connects St. Petersburg with the Caspian Sea and inland districts, forming a continuous navigation of 1434 miles. Charlemagne conceived the idea of connecting the Danube and the Main by a canal, but the project was not carried out until 1836–46, by Louis I. of Bavaria. The canal is 108 miles long, and its summit-level is 650 feet above the Main and 270 feet above the Danube. The Danish canal, 100 miles long, finished in 1785, unites the North Sea and the Baltic. In Prussia water-communication is had by canals and river improvements between Hamburg and Dantzic. The Gotha canal in Sweden, one of the largest European works of this class, was planned in 1716, the first part opened in 1810, and completed in 1832. It crosses Sweden from Stockholm to Gothenburg, is 280 miles long, and at its greatest elevation is 308 feet above the sea. There are altogether 800 miles of canals in Sweden. From a very early period extensive canals were used in India for purposes of irrigation. Some of these have in later times been enlarged for navigation. A canal for irrigation and for navigation by steamboats from Soonkelassa to Cuddapar, 190 miles, was built in 1861–71.

In England the Romans built a canal from the Nyne to the Witham, near Lincoln. Internal navigation was the subject of legislation as early as 1423, and there are still existing locks on the river Lee improvement built in 1570. At Exeter, Hugh Courtenay, earl of Devon, in 1316, in revenge for an affront, ruined the navigable approach to the town by dams in the river. Parliament passed an act for creating a navigable canal to the city in 1531, but the work was not begun until 1585, and completed in 1675. In 1758 the duke of Bridgewater procured a grant from Parliament for the construction of canals, and for forty years there was as great a rage for canals as in the second quarter of the present century for railroads. The canal excitement continued, somewhat subdued, however, for thirty years during this century. South of Durham no place in England is more than 15 miles from navigation. During the same period several short canals were constructed in Scotland. The Forth and Clyde Canal, first projected by Charles II., was constructed after plans of Smeaton in 1768–89. It is 35 miles long, and surmounts a summit of 160 feet by 39 locks. The CALEDONIAN CANAL (which see) is properly classed under the head of *ship-canals*. In Ireland the height of extravagance was attained. The Grand Canal from Dublin to Ballinasloe, 164 miles in length with its connections, 40 feet wide, and 6 feet deep, was built in 1765. Immense sums were thrown away in carrying this canal across the Bog of Allen. In 1792 the Royal Canal, from Dublin to Tormansburg, 92 miles, was built, of excessive size and nearly parallel to the Grand. The result is, that neither of them has ever produced any revenue. In Great Britain 4713 miles of navigable canals exist. None have been built since 1852.

The first canal in America was built in 1793 around the falls of the Connecticut River at South Hadley, Mass., Benjamin Prescott of Northampton, subsequently the superintendent of the U. S. armory in Springfield, being the engineer. The Middlesex Canal Co. (for a canal from Boston to Lowell) was not incorporated until a year or more afterward. For this earliest work of "internal improvement" recourse was had—by no means an unusual case since—to Holland; and this first "placing" of funds in our canal-stocks returned as little interest on capital as many subsequent larger operations. The boats were carried up and down an inclined plane in a car or caisson filled with water, and hauled by cables operated by water-wheels. The canal was subsequently lowered four feet, the cars and cables discarded, and the ordinary canal-lock introduced, under the direction of Ariel Cooley, a man of a great deal of energy and ingenuity. The canal around Turner's Falls, on the Connecticut River, was built by Capt. Elisha Mack in 1793–96. This canal is three miles in length. These works are now used only for water-power. The valley of the Mohawk, affording opportunity for connecting the lakes and the Hudson, early attracted attention. Gen. Washington examined it during the Revolutionary war. In 1792 the Western Inland Navigation Lock Co. was formed. By 1797 it had completed 6 miles of canals around rapids on the Mohawk, making a passage for 15-ton boats from above Little Falls to Lake Ontario. The State of New York bought their works. In 1808, Simeon De Witt, the surveyor-general of New York, was directed to survey a route for a canal from the Hudson to Lake Erie. James Geddes, the first engineer appointed by him, made his report on Jan. 20, 1809, on canal routes from Oneida Lake to Oswego and to Lake Erie. On Mar. 13, 1810, the legislature appointed a canal commission of seven members, at the head of which was Gouverneur Morris, to whom is attributed the first suggestion of the Erie Canal in 1803. These commissioners made several reports, but no decisive action was taken until Apr. 7, 1816, when a law was passed authorizing the construction of the Erie and Champlain canals. The first ground was broken at Rome, N. Y., July 4, 1817, and the canal was opened on Nov. 4, 1825, from Buffalo to Albany, 352 miles. (See CLINTON, DE WITT.) As first constructed, it was 40 feet wide at top, 4 feet deep, and was navigable for 76-ton boats. Between 1835 and 1862 it was enlarged, and is now generally 70 feet wide, 7 feet deep, and navigable for boats of 240 tons burden. Before the construction of this work the time occupied between Buffalo and Albany was 20 days, and the cost of freight $100 per ton. The opening of the canal reduced the time to ten days, and the cost to $10 per ton, and afterward to $3 per ton, from Buffalo to New York. An immense impetus was given to the cause of internal improvements, and enormous projects were undertaken by several of the States. Pennsylvania and Maryland began to connect their tidewaters with the Ohio River; Virginia undertook the construction of two canals from Chesapeake Bay to the Ohio; Ohio and Indiana strove to connect the lakes with the Ohio River, and Illinois to join the lakes and the Mississippi.

Several canals in Pennsylvania had been undertaken by private companies between 1790 and 1816, but little was done by them. Between 1816 and 1824 the Union Canal, 82 miles long, from Reading to Middletown on the Susquehanna, was constructed. In 1826 the State began the construction of water-routes from Pittsburg to Philadelphia and to Lake Erie, and built 608 miles of canals and navigable feeders. The main route across the Alleghany Mountains was broken by a portage railroad 37 miles long, and the eastern terminus was on the Susquehanna, 82 miles from Philadelphia. The improvement of the navigation of the Lehigh River was caused by the necessity for cheap transportation of coal to tidewater. Two iron manufacturers at the Falls of Schuylkill, near Philadelphia, discovered in 1817 that anthracite coal could be made available for smelting, and to obtain a supply cheaply leased a large tract of coal-land near Mauch Chunk, and obtained a charter for improving the Lehigh River. This was done first by wing-dams, afterward by pools and sluices, the coal being carried in "arks," which were built in the woods and broken up at their destination. In 1827 the State began the Delaware Division Canal from Easton to Philadelphia, and the Lehigh Company constructed a slackwater navigation by dams and locks from White Haven to Easton. On June 4, 1862, a heavy freshet carried away eighteen out of twenty dams between Mauch Chunk and White Haven, and these have never been restored. Below Mauch Chunk the damage done was repaired. There were built altogether in Pennsylvania 974 miles of canal, of which 934 miles are still in operation.

Ohio built two canals of limited capacity from the Ohio River to Lake Erie, and others of minor importance, 795 miles in all. Indiana, conjointly with Ohio, built the Wabash and Erie Canal from Toledo to Evansville, 461 miles. Mismanagement and neglect have brought much of this to ruin, and the lower portion of it has been for some years abandoned. In Virginia, a board of public works, established in 1816, furnished State aid to internal improvements. A favorite project since the days of Washington has been a water-route from the James River to the Ohio *viâ* the Kanawha. (See JAMES RIVER AND KANAWHA CANAL.) This route is the most important one for water-transportation between the West and the Atlantic seaboard south of the Erie Canal. It is peculiarly valuable from the fact that it would be available at the season of the year when the need for transportation of Western products is greatest and the Northern water-routes are closed by ice. It involves the piercing of the largest tunnel ever yet projected, 7⅘ miles long, under the Tuckahoe and Katis mountains, at an elevation of 1700 feet above the sea. As compared with a double-track freight railroad over the same route, while the cost of the water-line would be double, its carrying capacity would be also double, and the maintenance and running expenses less.

One of the very earliest projects was the connection of the Potomac and Ohio rivers by a navigable canal; and the improvement of the Potomac River (navigable by ships to Georgetown) to the foot of the Alleghanies was one of the first steps considered. In the year 1784 a charter was granted for this purpose by Maryland and Virginia conjointly; a company was organized, which up to the year 1822 had expended $730,000 in locks, dams, etc. The result, however, was unsatisfactory, and after a prolonged investigation the substitution of an independent canal from Georgetown to Cumberland was recommended (1823) by the engineers, Messrs. Moore and Briggs, appointed by the two States, 182 miles long, 30 feet wide at surface, and 3 feet deep, with 63 locks, at an estimated cost of $1,575,094. About this time the general government inaugurated its so-called system of internal improvements by act of Apr. 30, 1824, and a board of engineers was appointed, by whom the entire route to the Ohio at Pittsburg was surveyed, and the board rendered a report Oct. 23, 1826, estimating for 341 miles of canal from Georgetown to Pittsburg, to be 48 feet and 33 feet wide at surface and bottom, 5 feet deep, and to cost $22,375,081. The amount of money required was inordinate for that early day. In 1829 the eastern division was authorized to be built from Alexandria to Cumberland, Congress providing a subscription for 10,000 shares of stock; the city of Washington, 10,000; Georgetown and Alexandria, 5000; and the States of Maryland and Virginia, 7186 shares; the remainder being taken by individuals. The first blow struck for the actual construction was July 4, 1828, by the President of the U. S., John Quincy Adams. The dimensions were increased to 60 and 42 feet surface and bottom width, depth to 6 feet. The aqueduct by which it was carried across the Potomac at Georgetown, constructed (1832–40) under direction of Major Turnbull, U. S. Engineers, was one of the most important engineering constructions at that date undertaken in this country. The main portion consists of a wooden trunk resting on twelve masonry piers founded by coffer-dams on rock averaging 28 feet, and toward the western shore 40 feet, below the surface, covered by 15 to 20 feet of mud. (See *Reports on the Construction of Piers of the Aqueduct*, etc.) Up to the year 1845 there had been expended on the canal $9,502,345, and subsequently about $1,500,000; besides, charges of interest, loss on sale of bonds, have carried the aggregate expenditure to $15,000,000 and upward. Its main business has been the transport of coal to tide-water at Georgetown, of which it transports by recent statements (*Poor's Manual*) about 750,000 tons per annum. The Baltimore and Ohio R. R. transports double that quantity. The "eastern division" (from Georgetown to Cumberland), as it now exists, follows the N. side of the valley of the Potomac, to the eastern foot of the Alleghany Mountains, at Cumberland, Md. It departs from the immediate valley of the river by a cut-off and a tunnel of 3118 feet in length at Paw Paw Bend, 27 miles E. of Cumberland. The distance saved by this tunnel is about 6 miles. The Cumberland is 613$\frac{3}{4}$ feet, and is overcome by 74 locks, varying from 6 to 10 feet lift, with chambers 100 feet long and 15 feet wide. From Georgetown to Harper's Ferry, 60 miles, the canal-surface is 60 feet wide, and from Harper's Ferry to Cumberland it has an average of 70 feet width, the depth throughout its length being 6 feet. The canal is supplied with water from the Potomac River by means of seven dams thrown across the river at suitable distances. The boats used on this canal are ordinary flat-bottomed boats from 90 to 95 feet long and 14 feet wide, drawing 5$\frac{1}{2}$ feet when loaded. They carry from 110 to 115 tons of 2240 pounds. The terminus of the canal at Cumberland is 20 miles from the coal-field by the Cumberland and Pennsylvania R. R., its principal connection therewith. Surveys were made in 1873 to determine the practicability and cost of carrying out the original project, continuing the canal to Pittsburg, and making this one of the great *through lines* of transportation, showing that this route can be made available by using inclined planes in place of locks, and piercing a tunnel 3$\frac{75}{100}$ miles long an elevation of 1944 feet above the tide-water. From the summit the descent to the westward would be 1000 feet in 55 miles, connecting there with slackwater navigation.

In the early years of Western settlement, when the great rivers formed the *only* vehicle of transportation, an obstruction to navigation so grave as that made by the rapids known as the Falls of the Ohio at Louisville could not fail to compel early attention. In 1825 the State of Kentucky authorized a private corporation to construct a lateral canal (known as the *Louisville and Portland*), which was completed in 1830 at a cost of about $1,000,000. Length, 1$\frac{7}{10}$ miles; width, 64 feet; with three locks, each 200 feet long and 50 feet wide; lift, 8$\frac{2}{3}$ feet. In 1860 an enlargement, planned by T. R. Scowden, was undertaken, and $1,800,000 expended, the civil war interrupting the work. The Ohio being a great national highway, this work was deemed a proper object for governmental care, and in 1868 was placed in charge of the chief of engineers U. S. A., and carried on by appropriations of public money by Congress. A new enlarged canal was opened to navigation in Feb., 1872, and entirely completed Nov., 1873; the extra cost of enlargement (including the $1,800,000 already mentioned) was $3,250,000.

The present canal leaves the Ohio River in front of the city of Louisville, passes in a westerly direction around the falls, and enters the river just above Portland, Ky. Its length is 2$\frac{1}{10}$ miles, and its general width 86$\frac{1}{2}$ feet. The upper entrance is 400 feet wide, and suitable turn-out basins are provided. A dam on the crest of the falls will give, when completed, a minimum depth in the canal of 6 feet. The depth depends upon the stage of water in the river; the least depth being 6 feet, and the greatest depth known about 42 feet 8 inches. The great expense of this work is due to the fact that its bed is cut through hard limestone rock, and its sides are protected by stone walls, above which rise earthen parapets to a height of 44 feet above canal bottom and 1$\frac{1}{2}$ feet above highest known flood. A set of guard-gates at the head provides for shutting off water when necessary. At the lower end are the old locks, still preserved as originally constructed, and the two new locks which form the outlet of a short branch. These new locks are the pioneers of their size in the world; they have lifts of 12 and 14 feet, their length between mitre-posts is 372 feet, available length 335 feet, width 80 feet.

The guard- or flood-gates at the head of the locks are 47$\frac{2}{3}$ feet long and 46 feet 11 inches high. The upper lift-gates are 47$\frac{2}{3}$ feet long, 24$\frac{3}{4}$ feet high, and built of a combination of oak and pine. The middle and lower lift-gates are 47$\frac{2}{3}$ feet long, 31 feet 2$\frac{3}{4}$ inches and 27 feet 2 inches high, respectively. They are built entirely of oak, except planking, which is of pine. The heavy pressure brought on these gates and their enormous size (the weight of each in the middle set being 89 tons) necessitate great strength.

Except during high water, when there are ten feet or more at the head of the falls, the entire commerce of the Ohio River passes through the canal. During the year 1883, 4954 boats passed through the locks.

The Chesapeake and Delaware bays were connected in 1824–29 by a canal through Delaware 13 miles long. The summit-level, 46 feet above tide and 10 miles long, is supplied by pumps. Surveys have been in progress for a few years for a new canal between these bays. This work was aided by the U. S. government. In New Jersey the Delaware and Raritan Canal, built in 1831–34, 43 miles long, connects the Delaware and Raritan rivers, making an inland navigation from New York to Philadelphia. The first application of steam-power to operating locks was made in 1868 on this canal by Ashbel Welch, member of Am. Soc. C. E., and increased the capacity of the canal 50 per cent. The Morris Canal, 101 miles long, built about 1830, connects the coal-regions of Pennsylvania with New York harbor. In the Southern States there are no important canals, though about 250 miles in all have been built. (See ILLINOIS AND MICHIGAN CANAL, CANALS OF CANADA, and JAMES RIVER AND KANAWHA CANAL.)

The speculation in canals which began in 1820–21 was checked by the introduction of railroads, and, of more than 5000 miles projected and begun, less than 3000 were built. A very small proportion of these have paid interest on the money invested. The New York State Canals were built by the State government. Of 906 miles built, 514 miles are operated by the State at an annual expense of about $700,000. No tolls have been collected since Jan., 1883. For the twenty-one years 1862–82 the average tonnage was 5,600,782 tons, the gross expenses were $26,545,818, and the gross receipts were $56,795,944. The net profits of all the canals during the twenty-six years ending 1872 were equivalent to an annual dividend of 3$\frac{2}{10}$ per cent. per annum on their cost. During the same period the Erie Canal proper paid 4 per cent. on its cost, and for the whole 52 years of its operation has paid 3$\frac{1}{2}$ per cent. per annum on the cost of construction. The actual expense of the canals to the State up to Jan., 1884, has been $28,971,554 in excess of all revenue derived therefrom. This sum represents the premium which the people of New York have paid in taxes to secure and encourage the use of these waterways for purposes of transportation—the equivalent of an annual subsidy of about $500,000. The Ohio canals, built by the State government, were a continual source of expense, and in 1861 were leased to private parties for an annual rental of about one-tenth of 1 per cent. on their cost.

The cause of the failure to be remunerative of through routes of canal transportation has apparently been the insufficient channel dimensions which for economy were given them, and the consequent small loads which could be carried. Experience has proved that with an enlarged section of canal prism, accommodating larger boats, the carrying capacity is three times as great, while the towing expenses are increased less than 50 per cent., making the cost per ton per mile on a large canal 41$\frac{1}{2}$ per cent. of what it is on a small one. The carrying capacity of a canal accommodating boats of a given size depends upon the number of lockages which can be made in a given time. Increase of speed between the locks, while it lessens the time of transit on a canal worked to less than its maximum capacity, will not increase the volume of traffic. It is of the first importance, therefore, that the time of lockage should be decreased. Practically, the former consideration is first attended to, however, as no canals are as yet worked to their full capacity. The economical rate of speed for boats towed by horses is two miles per hour. The time lost by slowing up on approaching locks, the stoppage in locks, and the getting under way again reduces the average rate of speed to 1.7 miles per hour. The first cause of detention at locks has been very greatly overcome by the application of steam-power to the lock-gates as designed by Mr. Ashbel Welch, previously mentioned. For lessening the second and third, the use of inclined planes instead of locks, up which the boats are drawn by machinery, and passing over a summit descend into the upper level with an initial velocity greater than the average, has been found effective on the Morris Canal in New Jersey. Inclined planes instead of locks were used in England on the Ketling Canal in 1789. High velocities between locks have not been attained, the chief obstacle thereto being the greatly-increased tractive force required. A method of propulsion used to a considerable extent in Belgium and France is by an endless chain along the bottom of the canal, driven by stationary engines. To this chain the boats are attached. It is alleged that this method cannot be advantageously used on the U. S. canals, where the curves are much more frequent and sharp than in those of the countries where the system has been successfully applied. A trial on the Erie Canal in 1880 gave unsatisfactory results. Another method recently introduced on some Belgian canals is by a locomotive on the towpath, running on a single rail. When two boats meet they exchange locomotives, the latter returning until another boat is met. In the U. S. steam propellers have been used for some years on the Delaware and Raritan Canal. In 1871 the New York legislature offered rewards for the best motive-power other than animals for propulsion of boats on canals, excluding the Belgian system: 700 communications were received in reply, resulting in twelve steamers being placed on the canal for trial, of which three fulfilled the first test required. The result of experiments was so satisfactory that 92 self-propelling boats are now on the New York canals, running at an average rate of speed of 2¾ miles per hour, including detentions. The total number of boats is 4000.

The means of transportation of the products of the Western States to the seaboard have not kept pace with the increase of those products. In consequence, the existing lines have been overcrowded, freights have been carried at less than remunerative prices, and yet great quantities of produce have been unable to reach a market at all, causing demands from the producers for more transportation facilities and cheaper rates. The enlargement of the Erie Canal is seriously contemplated, so as to afford direct transport for large vessels from points on the great lakes to the ocean. A committee of the U. S. Senate made on Dec. 5, 1873, an exhaustive report on this subject, recognizing the necessity for additional routes from the West to the ocean, and recommending the examination of four routes as the most feasible and advantageous channels of commerce.

The cost of transportation by steam on canals is now reduced to less than 3 mills per ton per mile. The cost of through transportation on railroads is 7 mills per ton per mile. These prices do not include the interest on capital, nor profits. Both may be reduced somewhat by good management, but the proportion between the two cannot be much changed. (For SHIP-CANALS see that head; also CALEDONIAN CANAL, NORTH HOLLAND CANAL, NORTH SEA CANAL.) J. J. R. CROES.

Navigation, Inland (Rivers and Lakes). There is no portion of the world's surface that has been favored by nature with a better system of inland water-communication than that part of the North American continent which is included within the limits of the U. S. and the Dominion of Canada. Wholly within the U. S. is the magnificent combination of the Mississippi and its tributaries, several of which, such as the Ohio, the Missouri, the Arkansas, and the Red, are in themselves great rivers, as indeed are the Tennessee, the Cumberland, the Kanawha, the Alleghany, and the Monongahela, all of which are tributaries to a tributary, the Ohio. Partly in the U. S. and partly in Canada is the magnificent chain of freshwater lakes, Superior, Michigan, Huron, Erie, and Ontario, which empty into the ocean through the great river St. Lawrence, navigable for ocean-vessels to the wharves of Montreal.

River Navigation.—The lengths of the Mississippi and its chief tributaries are as follows: main Mississippi, 1268 miles; Missouri, 2908; upper Mississippi, 1330; Ohio, 1265; Arkansas, 1514; Red River, 1200. The total area drained by the Mississippi is 1,244,000 sq. m., which is more than that of all Europe, omitting Russia, Sweden, and Norway. Almost the entire area of the U. S. lying between the Alleghany and the Rocky Mountains drains into the Gulf of Mexico through the Mississippi, and a large portion of this area is thus made accessible to water-craft. It is worthy of note, however, that all the tributaries from the West flow for a considerable distance through dry or desert lands, and as a rule these tributaries are unnavigable except after they have entered more fertile regions. The Missouri, though much longer, is less navigable than either the Ohio or the upper Mississippi, and none of its tributaries, except the Yellowstone and the Osage, are navigable at all, and they only partially. The heads of navigation during ordinary low stages are Sioux City on the Missouri, St. Paul on the upper Mississippi, and Pittsburg on the Ohio, though none of these points can be reached at such stages by the large boats that run between New Orleans and St. Louis or Cincinnati. The Ohio has the largest commerce, and it consists chiefly of iron and its products, salt, lumber, petroleum, furniture, pork, liquors, groceries, and coal. On the upper Mississippi the chief articles of commerce are lumber, grain, flour, pork, and groceries. On the Missouri commerce by river has nearly died out, but above Sioux City there is during the spring a heavy traffic in merchandise for the Montana mines. On the main Mississippi the down-stream freight is composed of grain and other Northern products, and the up-stream of sugar, molasses, cotton, tropical fruits, and of coffee and other foreign products imported through New Orleans. It is difficult to estimate the value of this commerce, as no accurate records are attainable, but the best authorities place that of the Ohio and its tributaries at $700,000,000, and put the whole commerce of the Mississippi and tributaries in round numbers at $2,000,000,000. Of late years the character of Western river commerce has materially changed. The multiplication of railroads has greatly reduced the passenger travel by river, and steamboats are seldom used except for pleasure and to reach towns not yet touched by railroad lines. On the other hand, the commerce in heavy commodities, especially in coal on the Ohio, has greatly increased, and it is estimated that 100,000,000 bushels of coal annually pass Cincinnati, of which about half comes from Pittsburg, and the remainder from the mines on the Kanawha and on the Ohio itself. This coal is all brought out in coal-boats and barges, which are made up into fleets and pushed downstream by towboats whenever there is 6 feet or more of water in the channel. The records show that on an average such a stage or higher may be expected at Pittsburg for 163 days in the year. During lower stages the coal-barges lie in harbor waiting for a rise. A coal-*boat* is a rectangular box with strong bottom and light sides, 26 feet wide and 170 feet long, and carrying about 22,000 bushels, or 850 tons, on a draught of 7 feet. Such boats require 8 feet of water in the channel. They seldom return, but are usually broken up and sold for lumber. Coal-*barges* have a scow-bow at each end, and their sides are solidly built up of 8-inch timber. Their average size is 130 by 25, and they carry 11,000 bushels, or 425 tons. An ordinary tow from Pittsburg to Louisville consists of from ten to sixteen barges, carrying from 4250 to 6800 tons, and pushed by a single towboat. At Louisville the tows for towns below are usually doubled in size. The largest recorded tow was taken to New Orleans in May, 1882, by the steamer J. B. Williams, and consisted of 35 coal boats and barges, whose total contents aggregated 25,632 tons, and covered a surface, including towboat, of very nearly 3 acres. At 10 tons to a car, this amount of coal would have required 2563 railroad cars for its transportation.

A large commerce, especially on the Mississippi, is carried on in "model barges," or barges with regularly modelled double-end hulls. These barges are formed into fleets and pushed by powerful towboats. They have but one deck, and this is usually covered over by a house or cargo-box. They are much used for the transportation of grain in bulk. Of late years a number of freight-steamers have been built which are fully supplied with machinery for handling freight, but are entirely without accommodation for passengers. These steamboats are said to pay very well, while as a rule passenger-steamboats do not, thus showing that river-traffic will soon, in all probability, be confined to the transportation of bulky articles of freight. On the Ohio the rafting of timber is usually done by floating with the current; on the Upper Mississippi rafts are generally pushed by small steamboats.

The official statistics of the register of the U. S. treasury for the year ending June 30, 1883, show that the commerce of the Western rivers was carried on by

1163	steam-vessels, of	243,317	tons.
149	barges	117,731	"
1312		361,048	tons.

The estimated average cost of transporting freight (other than coal) on the Western rivers is 4 mills per ton per mile. The cost of transporting coal varies from two-thirds of a mill to 2 mills, the greater price corresponding to the shorter distance. In 1882 grain in bulk was carried from St. Louis to New Orleans, a distance by river of 1197 miles, for 6¾ cents. The receipts of grain and flour at New Orleans during 1882 were 14,500,000 bushels.

Lake Navigation.—The larger portion of the enormous surplus of grain that is raised in the States bordering on and W. of the Mississippi is carried to tide-water by way of the great lakes. From Chicago or Milwaukee the route is through Lakes Michigan, Huron, and St. Clair to the E. end of Lake Erie. The statistics of 1883 show that 45,000,000 bushels of grain and flour were received at New York by Lake Erie, canal, and Hudson River, while 82,000,000 were received by rail. The average charges during 1883 for carrying a bushel of grain from Chicago to New York were 9 cents by lake and canal, 11.6 cents by lake and rail, and 17 cents by all rail. During the five years ending in 1882, 65 per cent. of the shipments of wheat, 13 per cent. of the shipments of flour, and 70 per cent. of the shipments of corn went East from Chicago by water. Tolls on the Erie Canal were abolished in 1882.

The standard depth of lake harbors is 16 feet, and this depth has been obtained by jetties, aided by dredging. At most large harbors it has become necessary to build breakwaters outside in the lake for protection and increased harbor-room. At the flats in Lake St. Clair the U. S. has excavated a canal 300 feet wide, 16 feet deep, and nearly a mile and a half long. At the Limekilns, near the mouth of Detroit River, the U. S. is now blasting a channel out of the rock that will be 20 feet deep, 300 feet wide, and half a mile long. In 1882, 35,199 vessels carried through Detroit River 17,872,000 tons, valued at $262,000,000.

Much lake commerce goes to Europe *viâ* the Canadian canals and Montreal; 8,000,000 bushels were received at Montreal in 1882.

In 1883 the commerce of the lakes was carried on by

1373	sailing-vessels, of	310,454	tons.
1149	steam-vessels	304,642	"
725	canal-boats	65,241	"
156	barges	43,575	"
3403		723,912	tons.

The tonnage on the northern lakes is steadily increasing from year to year.

Other Rivers and Lakes.—Besides these two great systems of inland navigation, there is a heavy commerce on the Hudson River, some of which is local, but, as the Hudson is the direct continuation to the sea of the Erie Canal, the greater portion of its commerce consists of freight on its way to New York. The canal-boats are made up into fleets and towed by powerful towboats, one boat frequently towing three fleets—one in immediate contact, and the other two at long distances astern. The other navigable waters of the U. S. may be briefly named: The Penobscot does a large lumber business below Bangor. The Kennebec below Augusta has a large commerce in ice and lumber. On the Connecticut, in 1883, there was a commerce of about 290,000 tons of coal and merchandise and 12,000,000 feet of lumber. The Delaware above Philadelphia had a commerce in 1882 of 1,350,000 tons. From Philadelphia to the ocean the foreign commerce aggregated 1,762,000 tons, and there were 5137 clearances of coastwise vessels. The Potomac affords transportation to large quantities of coal coming from Western Maryland to Georgetown by the Chesapeake and Ohio Canal. The shipments from Georgetown and Washington in 1882 aggregated $7,000,000, and 179,000 tons of freight were received. The James has a large commerce in grain, tobacco, and other Virginia products. The clearances from Richmond in 1882–83 were 65 vessels in the foreign trade and 496 coastwise. The aggregate value of exports and imports was $1,510,000. The Alabama River and its branches bring out each year a large supply of cotton. In 1882–83 the total commerce was valued at $5,250,000, which included 47,052 bales of cotton. A large amount of business is done on the Sacramento River in California, 107,554 tons of wheat having been transported on this river, besides other freights. The commerce of the San Joaquin in 1882–83 is reported at 432,000 tons per annum. The Columbia river drains an immense area, but its navigation is impeded by numerous falls and rapids, of which the chief are the Cascades, 185 miles above the mouth, and the Dalles, 230 miles. At the former place the government has begun to build a canal one-half mile long with two locks, each having a chamber area of 462 by 90 feet, with gate-openings of 70 feet, and a minimum depth of 8 feet in low water. The river commerce of Portland in 1882 was 165,800 tons, and the commerce of the Lower Columbia was 875,000 tons, of which four-fifths was coastwise. The Upper Willamette River afforded transportation for 31,000 tons during the year ending May 31, 1883.

THROUGH TRANSPORTATION ROUTES.—A committee of the U. S. Senate, appointed in Dec., 1872, in obedience to the popular demand for cheap water-transportation, recommended the construction or improvement of a number of through water-lines, and the cost of these improvements was subsequently carefully determined by the U. S. engineers in charge. The routes and estimated cost of these lines are as follows:

Mississippi Route.—The opening of the mouth of the river so as to permit the free passage of vessels drawing 28 feet (this has since been realized at the South Pass, where a depth of 26 feet for a width of 200 feet and a central depth of 30 feet have been created and is maintained by James B. Eads in accordance with act of Congress approved Mar. 3, 1875, and modified Mar. 3, 1879; total cost, including 20 years' maintenance, $7,250,000); construction of reservoirs at the sources of the river (estimated cost, $488,551); improvement to give 3 to 5 feet above the Falls of St. Anthony (estimated cost, $2,100,000); 4½ to 6 feet from Falls of St. Anthony to St. Louis (estimated cost for 4½ feet from Falls to La Crosse, $348,670; for 6 feet at Rock Island Rapids, $2,404,000; for 6 feet at Des Moines Rapids Canal, $953,134; for 6 feet between mouth of Illinois and St. Louis, $1,000,000); 8 to 10 feet from St. Louis to New Orleans (estimated cost of 8 feet from St. Louis to Cairo, $6,160,000—no engineer's estimate below Cairo; committee's estimate from St. Louis to New Orleans, $5,000,000). The improvement of the Mississippi River is now under charge of a commission consisting of three army engineers, one officer of the Coast and Geodetic Survey, and three civilians. Approximate estimate of cost, $66,000,000.

Northern Route.—Improvement of Fox and Wisconsin rivers so as to give 5 feet from the Mississippi to Green Bay (estimated cost, with locks 160 by 35 and 6 feet of water on Fox, $3,600,000); construction of a canal from Rock Island on the Mississippi to Hennepin on the Illinois (estimated cost, with locks 170 by 30, $4,541,000); enlargement of the Erie Canal from Buffalo to Albany (estimated cost, on supposition that only one set of locks is enlarged to 225 by 26, $6,676,231); enlargement of the Oneida Lake Canal from Oswego to Albany (estimated cost, with locks 185 by 29 and 9 feet of water, $25,213,857); Champlain Canal, from Lake Champlain to deep water on the Hudson (estimated cost for a canal with locks 270 by 45 and 12 feet of water between Whitehall and Fort Edward, and for a slackwater thence to Albany, $14,115,893). Total cost of northern route, $54,146,981.

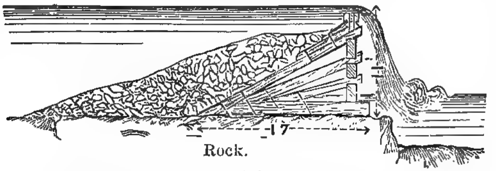
Central Route.—Improvement of the Ohio River from Pittsburg to Cairo so as to give 6 to 7 feet of water, with locks 600 by 110 and movable dams; improvement of the Kanawha River up to Great Falls, so as to give 6 feet of water (estimated cost, with locks 300 by 50, 3 permanent dams, and 9 movable ones, $4,071,216); a connection by canal or freight-railway from the Kanawha or Ohio to tide-water in Virginia (estimated cost of canal, with locks 120 by 20 and 7 feet of water, about $55,000,000 (see JAMES RIVER AND KANAWHA CANAL); this includes a summit-tunnel 7.8 miles long and the improvement of the New and Kanawha Rivers; the estimated cost of a single-track freight-railway from Charleston (on the Kanawha) to Newport News (near the mouth of the James River) is $36,364,136, without equipment). The sale of the James River and Kanawha Canal and its transformation into a railroad have caused the abandonment of the Central as a through route.

Southern Route.—Improvement of the Tennessee from its mouth to Knoxville, so as to give 3 feet in low water (committee's estimate, $5,000,000); canal or freight-railway from the Tennessee River to the Atlantic Ocean by shortest route (engineer's estimate for canal, $35,612,000; committee's estimate for freight-railway, $30,000,000).

Other Routes.—A survey was also made for the extension to Pittsburg of the Chesapeake and Ohio Canal, which is in operation from Georgetown to Cumberland. The engineer's estimate for a canal with locks 120 by 20 and 7 feet of water is $25,000,000. This canal will have a summit-tunnel 3¾ miles long, and will use 23 inclined planes worked by hydraulic power. A survey was made in 1868 of various routes for an American canal between the Niagara River above the Falls and Lake Ontario, and the average cost was $12,500,000.

IMPROVEMENT OF RIVERS.—*Tidal Rivers.*—The essential principle in all works for the improvement of tidal rivers is to give the freest possible entrance to the flood-tide by removing all projecting points and dredging away shoals. If the currents of the ebb are much diffused, they should be guided and concentrated by low training-walls. The best example of an improved tidal river is the Clyde in Scotland, which in 1755 only admitted a draught to Glasgow of 15 inches in low water of spring tides, and 39 inches in high water of spring tides; now vessels can ascend to Glasgow drawing 22 feet. Equal success has followed the efforts to improve the Tyne in England and the mouth of the Seine in France.

FIG. 1.

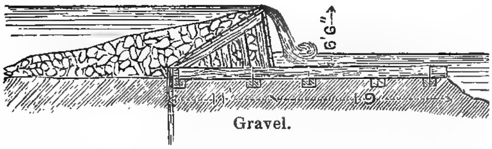


Dam on Schuylkill.

Non-tidal Rivers.—Rivers with currents that flow constantly in one direction may be improved by assisting the natural navigation or by canalizing.

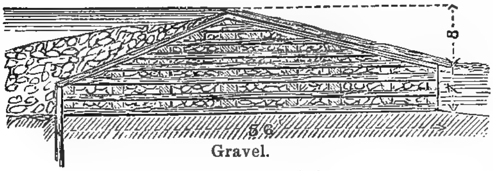
Natural navigation is assisted by building dikes or wing-dams to contract the river where it is too wide, by dredging shoal places, by protecting caving banks, and by removing loose rocks, snags, and wrecks. For removing snags on Western rivers the U. S. government has built a number of powerful steam snag-boats, each one having two bows, connected a little above the water-line by a very heavily-built beam. Snags are butted with this beam until sufficiently loosened, and are then hoisted up and cut into lengths by steam saws. The roots are dropped into deep holes and the tops allowed to float away. A river is canalized when it is divided by dams or weirs into a number of navigable reaches or pools. Boats pass from one pool into another by one or more locks in each dam. Figs. 1, 2, and 3 show three general styles of dam, all of them being of timber with backing of gravel, and two of them being filled with loose stone. The lower slope of No. 3 is sometimes broken into steps, but a continuous slope is preferable where there is much heavy ice in winter. When a dam is built on anything but hard rock, special precautions must be taken to prevent undermining. The dam shown in Fig. 2 had to be strengthened at the lower end of the apron by a line of cribwork extending across the river.

FIG. 2.



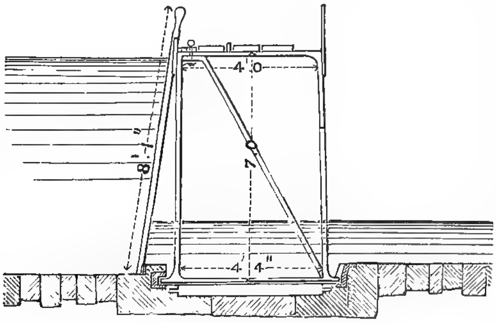
Dam on gravel foundation.

FIG. 3.



Dam on Monongahela.

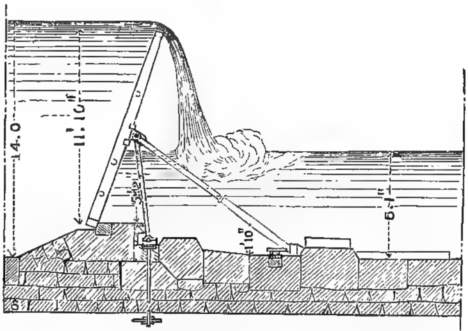
FIG. 4.



Poirée needle-dam.

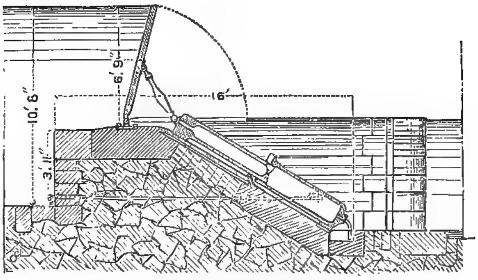
The latest improvement in canalizing rivers is to build movable dams (*barrages mobiles*), that can be lowered on the bed of the river when not needed. Fig. 4 shows the Poirée needle-dam, which consists of a trestle bridge with pieces of scantling (technically "needles") resting against its upper side. As the discharge of the river increases, the needles are gradually removed, until finally none are left, and then the trestles are dropped into a recess made in the bed of the river and extending from bank to bank. In the Boulé system the needles are replaced by shutters or gates, and in the Caméré system by a curtain of narrow slats hinged together, that can be rolled up from the bottom. The Chanoine wicket, shown in Fig. 5, may be described as a door supported by a prop. It is connected with the floor by an iron horse, which is hinged to the wicket at the same place as the prop, and is likewise hinged to the floor. The wicket can revolve on the upper axle of the horse, and the latter can revolve on its lower axle. A wicket is usually 3½ feet wide, and a series of them extends across the channel and forms the dam. The wickets are thrown down by a tripping-rod that lies horizontally on top of the floor and is provided with projections. The rod is worked from the lock or from a pier, and the projections on the rod push the feet of the props away from their supports; the pressure of the water at once forces the wickets down. They are raised by means of a windlass—on a small boat or on a temporary bridge—that lifts one at a time. By using for the props an improved stop or hurter invented by M. Pasqueau it is practicable to do away with the tripper, and thus increase to any desired extent the width of opening for navigation. This has been done in recent dams. The Girard shutter, shown in Fig. 6, is a much wider door, which is hinged to the masonry floor, and is raised or lowered by a hydraulic jack. All the jacks are connected with air and water pumps placed in a pump-house on shore, and power is obtained from a turbine worked by the fall at the dam. This system can only be used where the floor is above the bed of the river. The Desfontaines drum-wickets, shown in Fig. 7, are worked entirely by the difference in pressure of two contiguous pools. Water from the upper pool is admitted so as to press on the lower part of the wicket, and this pressure, being greater than that on the upper part of the same wicket, makes the wicket rise and become a dam. When this pressure is taken off by closing

FIG. 5.



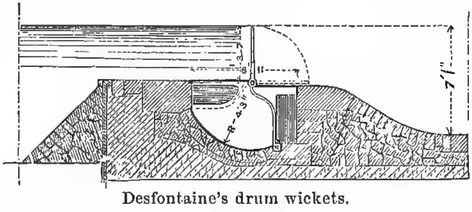
Chanoine wicket.

FIG. 6.



Girard's hydraulic shutter.

FIG. 7.



Desfontaine's drum wickets.

connection with the upper pool, and opening communication with the lower one, the wicket falls.

Of the systems of movable dams thus concisely described the Poirée and Chanoine are in very general use in many French rivers, the Girard is used on one weir on the Yonne, and the Desfontaines on several weirs on the Marne. The Chanoine system with Pasqueau hurter is in use in the U. S. on the Ohio and Great Kanawha rivers, and Poirée trestles with Boulé gates are used on the Falls of the Ohio and on the Upper Fox River.

It not infrequently happens that the navigation of great rivers is obstructed by rapids of limited extent, for which a resort to lateral canals is compulsory. Such works, though coming under the head of canals, are properly works of river improvement. There are three conspicuous examples in the U. S.—the Louisville and Portland Canal (see Navigation, Inland; Canals) the St. Mary's Falls (Sault Ste. Marie) Canal (for which see St. Mary's River), and the Des Moines Rapids Canal, on the Upper Mississippi.

A review of inland navigation by rivers and lakes would be quite incomplete without allusions to projects for grand systems of water-communication which might be effected by establishing brief artificial links of connection between natural reaches of river, lake, or sound navigation. Owing to the peculiar conformation of the coast of the U. S., it is possible, if circumstances should demand it, to create, by means of short artificial channels, an inland navigation along the greater part of the Eastern and Southern coasts of the U. S. which might be of great practical utility, especially in time of war. There is already an excellent natural navigation, almost wholly inland, among the islands that border the coast of Maine. A canal through Cape Cod, connecting Barnstable and Buzzard's bays, would be only 8 miles long, and it would complete an inland route from Boston to New York. Such a canal, 300 feet wide and 23 feet deep, would cost $9,700,000, or $7,800,000 without breakwater in Barnstable Bay (*Report of Chief of Engineers, 1870*, p. 476). From New York there is an existing water-communication with the Delaware River by the Delaware and Raritan Canal, 43 miles long, with 8 feet of water and locks 220 feet long. Thence the Chesapeake and Delaware Canal, 14 miles long and 10 feet deep, with locks 220 feet long, affords a water-connection with Chesapeake Bay. The latter affords a sheltered navigation to Norfolk in Virginia. Thence extending southwardly to the waters of Albemarle and Pamlico sounds, we find the Dismal Swamp and the Albemarle and Chesapeake Canals, the former connecting Elizabeth River with the Pasquotank, and the latter with North Landing River, Currituck Sound, and North River. Dismal Swamp Canal is 29 miles long, has 7 locks, 110 by 17½, and has a navigable depth of 3½ feet. The Albemarle and Chesapeake Canal is 14 miles long, in two separate sections, with one lock 220 by 40, and has a navigable depth of 5½ feet (*Report of Chief of Engineers, 1880*, p. 851). From Charleston there is a natural navigation for light-draught vessels among and behind the sea-islands to the mouth of the St. John's. A survey has been made for a ship-canal, 24 feet deep, across the northern part of Florida, from the St. Mary's to the Gulf, a distance of 169 miles, at an estimated cost of fifty millions (*Report of Chief of Engineers, 1880*, p. 973). From Mobile there is an inland passage to the rear of New Orleans *viâ* Mississippi Sound and Lake Pontchartrain, and from Galveston, Texas, there is a chain of sounds extending S. W. to the mouth of the Rio Grande that can readily be connected by open cuts.

The whole subject of an inter-ocean waterway for the defence of the seaboard has been committed by Congress to a mixed board of army and navy officers, who at this writing (1884) have not yet reported.

Inland Navigation in Foreign Countries.—Inland navigation in Great Britain is composed of canals, and rivers made navigable by locks and dams. The largest canal, the Caledonian in Scotland, connects a number of lakes and makes a water-line between the Irish and the North seas. A similar inland lake-navigation with short stretches of canal is found in Sweden and Norway. In France all the rivers have been improved, the latest practice being to use movable dams, of which the Seine is the best illustration. Movable dams, which are exclusively French in their origin, have also been used on rivers in Germany and in Russia. The latter country has a very extensive system of inland navigation, but not much is known of its details. In Germany it has been the practice to improve rivers by guiding-dykes and bank-revetments, and the Rhine, Elbe, Oder, Weser, Moselle, and Vistula are instances; but the results are not altogether satisfactory, and there is a strong movement in favor of movable dams (*Non-Tidal Rivers*, Merrill, Washington, 1881). A great deal of work has been done on the Rhine on the system of closing duplicate channels and rectifying abrupt bends, and on the Danube large sums are now being expended, especially at the "Iron Gates." Egypt is contemplating measures for extending the navigation of the Nile by devising means for getting over the rapids. In the East Indies the rivers are not generally navigable. China has many large rivers and canals, but they are not well known to foreigners. (For reference consult *Report of Senate Committee on Transportation, Reports of Chief of Engineers, Annales des Ponts et Chaussées.*) W. E. Merrill.

Navigation Laws. See International Law, Summary, by Pres. Theodore D. Woolsey, S. T. D., LL.D.

Nav'igator's (or **Samoan**) **Islands,** a group of ten islands, comprising an area of 1650 square miles, situated in the Pacific Ocean, between lat. 13° 30′ and 14° 30′ S., and between lon. 169° and 173° W. They are high, mountainous, of volcanic origin, with a rich soil, a hot, moist climate, and a luxuriant vegetation, forests of palms, bread-fruit trees, cocoanut trees, and bananas covering the mountains. Coffee, sugar, yams, and nutmegs are produced. The inhabitants are a well-formed and good-natured tribe of the Polynesian race, and different Christian missions work with considerable success among them. The largest island is Sawaii; the most fertile and most peopled is Tutuila (which see). Pop. 30,000.

Na'vy [Lat. *navis*, a "ship"], a word formerly used to express any large assemblage of ships, whether of war or of commerce. In the older English histories it was used in the sense of fleet or squadron. At present the word *navy* is applied exclusively to the war marine of a state. The Latin races generally and properly call a navy a *sea-army* (*armée de mer, armada*, etc.), applying the same term, in a technical sense, to a fleet. (See Naval Tactics.) The Anglo-Saxons use the word *fleet* (*flota*, to "float") as synonymous with navy, though in a stricter sense it is understood to apply to a naval force of definite magnitude. (See Tactics.) A navy is also called the military marine to distinguish it from the mercantile marine, and the vessels composing it are in general called "men-of-war."

The military value of a navy was demonstrated in the earliest pages of its history. Not to mention the Trojan war, when the Greeks were transported by means of a numerous fleet to the shores of Ilium, we may cite the first Persian invasion of Greece as the earliest case in point. Defeated at Marathon, the Persians hastily took to their ships, and rounding "Sunium's marbled steep" threatened Athens. Having no navy to oppose them, it was only by the rapid march of Miltiades that the barbarians were prevented from again landing. The facility with which the Persians transported a large army to a great distance by means of their fleet; the advantage they enjoyed of striking the coasts of Greece at any particular point, and of afterward transferring the field of operations to other parts, imposing toilsome, protracted, and exhaustive marches on their enemies, taught the Greeks the necessity of a floating force—a lesson they hastened to profit by. The Athenians were among the first known to authentic history to maintain a navy respectable in its character and distinguished for its organization, its discipline, and its efficiency. By a skilful use of this arm during the Peloponnesian war they were enabled to hold certain strategic points, giving them great advantage over their enemies: as the holding of Sestos, by which they kept control of the Hellespont and the corn-trade of the Euxine. The importance of the latter will be understood when it is known that Attica depended for subsistence entirely on that trade. The skilful movement of the Athenian fleet on Sphacteria (modern *Navarino*) succeeded as a diversion, and compelled the Spartans to abandon their campaign in Attica. But no event in ancient naval history is so instructive in all its aspects as the battle of Salamis and the strategic operations which immediately preceded it. It was at this time that the term "wooden walls" was first applied to a navy. While the victorious Persians were advancing by land and by sea, the Greeks were divided in opinion as to the course they should pursue. Seeking advice of the Delphic oracle, reliance was counselled in their "wooden walls." What these were no one knew till Themistocles, to whom the Pythia was probably indebted for the inspiration, named the fleet. The interpretation was at once accepted and the advice followed. Every Athenian capable of bearing arms repaired on board the ships of the fleet, while the old men, the women, and the children, abandoning their beautiful city to the barbarians, sought refuge on the island of "sea-born Salamis," placing themselves literally behind the wooden walls of the fleet. In the splendid victory of Salamis we learn the value of discipline and laborious training, for it was a victory gained by the disciplined valor of a small Greek fleet over the misguided fury of the Persian hosts.

Navies have grown out of either military necessities or the requirements of an ocean commerce obstructed by pirates. Trade and navigation may be said to be the parents of navies, those countries most largely interested in the former generally boasting of the most powerful fleets. While foreign trade produces wealth, and at the same time trains a class of men to the hardships of the sea, it requires protection and assistance in return. This is rendered by the military marine, whose service is largely recruited from the commercial: the benefits conferred are reciprocal. The Carthaginians, descended from the Phœnicians, were the most successful navigators of their day, their powerful navy being but the natural offspring of an extensive ocean trade. The Romans, on the other hand, were not a commercial people. Their navy was forced into existence as an implement necessary in the great game of war, but it ever suffered the cold and unsympathetic regard of a step-child.

Though a navy is well called a sea-army, it yet differs from an army proper in the important particular of being unobjectionable on political grounds. While an army may be feared as dangerous to civil liberty, the example is yet wanting of the supreme power of the state being subverted by its navy. Moreover, a navy proportioned to the commercial tonnage of a country and the extent of its shore-line is the best and least expensive protection to the coasts and commerce of that country. While standing armies have always been regarded with jealousy, every maritime state, even from the earliest times, has found it expedient to maintain a permanent navy. Besides the ordinary duties of policing the seas to keep down piracy and of affording a moral support to ministers at foreign courts and merchants in foreign trade, navies are constantly engaged in the fields of science, some of the most important discoveries, and such as have contributed most generously to the common stock of knowledge and the advancement in civilization, being due to their labors. While this keeps a navy well occupied, and enables it to render during peace a return for its cost, it at the same time maintains in active service a corps of experienced men always ready for the sterner duties of war. An efficient naval force cannot be improvised. Instances are given by the naval historian of opposing fleets where seasick men and inexperienced officers have been called upon to contend against veritable "tars" under officers who, bred from childhood to the sea, prided themselves upon their skill as seamen. The results of such conflicts could never be doubtful.

From these general views the reader may understand how and why navies have come into existence. To render it clearer many examples might be drawn from modern history, but we may cite the origin of the U. S. navy alone as a fair illustration. In Sept., 1775, the British troops, closely invested in Boston, could receive supplies only by water. To intercept these, Gen. Washington, by virtue of his commission as commander-in-chief of all the Continental forces, detailed certain of his officers and men familiar with nautical pursuits to operate afloat in small armed cruisers. Vessels were purchased, fitted out, armed, and manned by the hardy seamen of New England, and cruised in Massachusetts Bay with such success that, while depriving the enemy of necessary supplies, their prizes furnished the American army with such materials of war as alone rendered the successful prosecution of hostilities possible. The measures adopted by Washington being confirmed by Congress, other vessels were soon added to the list by legislative authority, prize-laws enacted, and a navy gradually formed. The country was so exhausted by the struggle that on the termination of the Revolutionary war the navy for a time passed out of existence. Its re-establishment under the present constitution furnishes another illustration. American commerce having spread to every sea, the new flag was regarded by the old habitués of the ocean with no little curiosity. Finding it without protection, however, it was treated with little respect by either civilized or uncivilized states: the former disregarded its neutral rights, the latter hesitated not to offer it insult. The U. S. was bound, therefore, in the interests of peace and civilization, to create a navy. Peace with Algiers put an end for a time to naval preparations, when our statesmen were again admonished of the necessity of an armed force on the ocean by the depredations of French cruisers. But as hostilities with France were of short duration and never fully recognized, the first notable service of our present navy was to fulfil the mission for which it was primarily created by putting down the Barbary powers, who had been plundering our merchantmen, imprisoning our citizens, and to whom we had, in our weakness, been paying tribute. The successful prosecution of the war with Tripoli, by which the dey was compelled to recognize the laws of nations, redounded greatly to the credit of the young navy. And it is a fact of no little interest that our navy gained its reputation first on the classic waters of the Mediterranean—the scene of so many great conflicts—and in combating the descendants of Zebulun, who "dwelt at the haven of the sea, whose borders were unto Zidon." The war of 1812 with Great Britain was the next in which the navy was called to take a prominent part. Although the U. S. had nothing on the ocean that could contend against the powerful fleets of England, yet the few single engagements that were fought discovered so much professional skill on the part of the officers, such fine qualities on the part of the seamen, that the country soon saw itself possessed of all the elements for one of the finest navies in the world. On the lakes, where the forces of the two countries were more on a par, this was still more manifest, for the results of the victories gained on Erie and Champlain were immediate and important, the English themselves admitting that they lost there all but their honor. During the Mexican war and the civil war the field of operations of the navy was confined to blockading and to service on shore, there being no seagoing ships on either occasion to contend against our own.

Though justly proud of the achievements of their little navy, the people of the U. S. should bear in mind that it has never been opposed, in a military sense, to any other navy. The single fights of isolated cruisers, however heroic, rarely have any effect upon the ultimate results of a war. The real strength of a navy is measured by its line of battle. Now, the U. S. have never had a line of battle; so that in reality their strength as a naval power has never been tested. What we may justly pride ourselves upon, therefore, are the indications we have discovered of a capacity for naval power, rather than upon the power itself. By keeping this fact in prominent view we may be able to appreciate the true value of our small navy, and in contemplating a maritime war cease to indulge expectations which cannot by our present policy be realized.

Navies have their triumphs of peace as well as of war. The U. S. Exploring Expedition and that to Japan, the interoceanic canal surveys, Arctic voyages, and those for deep-sea soundings, the Pacific explorations for hidden dangers, and the distant voyage of the Swatara (which, like that of the celebrated Cook to Otaheite in 1769, was undertaken for the purpose of observing the transit of Venus), show how valuable may be the returns made to the country in time of peace by a well-employed navy, while the Naval Observatory, the Coast Survey, Hydrographic Office, Torpedo station, and Naval Academy are all working their way in the broad domain of scientific research and adding daily to the common stock of useful information.

Organization of the U. S. Navy.—The Constitution imposes on Congress the duty of providing and maintaining a navy, and of making rules for the government and regulation of the naval forces. It declares the President to be commander-in-chief of the army and navy, and requires him to commission all officers of the U. S. Such commissions continue in force only during the pleasure of the President of the U. S. for the time being. The secretary of the navy presides over the navy department, and is the duly-constituted adviser of the President on all questions relating to naval affairs. In his former duties he is assisted by the chiefs of eight bureaus, as follows: equipment and recruiting, yards and docks, navigation, ordnance, medicine and surgery, provisions and clothing, steam engineering, and construction and repairs. The chiefs of bureaus are appointed by the President, with the sanction of the Senate, for a term of four years, and while so acting have the relative rank of commodore, unless already holding a higher grade. The law declares that the orders of the chiefs of bureaus shall be considered as emanating from the secretary of the navy, "and shall have full force and effect as such." The active list of the line-officers is divided into eleven grades, the number in each grade being limited by the act of Aug. 5, 1882, as given below. The relative rank between officers of the navy and army on the active or retired list is as follows:

The admiral of the navy	to	rank with	general	of the army.
The vice-admiral	"	"	lieutenant-general	"
6 rear-admirals	"	"	major-generals	"
10 commodores	"	"	brigadier-generals	"
45 captains	"	"	colonels	"
85 commanders	"	"	lieutenant-colonels	"
74 lieutenant-commanders	"	"	majors	"
250 lieutenants	"	"	captains	"
75 masters	"	"	first lieutenants	"
75 ensigns	"	"	second lieutenants	"
—— midshipmen.				

The offices of admiral and vice-admiral expire on the death of the present incumbents.

All staff officers are appointed by the President with the sanction of the Senate. By the act of Aug. 5, 1882, the active list of the medical corps consists of 15 medical directors, 15 medical inspectors, 50 surgeons, and 90 assistant surgeons, with the relative rank respectively of captain, commander, lieutenant-commander or lieutenant, and of master or ensign. The pay corps consists of 13 pay directors, 13 pay inspectors, 40 paymasters, 20 passed assistant paymasters, and 10 assistant paymasters, having relative rank with captains, etc., as before. The engineer corps consists of 10 chief engineers having the relative rank of captain, 15 of commander, and 45 that of lieutenant-commander, 60 passed assistant engineers, and 40 assistant engineers. The law authorizes the appointment of 24 chaplains, who are permitted to conduct public worship according to the manner and forms of the Church of which they are members. The law also authorizes the appointment of 12 professors of mathematics, and as many naval constructors as the service may require. The foregoing officers are commissioned. The President is authorized to appoint for vessels in actual service as many boatswains, gunners, sailmakers, and carpenters as may, in his opinion, be proper. These are called warrant officers. All officers not entitled to hold commissions or warrants, except secretaries and clerks, are called petty officers. The number of enlisted persons in the navy, including seamen, ordinary seamen, landsmen, mechanics, firemen, coal-heavers, apprentices, and boys, is limited by act of Mar. 3, 1883, to 8250.

The pay of all officers of the navy is fixed by law, and may be seen by reference to the *Navy Register* issued for the year. The pay allowed to petty officers (excepting mates), and the pay and bounty upon enlistment of seamen and others of inferior rating, is left by Congress to the President, with the sole proviso that the total amount of pay for officers and seamen shall not exceed the amount appropriated for that purpose. By the act of Aug. 5, 1882, vacancies in the lower grades of the line, engineer corps, and marine corps are to be filled from the graduates of the Naval Academy. The marine corps forms part of the naval organization. (See MARINE CORPS.)

Naval discipline is maintained by the code embraced in the "act for the better government of the navy of the U. S.," commonly known as the "Articles of War."

The vessels of the navy are divided into four classes: *First rates* (including iron-clads), of 3000 tons and upward, to be commanded by commodores; *second rates*, from 2000 to 3000 tons, including sailing frigates commissioned for sea-service, to be commanded by captains; *third rates*, between 800 and 2000 tons, to be commanded by commanders; *fourth rates*, steamers below 800 tons, small iron-clads, store-ships, etc., to be commanded by lieutenant-commanders. Vessels are named by the secretary of the navy, under direction of the President, as follows: First rates after the States of the Union, second rates after rivers, third rates after principal cities, and fourth rates as the President may direct. The number of cruising vessels (which will hereafter be built of steel) has been fixed at 70. They will be fast, unarmored, and carry guns of high power. (See SHIPS OF WAR.)

The act of Apr. 21, 1806, authorizes the President to keep as many ships in commission during peace as he thinks proper, but Congress practically limits the number by the amount annually appropriated for the maintenance of the navy. Vessels of the navy are further distinguished by classes, a particular type of vessel giving her name to a class; thus, we have the "Colorado and class," the "Lancaster and class," etc., the sixty steamers on the navy list having as many as twelve different classes.

Navy-Yards.	Acres.	Dry docks.	Ship-houses.	Slips.
Portsmouth, N. H.	164	...	3	
Boston	83⅛	1	3	3
New York	193¼	1	2	1
League Island*	923			
Washington	42†	...	2	
Norfolk	109	1	...	4
Pensacola	83¼			
Mare Island	900	1	...	1

Shore Stations.—Apprentice Training Station, Coaster's Harbor Island, Newport, R. I.; Key West, Fla.; Naval Academy, Annapolis, Md.; Naval Asylum, Philadelphia, Pa.; Naval War College, Coaster's Harbor Island, Newport, R. I.; New London, Conn.; Port Royal, Beaufort, S. C.; Torpedo Station, Newport, R. I.

The act of Aug. 5, 1882, authorizes the closing of certain yards. New York, Norfolk, and Mare Island yards alone will be retained in active operation for the present.

The annual naval appropriations for the five years 1880–84, inclusive, averaged $14,838,675.77. S. B. LUCE.

Nax'os, an island belonging to Greece, the largest and most fertile of the Cyclades, is 20 miles long and 14 miles broad, and has about 11,000 inhabitants. Anciently it must have had 100,000. It is high and mountainous, but contains many beautiful, well-watered, and fertile valleys, which produce wheat, wine, figs, and olives in abundance and of superior quality. Naxos, situated on the north-western coast of the island, is the capital, and has about 5000 inhabitants. There was a duchy of Naxos which lasted (from 1206 A. D.) 360 years, giving place to the Turkish dominion in 1566.

Nay'ler (JAMES), b. at Ardsley, Yorkshire, England, about 1616; was a quartermaster in the Parliamentary ranks during the great civil war 1643–51; was one of the early converts to Quakerism 1651; became an itinerant preacher; claimed to be inspired and to be a sign of Christ's second coming, for which profession he was imprisoned at Exeter, condemned by Cromwell's Parliament Dec. 17, 1656, to stand in the pillory, to be whipped at the cart's tail, to have his tongue pierced by a hot iron and his forehead branded with a B (blasphemer), and to be kept in prison for an indefinite period. The sentence was executed at Bristol, and he was confined in the Bridewell, London, until the Long Parliament released him Sept. 8, 1659, and he d. in Huntingdonshire in 1660. He wrote a number of tracts, which were reprinted in 1716; a *Memoir* was published in 1719, and another by J. G. Bevan in 1800.

Nazareans. See MENDÆANS.

Nazarene' [Gr. Ναζωραῖος or Ναζαρηνός], a term employed in several significations in the New Testament and in ecclesiastical history. As first used (Matt. ii. 23), it is applied to Christ's residence at Nazareth as the fulfilment of a prophecy that "he shall be called a Nazarene;" but as no such passage occurs textually in the Old Testament, the term has been referred to the Nazarites; or to *Netser*, "the Branch" (Isa. xi. 1); or, rather, it expresses reproach, Nazareth being a proverbially contemptible place (John i. 46). Where Jesus "of Nazareth" is mentioned the correct translation is *Nazarene*, and might therefore have a signification distinct from that of "inhabitant of Nazareth." Theodore Keim, a recent German writer, in his *History of Jesus of Nazara*, derives the name from Nazara, a village in Judæa, basing his argument upon the reading given by Tischendorf (8th ed.) in Matt. iv. 13. A powerful Christian sect (referred to Acts xxiv. 5), found chiefly in Egypt, bore this name in the second century, having a Gospel of their own, called indifferently "of the Egyptians" or "of the Nazarenes," numerous passages of which were preserved in the writings of the earlier Fathers. The name has been a common one in India and the East generally as applied to all Christians (see MENDÆANS), and has been assumed in recent times by a sect which originated in Hungary in 1857. PORTER C. BLISS.

Naz'areth, village of Palestine, in the ancient district of Galilee, 70 miles N. of Jerusalem, in the modern eyalet of Beyroot, is celebrated as the place of the Annunciation and the abode of Christ during most of his life. The Roman Catholics have erected a church on the spot where the angel came to Mary to announce the birth of the Saviour, and the Greeks another church on another spot where the event took place, according to their belief. Chapels have also been built over Joseph's workshop and over Christ's table where he used to eat with his disciples. The village is in a little valley about a mile long and a quarter of a mile wide, just N. of the Plain of Esdraelon. From the hill overlooking the village is one of the finest prospects in Palestine. The present pop. is about 6000, and the Christian part of it is steadily increasing. Besides Mohammedans (about 2000). there are orthodox Greeks, Roman Catholics, Roman Catholic Greeks, Maronites, and a few Protestants.

Nazareth, on R. R., Northampton co., Pa. (see map of Pennsylvania, ref. 4–J, for location of county), 9 miles N. W. of Easton, established in 1739 by George Whitefield, who intended to found here a school for Africans; but it was purchased by Zinzendorf, and became the site of a celebrated Moravian academy for boys. Pop. in 1870, 949; in 1880, 984.

Naz'arite, more properly **Naz'irite** [Heb. *nâzar*, "to separate"], among the ancient Hebrews an ascetic of either sex who had taken a vow to abstain from wine, strong drink, and everything that is made of the vine, to let the hair grow, and to touch no dead body. Naziritism is older than the time of Moses. The vow might be either for a specified time or for life. Samson and Samuel were Nazirites for life, and so was John the Baptist. R. D. HITCHCOCK.

Neagh, Lough, a lake of Ireland, in the province of Ulster, 17 miles long, 10 miles broad, and covering an area of 153 square miles. It receives from the S. the Upper

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* Work on this yard suspended to await plans.

† Will be closed as a navy yard, and retained for manufacturing purposes under the bureau of ordnance and bureau of equipment and recruiting.

Bann and the Blackwater, and communicates on the N. with the Atlantic by the Lower Bann.

Nea'gle (John), b. at Boston, Mass., Nov. 4, 1799; was apprenticed to a coach-painter in Philadelphia; began in 1818 to paint portraits, and achieved a considerable success and reputation. Among his portraits are those of Washington in Independence Hall, Gilbert Stuart, Matthew Carey, Henry Clay, and Com. Barron. He married a daughter of the artist Sully. D. at Philadelphia in 1865.

Neal (Daniel), b. in London, Eng., Dec. 14, 1678; studied at the universities of Utrecht and Leyden; became a dissenting minister in London 1703; preached at Lorimer's Hall 1706–07, and to a congregation in Jewin street from 1707 until his death, which occurred at Bath Apr. 4, 1743. Besides minor writings, he published a *History of New England* (2 vols., 1720) and a *History of the Puritans* (4 vols., 1732–38). The latter work was reprinted in 1754, 1759, 1793–97 (with *Memoir* by Joshua Toulmin), 1822, and 1837, and an American edition, revised, corrected, and enlarged, was issued by Rev. J. O. Choules (New York, 2 vols., 1844). Many replies to Neal appeared, the chief being by Bishop Isaac Madox and Dr. Zachary Grey, and Neal published several rejoinders. The *History*, though little more than a digest of Strype's voluminous writings, may still be consulted with advantage.

Neal (John), b. at Portland, Me., Aug. 25, 1793; was brought up in the Society of Friends, but left them when twenty-five years old; became a shop-boy at twelve, and afterwards a peddler; a dry-goods jobber in Boston and New York 1814–15; was John Pierpont's business-partner in Baltimore; failed in 1816; was admitted to the Maryland bar in 1819, having previously begun to write for the press; was in Europe, most of the time the associate of Bentham, 1824–27, and a correspondent of *Blackwood;* returned to Portland, and was engaged as editor, lecturer, lawyer, poet, novelist, and teacher of gymnastics, fencing, sparring, drawing, and writing. Among his works are *Keep Cool,* a novel (1817), *The Battle of Niagara, Goldau and Other Poems* (1818), *Otho,* a tragedy (1819), *Brother Jonathan* (1825), *Rachel Dyer* (1828), *Bentham's Morals and Legislation* (1830), *The Down-Easters* (1833), *True Womanhood* (1859), *Wandering Recollections of a Somewhat Busy Life* (1870), and a very large number of other works. D. June 20, 1876.

Neal (Joseph Clay), b. at Greenland, N. H., Feb. 3, 1807; resided at Portsmouth, N. H., and Pottsville, Pa.; removed in 1831 to Philadelphia; became editor of the *Pennsylvanian,* a Democratic journal, and 1844–47 edited the *Saturday Gazette.* He was the first husband of Mrs. Alice B. Haven (which see). Author of *Peter Ploddy* (1844), 2 volumes of *Charcoal Sketches,* and other humorous writings. D. at Philadelphia June 18, 1847.

Neale (John Mason), b. in London, Eng., Jan. 24, 1818; graduated at Trinity College, Cambridge, 1840; took orders in the Church of England 1842; was made incumbent of Crawley in Sussex, and warden of Sackville College, East Grinstead, May, 1846. He became one of the literary champions of the "High Church" party, and was the founder of the sisterhood of St. Margaret 1856; obtained the Seatonian prize at Cambridge for an English sacred poem on nine occasions between 1845 and 1861. He published nearly seventy volumes, chiefly upon theological and ecclesiastical subjects, of which the best known were *The History of the Holy Eastern Church, the Patriarchate of Alexandria* (4 vols., 1847–51), *Mediæval Preachers* (1857), *History of the so-called Jansenist Church of Holland* (1858), *Essays on Liturgiology and Church History* (1863), *Mediæval Hymns from the Latin,* and *Hymns of the Eastern Church* (1871). He also published an expurgated edition of Bunyan's *Pilgrim's Progress* (1853) for the use of children, and his notes to that work gave rise to much controversy. Wrote the popular hymns on the New Jerusalem ("Jerusalem the Golden," etc.), besides a great number of other hymns, partly original, partly translated: *Hymns for the Sick* (1843), *Hymns for Children* (1844), *Rhythm of Bernard de Morlaix* (1858), and *Hymns of the Eastern Church* (1863). Indeed, as a hymn-writer he won many admirers who otherwise kept aloof from him on account of his Romanizing tendancies. D. at East Grinstead Aug. 6, 1866.

Neale (Leonard), D. D., b. in Maryland Oct. 15, 1746; was consecrated a Roman Catholic bishop and made coadjutor to Archbishop Carroll in 1800; became archbishop of Baltimore 1815. D. at Georgetown, D. C., June 15, 1817.

Neale (Rollin Heber), D. D., b. at Southington, Conn., Feb. 23, 1808; graduated at Columbian College, D. C., 1829; became in 1838 pastor of the First Baptist church, Boston, Mass.; author of several published sermons and religious works. D. at Boston, Mass., Sept. 18, 1879.

Nean'der (Johann August Wilhelm), b. at Göttingen Jan. 17, 1789, of Jewish parents and in humble circumstances; was educated in Hamburg, where he frequented the Johanneum; embraced Christianity in 1806; studied theology at Jena and Göttingen, and was appointed professor of church history in 1812 at the University of Berlin, where he d. July 14, 1850. He was unmarried, and a very peculiar man in personal appearance, manners, and habits, but with immense learning and decided genius he connected great simplicity of character, earnestness and enthusiasm. By his works he won the title of the "father of church history," and he deserved it. The old conception of history as a mere concatenation of individual exertions he abandoned, and represented the history of the Christian Church as a general process by which a divine force works its way into the life of the human race. By this idea, first developed by Hegel and afterwards manifoldly elaborated by the romantic school, Neander remodelled or regenerated the science of church history; and he was prominent in that circle of theologians whose centre was Schleiermacher, and which, in the earlier part of this century, awakened the educated classes of the German nation from their rationalistic indifference and led them back to Christianity, without throwing them into the arms of Romanism, as the romantic school did. As a writer of history he lacks dramatic power, and his style is heavy. His principal work is his *General History of the Christian Religion and Church,* from the close of the apostolic age to the Council of Bâle in 1431 (6 vols., in 11 parts, 1825–52), translated into English by Prof. Torrey. But several of his monographs, on Julian the Apostate (1812), St. Bernard (1813), Gnosticism (1818), St. Chrysostom (1821), *Memorials of Christian Life in Early and Middle Ages* (translated into English by Ryland, London, 1852), are models of that kind of composition. He also wrote *History of the Planting and Training of the Christian Church by the Apostles* (translated by Ryland, Edinburgh, 1842, 2 vols.; revised by Dr. Robinson, New York 1864) and *The Life of Jesus Christ* (translated by John McClintock, New York, 1848), in refutation of Strauss, etc. A complete edition of his *Works* appeared at Gotha in 13 vols. (1862–66). His library was purchased after his death for the theological seminary of Rochester, N. Y. Clemens Petersen.

Near'chus, one of the generals of Alexander the Great, commanded the fleet during the Indian expedition, and conducted it at the end of the campaign from the mouth of the Indus, through the Persian Gulf, to the mouth of the Tigris. Of his voyage he wrote an account, Παράπλους, of which the substance is in Arrian's *Indica.*

Neath, town of England, county of Glamorgan, South Wales, on a river of the same name. It exports much coal, copper, tin, iron, and bricks. Pop. in 1881, 10,347.

Neb'-neb, the dry pods of a gum-arabic tree, *Acacia Arabica,* imported for tanners' use. They contain much tannic acid, and are chiefly used in Egypt.

Ne'bo [Accadian, *Nabiu;* Assyrian, *Nabu*], one of the principal divinities of the Babylonian pantheon, generally identified with the Egyptian Thoth and the Greek Hermes. His greatest temple was at Borsippa (Birs-Nimrud). (See Myth.)

Ne'bo [Heb. "hill-top"], a mountain of Eastern Palestine, "over against Jericho" (Deut. xxxii. 49), identified, in 1875, by Prof. John A. Paine, of the American Palestine Exploration Society, with *Jebel Nebba,* 5 miles S. W. of Heshbon. It is 2685 feet high. There was also a city of the same name (Num. xxxii. 3) in the immediate neighborhood. R. D. Hitchcock.

Nebras'ka, one of the central States of the American Union, between 40° and 43° N. lat. and 95° 23' and 104° W. lon.; bounded N. by Dakota, E. by the Missouri River, which separates it from Iowa and Missouri, S. by Kansas and Colorado, W. by Wyoming and Colorado (see map of Dakota and Nebraska, in article Dakota); length from E. to W., about 412 miles; breadth from N. to S., 208 miles; area, 76,855 square miles, or 49,187,200 acres.

Nebraska, by census of 1880, ranked 30 among the States in population, 24 in value of agricultural products, and 33 in value of manufactures.

Face of the Country, etc.—The N. W. portion, bordering upon "The Bad Lands" (Mauvaises Terres), has some hills of considerable height. The river-beds are deeply eroded by the action of water, and the high bluffs with which they are lined give an appearance of hills where none in reality exist. The greater part of the State is a rolling prairie, rising gradually toward the W. The E. portion is well drained and watered, the Missouri, which forms the entire E. boundary, receiving the Niobrara and Nebraska or Platte, and the Great Nemaha, Little Nemaha, and Weeping Water rivers; the Republican Fork of the Kansas also drains the S. part of the State, and receives numerous tributaries. The Big Blue, another large branch of the Kansas River, drains several counties in the S. and S. E., and receives a number of smaller streams. The Nebraska or Platte, a broad and majestic but not a navigable river, is the principal stream, and traverses the entire State from W. to E. The Niobrara or Eau-qui-Court River also traverses nearly the entire State from W. to E., receiving several considerable affluents. The Republican River, or Republican Fork of the Kansas, is of great value to Southern Nebraska, both from its great length and broad stream and from its numerous tributaries. There are no lakes of importance in the State.

Seal of Nebraska.

Mineralogy.—The mineral wealth of the State consists mostly of coal from the upper coal-measures, and not of sufficient thickness to furnish more than a local supply; this coal is confined to the Upper Carboniferous region along the Missouri River, and mostly below the Platte River; the lignite-beds in the S. W. part of the State will probably prove a more profitable source of supply of coal. Lime, sandstone, limestone, and marble for ornamental purposes, gypsum, and especially salt, are the other principal minerals. There are numerous salt-basins in the central and W. parts of the State. The most extensive is in Lancaster county, in a district of 12 by 25 miles surrounding Lincoln, the capital of the State. The springs contain 29 per cent. of salt, and the salt is manufactured by solar evaporation. The salt is said to be the purest in the world, being 98.3 per cent. of pure chloride of sodium. The sandstone is very soft at first, but hardens on exposure to the air, and becomes an excellent building-material. The limestones are the blue Trenton limestone, a fair building-stone, and a gray magnesian limestone susceptible of a fine polish and as enduring as the Italian marble.

Soil and Vegetation.—The E. part of the State is well watered, and the soil of the Missouri bottoms and the whole region S. of the Platte and E. of the 99th meridian is a rich black vegetable mould from 2 to 10 feet deep. The subsoil is mostly yellow clay, but is not impervious to water. The wild grasses grow luxuriantly upon both the bottom- and the table-lands, yielding from 1½ to 3 tons of hay per acre, and are nutritious and well adapted to the raising of sheep and cattle. The soil readily withstands the extremes of drought and rain, the crops being abundant in either case. There is but a limited supply of timber, and that along the watercourses. The W. portion of the State is not well watered. With the exception of the two forks of the Platte and Niobrara and a few small affluents of each, there is a lack of running streams. The region N. of the Niobrara and along its banks is a country of sand-dunes, sandhills, or heaps of fantastic forms, and a little farther N. is succeeded by the "Bad Lands." This portion of the State is barren and worthless for cultivation. N. of the Platte and W. of the 99th meridian the river-bottoms are the only arable portions of land.

Zoology.—The buffalo still roams over the W. prairies of the State, though in diminishing herds; the grizzly bear, black and brown bears, the big-horn or Rocky Mountain sheep, antelopes, deer, elk, panthers, wolves, otters, lynxes, coyotes, and the army of rodents, as well as the mink, raccoon, opossum, skunk, muskrat, and beaver, furnish abundant supplies of peltry to the hunter and trapper. There are two species of venomous serpents and a considerable number of harmless ones. Toads, frogs, and lizards are found in most parts of the State. There is a great variety of game-birds, including wild turkeys and several species of grouse, and all the birds of prey, singers, and birds of fine plumage pertaining to the Rocky Mountain region. The Missouri and most of its tributaries have a fair supply of fish, and some attention is paid to fish-breeding.

Climate.—Nebraska has a fine climate. It is essentially a dry one, though the rainfall is not much less than in the E. The mean temperature during the winter months ranges from 22° to 30°: that of the spring, from 47° to 49°; the summer, 70° to 74°; and the autumn, 49° to 51°. A weather-record of seven years at Nebraska City gave the mean annual rainfall as 30.36 inches, of which 20.87 inches fell between Apr. 1 and Oct. 1, and only 9.49 inches between Oct. 1 and Apr. 1.

Agricultural Products.—The census of 1880 showed the production of Indian corn to be 65,450,135 bushels; wheat, 13,847,007 bushels; oats, 6,555,875 bushels; barley, 1,744,686 bushels: rye, 424,348 bushels. The wool clip of 1880 yielded 1,282,656 pounds; 57,979 pounds of tobacco were raised.

*Farm Animals.**—In 1880 there were 204,864 horses, 19,999 mules and asses, 758,550 cattle, 199,453 sheep, and 1,241,724 swine.

Manufactures.—Number of establishments (1880), 1403; hands employed, 4793; capital invested, $4,881,156; wages paid, $1,742,311; aggregate product, $12,627,336. Amount of coal mined in 1881, 100,000 tons.

Railroads.—There were in operation, Jan., 1882, in Nebraska, 2310 miles of R. R., costing $172,057,659, with net earnings of $11,719,921, paying in interest and dividends $8,895,252. Two of these are great trunk lines—the Union Pacific and the Chicago Burlington and Quincy.

Finances.—The valuation of taxable property as assessed in 1881 was: real estate, $54,279,362; personal, $38,863,095; total, $93,142,457. Rate of State tax, 65 cents on $100, producing, in 1881, $573,066. Total taxation, State and local, in 1880, $2,792,480; State debt, Nov. 30, 1880, less sinking fund, $440,000; aggregate indebtedness, State, county, and municipal, $7,425,757.

Commerce.—Nebraska has no port of entry, but her internal commerce is very considerable, both by R. Rs. and by rivers. No complete statistics are attainable. The number of registered vessels in 1881 was 29, all steamboats, with a tonnage of 5887.

Banking Institutions, etc.—Nebraska had in operation, in Oct., 1881, 12 national banks, with capital of $910,000; circulation, $665,000; U. S. bonds to secure circulation, $739,000; deposits, $5,557,124. Number of State banks and trust companies, 12, with $269,072 capital and $607,905 deposits; number of private bankers, 86, with $675,300 capital and $2,053,586 deposits. Insurance losses of $203,800 were paid in Nebraska in 1881, and insurance premiums to the amount of $417,524 received.

Education.—The number of children of school-age (five to twenty-one years) in 1880 was 142,348, of whom 100,871 were enrolled in public schools, with estimated average attendance of 62,510. Aggregate expenditure for common schools in 1880, $1,079,966, of which teachers' salaries consumed $565,651. Nebraska has 4 colleges and universities, employing 37 instructors and having 661 students, paying tuition fees of $1800. In 1882 there were 175 newspapers and periodicals published in Nebraska, 10 of them daily.

Churches.—The Lutheran denomination has the most adherents, numbering 144 churches, 80 ministers, and 17,500 members; Christians (Disciples of Christ), 75 churches, 13,580 members; Methodist Episcopal, 96 churches, 12,494 members: Presbyterians, 121 churches, 4340 members; Baptists, 126 churches, 4226 members; Congregationalists, 111 churches, 3121 members; Roman Catholics, 67 churches, 49 priests; 22 other denominations have from 1600 to 20 members each.

Population.—In 1860, 28,841; 1870, 122,993; 1880, 452,402 (white 449,764, colored 2638, including 18 Chinese and 235 Indians); in 1885, 740,645.

Principal Cities and Towns, Pop. 1885.—Omaha, 61,835; Lincoln (cap.), 20,004; Hastings, 7980; Plattsmouth, 5796; Nebraska City, 5597; Beatrice, 5211; Grand Island, 5040; Fremont, 4014; Kearney, 3601; Columbus, 2573; Crete, 2258; Falls City, 2070; Seward, 2032; Brownville, 1029.

History.—Nebraska was a part of the Louisiana territory ceded to the U. S. by France in 1803. It was traversed by Lewis and Clarke in 1804–05, and they are believed to have been the first white explorers who had passed through it from E. to W. In 1812 it formed a part of Missouri Territory, and, being occupied by strong and warlike Indian tribes, it was not regarded as desirable for emigrants for many years. In 1844, Senator Douglas introduced a bill for the establishment of a Nebraska Territory including Kansas, Dakota, and portions of Colorado and Wyo-

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* On farms only.

Counties.	* Ref.	Pop. 1880.	Pop. 1885.	County Towns.	Pop. 1885.
Adams	11–F	10,235	18,004	Hastings	7,980
Antelope	9–F	3,953	9,463	Neligh	760
Blackbird†	9–H	109			
Blaine ‡	9–D	......	275		
Boone	10–F	4,170	7,645	Albion	916
Brown ‡	8–D	......	6,689	Ainsworth	566
Buffalo	10–E	7,531	14,543	Kearney	3,601
Burt	9–H	6,937	10,437	Tekamah	1,200
Butler	10–G	9,194	13,314	David City	1,489
Cass	10–H	16,683	20,705	Plattsmouth	5,796
Cedar	8–G	2,899	4,948	St. Helena	210
Chase	11–C	70	170		
Cherry ‡	8–C	......	2,619	Valentine	615
Cheyenne	10–B	1,558	1,653	Sidney	1,031
Clay	11–F	11,294	14,201	Clay Centre	182
Colfax	10–G	6,588	9,260	Schuyler	1,588
Cuming	9–G	5,569	10,170	West Point	1,680
Custer	10–E	2,211	12,399	Broken Bow	212
Dakota	9–G	3,313	4,507	Dakota	420
Dawes ‡	8–A	......	2,516		
Dawson	10–E	2,909	6,710	Plum Creek	825
Dixon	9–G	4,177	6,990	Ponca	1,062
Dodge	10–G	11,263	15,499	Fremont	4,014
Douglas	10–H	37,645	72,658	Omaha	61,835
Dundy	11–C	37	432		
Fillmore	11–F	10,204	13,452	Geneva	629
Franklin	11–E	5,465	6,588	Bloomington	560
Frontier	11–D	934	4,107	Stockville	111
Furnas	11–D	6,407	7,063	Beaver City	133
Gage	11–G	13,164	26,164	Beatrice	5,211
Garfield ‡	9–E	.....	1,137	Burwell.	
Gosper	11–D	1,673	3,839	Homerville	95
Greeley	10–F	1,461	3,536	Scotia §	327
Hall	10–F	8,572	13,130	Grand Island	5,040
Hamilton	10–F	8,267	12,065	Aurora §	1,178
Harlan	11–E	6,086	7,150	Alma	911
Hayes	11–C	119	668	Hayes Centre.	
Hitchcock	11–C	1,012	2,388	Culbertson	393
Holt	8–E	3,287	16,065	O'Neill	613
Howard	10–F	4,391	7,129	St. Paul	1,311
Jefferson	11–G	8,096	11,893	Fairbury	1,423
Johnson	11–H	7,595	10,089	Tecumseh	1,670
Kearney	11–E	4,072	7,787	Minden	945
Keith	10–C	194	1,140	Ogalalla	349
Keya Paha ‡	8–E	......	4,313		
Knox	8–F	3,665	7,279	Niobrara	325
Lancaster	10–G	28,090	39,719	Lincoln	20,004
Lincoln	10–D	3,632	5,002	North Platte	2,540
Logan ‡	9–D	......	456		
Loup ‡	9–E	......	976	Taylor §	247
Madison	9–F	5,589	9,871	Madison	903
Merrick	10–F	5,341	7,223	Central City	1,232
Nance	10–F	1,212	3,829	Fullerton	936
Nemaha	11–H	10,451	13,134	Brownville	1,029
Nuckolls	11–F	4,235	7,953	Nelson	457
Otoe	11–H	15,727	19,366	Nebraska City	5,597
Pawnee	11–H	6,920	9,802	Pawnee City	1,632
Phelps	11–E	2,447	6,073	Phelps	212
Pierce	9–F	1,202	3,369	Pierce	487
Platte	10–F	9,511	12,590	Columbus	2,573
Polk	10–F	6,846	9,805	Osceola	653
Red Willow	11–D	3,044	6,192	Indianola	503
Richardson	11–H	15,031	18,688	Falls City	2,070
Saline	11–G	14,491	19,760	Wilber	1,152
Sarpy	10–H	4,481	5,867	Papillion	558
Saunders	10–G	15,810	20,427	Wahoo	2,059
Seward	10–G	11,147	15,225	Seward	2,032
Sheridan ‡	8–B	......	2,916		
Sherman	10–E	2,061	4,916	Loup City	378
Sioux	8–A	699	279		
Stanton	9–G	1,813	3,460	Stanton	811
Thayer	11–G	6,113	10,330	Hebron	894
Valley	10–E	2,324	5,835	Ord	924
Washington	10–H	8,631	11,855	Blair	2,132
Wayne	9–G	813	3,584	Wayne	818
Webster	11–F	7,104	10,221	Red Cloud	1,725
Wheeler	9–F	644	1,301	Harrington.	
York	10–G	11,170	15,082	York	2,085
Unorganized	......	2,913	2,750		
Total		452,402	740,645		

ming, and the following year an amended bill on the same subject; but nothing was done in regard to it. In 1848 he introduced another bill, which was reported the following April, and recommitted in December, but not acted upon. In 1853–54 the subject assumed a new interest, and the Kansas-Nebraska bill was introduced, which in effect repealed the Missouri Compromise and permitted the inhabitants to decide whether slavery should be admitted into their respective Territories. This doctrine, known as "squatter sovereignty," exerted an untoward influence on Kansas, inducing much disturbance there, but had no effect in Nebraska, which was organized as a Territory in 1854, and included part of Dakota, Montana, most of Wyoming, and the N. E. portion of Colorado. This region was given up to be free territory by common consent. In 1861 and 1863 the extent of Nebraska Territory was greatly diminished by the setting off of Dakota, Colorado, Wyoming, and Montana Territories. Its population increased very slowly at first, as it had little or no gold or silver; but as the Pacific R. R., which had its eastern terminus at Omaha, stretched westward, it began to fill up, and its great advantages for agricultural purposes, its rich soil, and genial climate attracted many immigrants. Its principal growth has been from 1867 to the present time. It was admitted into the Union Mar. 1, 1867, and lived under the constitution then adopted until the close of 1875, when a new constitution was ratified by the people, to take effect in 1876.

Governors.

TERRITORY.		STATE.	
Francis Burt	1854	David Butler	1867–71
T. B. Cuming (acting)	1854–55	W. H. James (acting)	1871–73
Mark W. Izard	1855–58	Robert W. Furnas	1873–75
Wm. A. Richardson	1858	Silas Garber	1875–79
J. S. Morton (acting)	1858–59	Albinus Nance	1879–83
Samuel W. Black	1859–61	James W. Dawes	1883–87
Alvin Saunders	1861–66		
David Butler	1866–67		

REVISED BY A. R. SPOFFORD.

Nebraska City, city and R. R. centre, cap. of Otoe co., Neb. (see map of Nebraska, ref. 11–H, for location of county), on the Missouri River, 35 miles S. of Omaha and 45 miles E. of Lincoln, has a Catholic convent, a public library, good public buildings, an opera-house, city gasworks, several flouring-mills and manufactories, and a large and increasing trade. It is the seat of Nebraska College. Pop. in 1880, 4183; in 1885, 5597.

Nebuchadnez'zar [in the Babylonian cuneiform texts *Nabu-kuduri-usur*, "Nebo protects the crown"], the greatest of the kings of Babylon, son and successor of Nabopolassar, the founder of the empire; was of marriageable age at the time of his father's revolt against Assyria (B. C. 625), at which time Amuhia, daughter of the Median king, was betrothed to him; is supposed to have commanded the Babylonian auxiliaries in Cyaxares's war against Lydia, and to have brought the hostilities to a close by his mediation on the occasion of the famous eclipse foretold by Thales, B. C. 610; regained Carchemish on the Euphrates from the Egyptian king 605; subjugated Syria and Palestine, carrying the principal Jews into captivity in the same year; succeeded to the throne 604; besieged Tyre 598; completed the reduction of Judæa 586; destroyed Tyre after a siege of thirteen years 585; invaded and ravaged Egypt some years later; rebuilt in a splendid manner all the cities of Upper Babylonia; constructed vast temples, aqueducts, and palaces, of which the ruins still testify to his grandeur. He was, indeed, the most successful and the most powerful monarch who sat on the throne of Babylon. Of his insanity and the events preceding it we have no other account than from the book of Daniel, though otherwise numerous inscriptions tell us about his occupations at home. D. about 561. (See Rawlinson's *Five Great Monarchies*, also the book of Daniel.)

Neb'ulæ, the name given to a class of celestial objects characterized by a certain cloudy aspect resembling the light of the Milky Way or the Magellanic clouds, or in numerous cases the diffused light of a comet's tail. Many bodies having this nebulous appearance can by means of powerful telescopes be shown to be merely clusters of apparently faint stars, whose light, commingling together, gives in the feebler telescopes a hazy or nebulous appearance, nor does there appear at present any impropriety in treating of clusters and nebulæ under one general name—nebulæ. The nebulæ are distinguished from the fixed stars by their apparent diameter, since the latter bodies appear, even under the most powerful magnifying powers, without sensible magnitude. They are, on the other hand, distinguished from the planetary and cometary disks, not only by their peculiar lustre, but by their immobility, since, as yet, a proper motion has not been demonstrated for any nebula except the trifid (*G. C.* 4355), although changes are known to have occurred within the body of one nebula and perhaps others. (See Holden in Silliman's *Am. Jour.*, 1876, May.) On account, therefore, of their fixity in position, it has always been considered that the nebulæ belong to the regions of space very far removed from our solar system. Our knowledge of these celestial bodies has been peculiarly dependent upon the successful construction of large telescopes, and is therefore almost exclusively the result of the labors of modern astronomers, beginning with Sir William Herschel. In treating of the nebulæ and allied celestial objects we shall confine ourselves to a general review of the principal labors of astronomers in discovering and describing them, and shall give such items of our knowledge respecting them as can be safely gathered from the mass of generalizations, hypotheses, and theories that have been framed in regard to these bodies.

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* Reference for location of counties. See map of Dakota and Nebraska in article, DAKOTA.

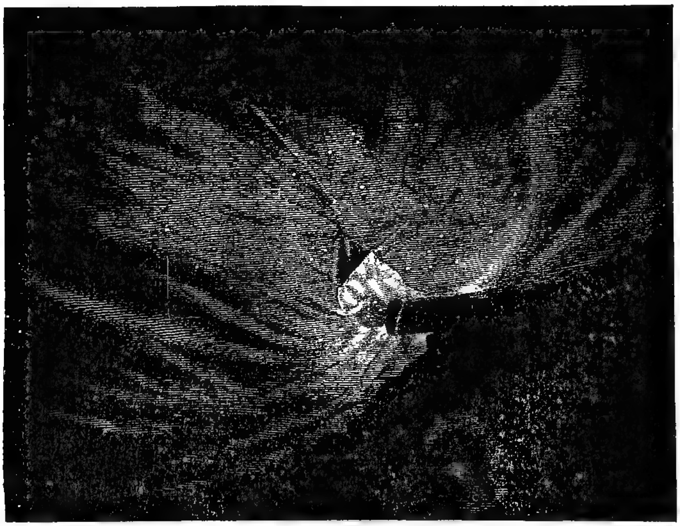
† Attached to districts for judicial purposes.

‡ Formed since census of 1880.

§ Township.

The term "cloudy stars" is first found in the catalogue of Ptolemy, but each of the five objects so named by him is now known to be a coarse cluster of stars, easily resolvable into its elements by feeble telescopes. The Arabian astronomer Sufi in the middle of the tenth century makes mention of the Magellanic clouds and of the Andromeda nebula. The first recorded telescopic observation of a true nebula is by Simon Marius, who in 1612 had appropriately described the great nebula in Andromeda as appearing to the naked eye like the flame of a candle seen through a semi-transparent sheet of horn. In 1656, Huyghens recorded the discovery of a similar nebulous body in Orion, which had been discovered without the use of a telescope by Cysat in 1619. In 1714, Halley gave an account of 6 nebulæ. In 1733, Durham contributed to the *Philosophical Transactions* a list of 22 nebulæ, 16 of which had been observed by Hevelius. In 1755, La Caille communicated to the Paris Academy of Sciences a catalogue of 42 nebulæ discovered by him at the Cape of Good Hope. These had been found by La Caille in the course of his observations of fixed stars. The important memoir of Le Gentil was published in the *Mem. Paris Acad.*, 1759; Schröter's observations in 1779. The largest general collection of nebulæ previous to the time of Sir William Herschel was that published by Messier, whose first catalogue (published in 1771) contained 45 nebulæ and clusters; while his second and third catalogues, published respectively in the *Conn. des Temps* for 1783 and 1784, contained 103. Sir William Herschel (b. 1738, d. 1822) having in 1781, with a seven-foot reflector of his own construction, discovered the planet Uranus, which he named Georgium Sidus, after his patron, George III., king of England, received from the latter both homestead and pension and other needed assistance, and was able subsequently to construct telescopes of twenty and forty feet focal length, having reflectors of from twenty to forty-eight inches diameter. By means of these telescopes he discovered several thousand new nebulæ and clusters, the places of which, with appropriate descriptions, were communicated by him to the Royal Society of London in successive memoirs—the first in 1786, 1000 new nebulæ and clusters; the second in 1789, a second 1000 additional nebulæ and clusters; and the third in 1802, a third catalogue of 500 of these bodies. The next great work by way of observation of the nebulæ is due to Sir John F. W. Herschel, son of Sir William (b. 1792, d. 1871), who in 1825 to 1830, with a twenty-foot reflector, revised a portion of the work of his father in the northern hemisphere, compiling a catalogue of 2306 nebulæ, of which 500 were new. He then transported his telescope and other apparatus in 1833 to the Cape of Good Hope, and devoted the years 1834 to 1838 inclusive to a "telescopic survey of the whole surface of the heavens." Of the seven portions into which this great work was divided, the first, on the nebulæ of the southern heavens, contained a catalogue of 2049 nebulæ, of which about 500 were new. Some of the nebulæ in the southern hemisphere observed by Sir John Herschel had also been catalogued by Dunlop, who in 1828 had presented to the Royal Society a catalogue (full of errors, however) of 629 nebulæ and clusters observed at Paramatta.

Fig. 1.



The Nebula in Orion (*G. P. Bond*).

Equally brilliant have been the labors of William Parsons, earl of Rosse (b. 1800, d. 1867), who applied reflecting telescopes of three and six feet diameter and thirty and fifty-three feet focal length to the study of the nebulæ, and whose labors have been directed rather to the minute study of interesting objects than to the discovery of new ones. Besides several earlier smaller papers, he communicated in the *Philosophical Transactions* for 1844 and 1850 the results of his examinations of several of the nebulæ observed by Sir John Herschel, and in this paper, among other interesting phenomena, announced the existence of spiral nebulæ. Further observations were published by him in 1860 and 1861. The astronomical labors of the earl of Rosse have been worthily continued by his eldest son, the present earl. Equally effective have been the labors of Lassell, who by the establishment of a magnificent reflector of four feet aperture at Malta contributed greatly to this branch of astronomy. The *Memoirs of the Royal Astronomical Society*, vols. xxiii., xxxvi., contain his work on this subject, as well as that of his assistant Mr. Marth, who discovered about 600 new nebulæ. The great reflectors at Melbourne, Australia, and at Paris and Toulouse, France, are also devoted to the nebulæ.

While the British observers of nebulæ have preferred the use of large reflectors, those of other nations have been slow to adopt them; the only important observations made by others in which reflectors have been used, at least so far as yet published, are contained in the memoir of E. P. Mason of New Haven, Conn., printed in the 7th volume of the *Transactions of the American Philosophical Society*.

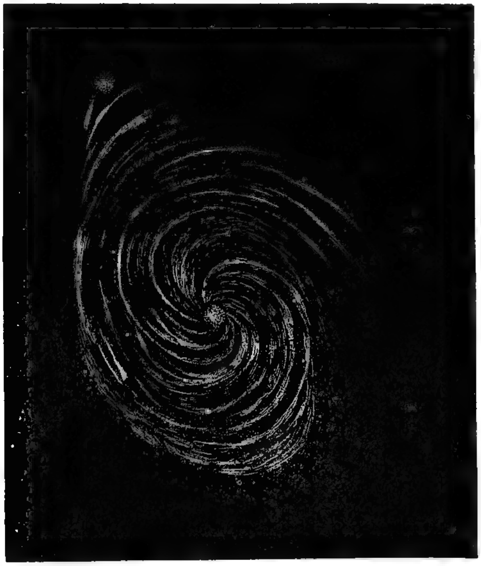
Extensive works have, on the other hand, been undertaken by continental and American astronomers with refracting telescopes. The interest in these subjects is more especially shown by the accurate observations of Schönfeld at Mannheim (1857 and 1875), D'Arrest at Leipsic (1855–61), and subsequently at Copenhagen (1861–75), Vogel at Leipsic (1867 and 1876), Auwers at Königsberg (1862), Laugier at Paris (1853), and Schultz at Upsala (1874). All of these have extended their observations to the most exact determination of the positions of a greater or less number of nebulæ, in hopes thereby to lay a foundation for our knowledge of the movements of these bodies with reference to the fixed stars. Besides the discovery of new nebulæ, admirable monographs of special nebulæ have been published by G. P. and W. C. Bond at Harvard College, Otto Struve at Pulkova, Liapounoff at Kazan, Mason at New Haven, and Holden at Washington, as well as Sir John Herschel, Lord Rosse, Lassell, Abbott, and others before mentioned.

The most comprehensive list of nebulæ and clusters that has as yet been published is the General Catalogue of Sir John Herschel in the *Philosophical Transactions* of 1864, in which work he has combined in one catalogue all the observed positions of nebulæ accessible to him in 1863, to the number of 5079, which by a comprehensive system of references and synonyms enables one to recognize by whom a given nebula was first observed, and what is its general appearance. Since the publication of this catalogue the following, among others, have appeared: D'Arrest, *Siderum Nebulosorum* (Copenhagen, 1867); Schultz's *Micrometrical Observations of 500 Nebulæ* (Upsala, 1874); Vogel, *Beobachtungen* (Leipsic, 1867 and 1876), and others by Stephan of Marseilles, Borelly. To the preceding list of those who have detected or have carefully observed the positions of nebulæ should be added, especially now, the name of Huggins, who by applying (in 1864) spectrum analysis to these bodies opened a new field of investigation; some results of the labors of Huggins, D'Arrest, Secchi, Bredichin, and others in this field will be mentioned in the following portion of this article. Rutherfurd of New York since 1860 has successfully photographed a number of clusters of stars, and thus approached the more difficult problem of the nebulæ.

If we pass now from a chronological statement of the works of astronomers relative to the discovery of nebulæ to a systematic arrangement of some portions of our knowledge of these bodies, we have at once to remark that our knowledge of them is in great part a statement merely of apparent forms and superficial features, and our classification of them has been as arbitrary as the classifications which the earlier naturalists imposed upon the animal kingdom, and has been at times as much affected as those by arbitrary hypotheses and theories. In 1755, La Caille subdivided the nebulæ known to him into three distinct classes, which may be described as—first, the irresolvable; second, the resolvable: and third, nebulous stars. The term "resolvable" is applied to a nebula whose light can, by using sufficiently powerful telescopes, be seen to be actually resolved into a mass of bright points or stars. By "nebulous star" is understood a bright star or point surrounded by haze. These latter objects were supposed by La Caille to be accidental associations of nebulæ and stars, the latter being apparently between the observer and the more distant nebulæ.

The extensive catalogues of Sir William Herschel were accompanied by systematic and detailed descriptions of the nebulæ embraced therein, which were separated by him into classes and species, pretty much as follows: first, clusters of stars, subdivided into globular and irregular clusters: second, resolvable nebulæ, or such as may be expected to be resolved into distinct stars by some increase in the optical power of the telescope; third, nebulæ properly so called, in which there is no appearance whatever of stars; fourth, planetary nebulæ; fifth, stellar nebulæ; and sixth, nebulous stars. In this classification it will be noticed that the passage from clusters of stars to nebulæ is by insensible gradations from one to the other. This classification, so far as it was based upon the observations of Sir William Herschel and the knowledge available fifty years ago, was one of convenience rather than one based upon any law of nature (except so far as we adopt Herschel's views of the construction of the universe), since what seems a nebula or a cluster to an observer on the earth might easily become, inversely, a cluster or a nebula to an observer on some distant star. Herschel's classification of both nebulæ and clusters into orders, defined by their actual shapes, is one more philosophical and equally instructive. Thus, we have first, circular; second, elliptic; third, annular; fourth, long or ray-like; fifth, spiral; and sixth, very irregular nebulæ.

FIG. 2.



The Spiral Nebula 51 M Canum Venaticorum (*Earl of Rosse*).

Again, if we classify them according to the number of nuclei, we have those of a single nucleus, including the nebulous stars or planetary nebulæ; those of two nuclei, including many elliptic and very much extended nebulæ; third, a few tri-nuclear; fourth, those having many nuclei, including in the latter most of the very irregular nebulæ, such, for instance, as the great nebula in Orion.

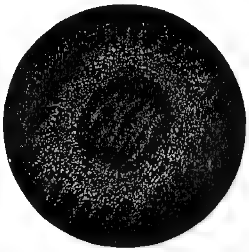
Another equally suggestive classification has regard to the distribution of light over the apparent disk of the nebula; in respect to this, we find, first, the perfectly uniform, under which we include in strictness only a few mostly so-called planetary nebulæ; second, those which exhibit a decided increase of brightness toward the centre, in which class would be enumerated the stellar nebulæ and the nebulous stars, together with numerous clusters and irregular nebulæ; third, those in which an increase of brightness takes place as we proceed from the centre outward, under which must be included the annular nebulæ and some of the more complicated forms, as, for instance, the double annulus in Toucani.

If, again, we study the relation of the nebulæ to the stars about them, we find that while the majority of these bodies appear to be indiscriminately distributed among the stars in their neighborhood, there is yet a large number of cases in which nebulæ are located in regions of comparatively few stars, and other cases in which the reverse takes place, the nebulous matter being apparently at the centre of a region in which the stars are especially numerous: the great improbability of the accidental origin of such collocations of stars and nebulæ shows that these bodies must be intimately associated together.

Again, within an irregular nebula it is found with equal frequency either that on the one hand the stars in the midst of the nebulous light seem to be surrounded by a region of little or no nebulosity, or on the other that they are centres of specially bright nebulosity—appearances which, though they may be partially, cannot be wholly, due to the effects of contrast. The classification of nebulæ according to their apparent brightness and according to their apparent size has an important bearing on the question of their actual distribution in space, notwithstanding our ignorance of their real dimensions and nature; and it is sufficient to say that while six or eight of the brightest are barely visible to the naked eye, a large majority (those which are designated as very faint nebulæ) are difficult objects with powerful telescopes. Argelander in his *Durchmusterung des nördlichen Himmels* enumerates only 64 nebulæ as visible in a telescope of three inches aperture and capable of showing stars of the tenth magnitude. As regards their apparent size, it is sufficient to add that the smallest subtend angles of from three to ten seconds in their respective dimensions, while the larger nebulæ extend over areas of one or more square degrees; in certain portions of the heavens nebulous streaks seem in powerful telescopes to connect together those nebulæ which as seen in smaller telescopes appear to be isolated. Evidences are at hand of slight variations in brightness, size, and form of a few nebulæ. The frequent occurrence of double nebulæ suggests the classification of these objects in this regard, and we find in the General Catalogue of Sir John Herschel, above mentioned, out of 5079 objects, of which 4050 are unresolved or true nebulæ, 229 double nebulæ, 49 triple, 30 quadruple, and 11 more or less complex multiple nebulæ. D'Arrest remarks that among nebulæ the double and probably binary nebulæ occur more frequently than do similar stellar combinations in comparison with the total number of fixed stars.

There remains an important class of observations by means of which we may be led to another system of classification—viz., that afforded by the application of spectrum analysis to these bodies. This difficult branch of observational astronomy we owe to William Huggins of London, who in Aug., 1864, first turned his delicate spectroscope and moderately powerful refracting telescope upon the planetary nebulæ. Secchi, D'Arrest, and, to a less extent, a few others, but especially Bredichin of Moscow and the younger (or Lieutenant) John Herschel, have also contributed to our knowledge of this subject. It is apparent from the observations of these spectroscopists that among the nebulæ we find some whose spectra have the characteristics belonging to the spectra of gases, and this almost entirely irrespective of the apparent resolvability or stellar nature of the nebulous mass. Other nebulæ have the equally characteristic spectra peculiar to glowing solids. In a third and numerous class of nebulæ we place all those whose spectra combine the characteristics of both the preceding classes. The relative motions of the earth and some nebulæ are also indicated by Huggins's later observations.

FIG. 3.



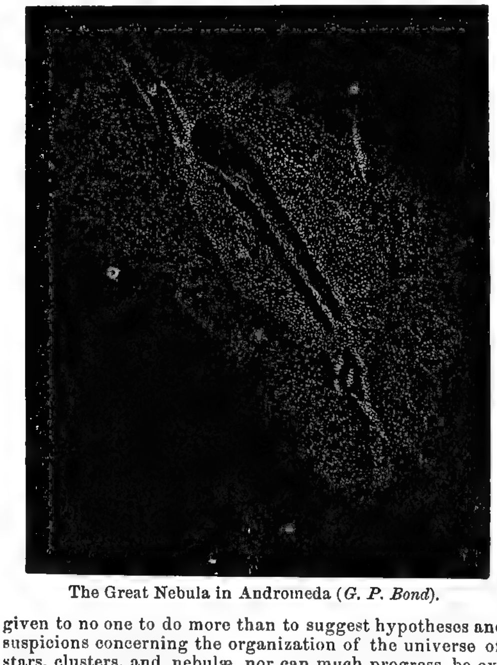
The Annular Nebula 57 M Lyræ (*Earl of Rosse*).

Our study of the nebulæ need not, however, be confined to the simple consideration of the merely superficial results of observation, but our knowledge of these bodies has been considerably advanced by the more careful processes of reasoning. Thus, the consideration of the imperceptible gradation that exists as we pass from the faintest, most diffuse, and most irregular, by insensible gradations, down to the well-defined, brightest, and smallest of the planetary nebulæ, led Sir William Herschel to imagine, most naturally, that the fixed stars, our sun, and the planets of our solar system were but the results of the systematic operations of evolution by means of which inhabitable worlds endowed with warmth, light, and life were brought forth out of primitive and gaseous matter; and, however much of hypothesis may be inherent in such a system as this, or however little ground there may have been for belief in the nebular hypothesis as first advanced by Herschel, and subsequently elaborated by Laplace, there would seem at the present day to be no reason to reject all of its propositions.

One of the most suggestive of the methods of study (applied to the stars and nebulæ in a somewhat fanciful manner by Swedenborg, Wright, Kant, Lambert, Mitchel, Boscovich, and others, but more philosophically by Sir William Herschel, John Herschel, Struve, and others) consists in the analysis of the laws according to which the nebulæ appear to be distributed over the celestial vault. From this distribution Herschel, like Lambert, Kant, etc., attempted to form some idea as to their actual distribution in space, and to supplement the earlier speculations by reliable observations and rational philosophy. On this point his conclusions seem to have been in part, if not wholly, modified during his own lifetime, and at present, instead of defending the idea held by him originally, that certain classes of nebulæ are external to the stellar system, while others form part thereof, it seems to the present writer more proper to conclude that throughout infinite space both stars and clusters and gaseous nebulæ are intermingled with each other; not necessarily in equal proportions, nor even indiscriminately, but yet so thoroughly that it is improper to describe the universe, as is frequently done, as a collection of nebulæ, of which the Milky Way is one, and which are themselves composed either on the one hand of gaseous matter, or on the other hand of stars, of which our sun is one. The fancy which makes our sun revolve about some distant star, and these both revolve, with all the members of the Milky Way, around some common centre, while the Milky Way as a whole revolves with other nebulæ around the centre of the universe, must be looked upon as a poetical conception that finds no base in philosophy and no realization in nature.

The main features of the apparent distribution of the nebulæ were made known by the Herschels. The consideration of this subject is at present made comparatively an easy matter by the publication of Sir John Herschel's General Catalogue of Nebulæ; and, based thereon, the present writer, as well as Mr. Richard A. Proctor, has ventured some speculations. (See *The Monthly Notices of the Royal Astronomical Society*, 1867–75. See also Prof. Stephen Alexander in Gould's *Astr. Journ.*, vol. ii., 1852.) In respect to all such views, it is not unfair to say that it has as yet been given to no one to do more than to suggest hypotheses and suspicions concerning the organization of the universe of stars, clusters, and nebulæ, nor can much progress be expected until we know with certainty something concerning the relative distances of some of these bodies. The determination of nebular parallax has been attempted by D'Arrest. C. ABBE.

FIG. 4.



The Great Nebula in Andromeda (*G. P. Bond*).

Neb'ular Hypoth'esis, an hypothesis proposed by Swedenborg (1734), whom Buffon (1749) closely followed, and by Kant and Wright, but elaborated by Laplace and William Herschel, and modified by later writers, according to which the present state of the universe is explained as the result of a process of gradual condensation and evolution from a primordial chaotic gaseous matter. Laplace, in the earliest editions of his *Système du Monde*, conceived that an atmosphere might originally have surrounded the sun extending to beyond the limits of the solar system; that it contracted with the loss of heat by radiation, and threw off in its rotation about a central axis certain rings of matter, which subsequently broke up into the planets and their satellites. He did not suppose that this primordial gas still existed, but that the nebulæ were aggregations of stars. Herschel, who in 1794 at first also supposed the nebulæ to be composed of stars, finally in 1811 and 1814 read before the Royal Society two memoirs in which he advanced the conclusion, based on his studies among the nebulæ, that some, and especially the irregular nebulæ, must be in part at least composed of nebulous matter, a remnant of an original vapor or gas, and that from this primordial matter there were by a process of condensation still being formed irregular nebulæ, nebulous stars, stars, etc. etc. in the order here given. These two theories being thus complementary of each other, Laplace, in subsequent editions of his *Système du Monde*, adopted Herschel's primordial nebulous matter and its actual present existence, and extended his own theory so as to include a cosmogony of the entire universe.

These views, advocated by Humboldt, Arago, and others, have been generally tacitly assumed to afford the most plausible philosophical view of the subject at present known; and within the past sixty years the beautiful experiments devised by Plateau; the discovery of the ring of asteroids; the observations of the zodiacal light; the demonstration by means of the spectroscope that certain nebulæ (not, however, those predicted by Herschel) have some of the characteristics of gases; and some other phenomena,—have, it is claimed, given additional support to slightly-modified forms of this theory.

Some of the objections to the nebular hypothesis are, however, very grave, and in the present state of our knowledge we are forced to decline to accept certain details as propounded by Herschel and Laplace, either substituting therefor ideas derived from the meteoric and cometic theories of Schiaparelli, etc., or from the molecular theories of Clausius, etc., or in other points acknowledging our complete ignorance.

Of recent general writers upon this subject we refer especially to Herbert Spencer (*Westminster Review*, 1858) and R. A. Proctor. The dynamic principles involved in the formation and preservation or disruption of revolving rings have been treated of by Maxwell, Peirce, and Hirn in memoirs on Saturn's rings, and especially in some remarkable memoirs on *Vortex Rings* by Helmholtz and Thomson, and on *Molecular Vortices* by Rankine, which latter works have a direct bearing on this subject, although perhaps not so intended by their authors. C. ABBE.

Nece'dah, on R. R., Juneau co., Wis. (see map of Wisconsin, ref. 6–D, for location of county). Pop. in 1870, 944; in 1880, 1475.

Neces'sity [Lat. *necessitas*], **Doctrine of,** treats of the essential relation which a being has towards another. It has importance theologically, morally, and scientifically. On it hinge the questions of God, freedom, and immortality, their solutions being determined affirmatively or negatively according to the type of necessity which is assumed as predominant in the universe. Three kinds or species of necessity may be enumerated as including the manifold distinctions under this head: (*a*) *Physical or causal necessity*, whereby a somewhat is subject to external constraint, determined to be what it is by another outside it. This necessity is founded on causation, and is known also under such designations as "fate" (*εἱμαρμένη* of the Stoics), "destiny" (*necessitas consequentis* of the Schoolmen), "natural selection" (of the Darwinians and ancient Epicureans and atomists); such epithets as "material," "natural," "blind," "brute" (necessity) are given to it. (*b*) *Logical or substantial necessity*, called also "ideal" or "formal," "absolute," "metaphysical or mathematical" (Leibnitz), *necessitas consequentiæ* (Schoolmen), is variously defined as "that which cannot but be in the nature of things;" "connection between parts of mental or verbal propositions;" "that the opposite of which implies contradiction." This form of necessity is founded on substantiality, "the connection of existence and essence," and is first a subjective necessity, the opposite of which is inconceivable, and, secondly, the condition also of objective reality. It is exemplified in "necessary truths" or "necessary ideas," the contrary of which cannot be conceived. (*c*) *Moral or teleological necessity* is defined as "connection of end and means," "moral obligation or conscience," "that of motives," "that of rational determination or freedom." It is called in its various phases "categorical imperative" (Kant), "hypothetical necessity" (applied by Leibnitz to the divine predetermination), "overruling Providence" (πρόνοια of the Stoics). It is founded on Final Cause, and embraces phases of manifestation within the consciousness of man, as well as those based upon the divine will; hence the wide differences in the above definitions and epithets. Logical necessity, as the distinctive characteristic of *a priori* truth, was first enunciated by Leibnitz (*Nouveaux Essais*), and afterwards made the basis of the critical system by Kant. In his *Critic of Pure Reason* Kant places the category of Necessity after those of Possibility and Reality, as forming their identity. A reality which has unrealized possibilities is contingent (this is Kant's thought), while a reality that has realized all of its possibilities is a necessary being, and cannot be otherwise, having no other possibilities. They who set up physical or material necessity as the highest principle, if consistent, make God to be a blind force, mind to be an emanation from matter, and deny freedom and immortality. They who make moral or teleological necessity the first principle hold God to be personal, and interpret nature and history as stages in the realization of free, personal beings. Logical necessity is held to be identical with God's moral necessity by some. Psychologically, the perception of necessity marks the entrance into the stage of reflection. Sense-perception perceives no necessity; to it all is contingent. Each individual is to it independent and valid by itself. Without transcending experience one cannot perceive necessity (although this is denied by Occam, the great nominalist). Reflection throughout all its stages is dominated by the idea of necessity. Each thing is dependent upon others—upon all others. In this principle are contained antinomies or unavoidable contradictions which it is the object of philosophy to solve. The process of their evolution and solution is called *dialectic*. By it the subsidiary character of physical necessity may be shown. It proves to be only a phase in the process of moral or teleological necessity, which is free-will. The following is an outline of the dialectic statement of the attitudes successively assumed by consciousness towards necessity: (*a*) All things are necessitated; each is necessitated by the totality of conditions; hence whatever is, must be as it is, and under the conditions cannot be otherwise. (This is the standpoint of complete fatalism; its incompleteness and inadequateness is seen when applied to explain change.) (*b*) But things change—something new begins and something old ceases; according to the principle of necessity, the new must be necessitated by the totality of conditions, just as the old was. If the same totality of conditions necessitates both states (the new and the old), it follows that it is adapted to both, and hence indifferent to them; it allows one to pass into the other, and therefore does not absolutely condition or constrain either. Hence, there must be two totalities of conditions, or indeed a new one for every change in the world, for the totality of conditions includes the reality of each thing, and therefore changes whenever anything changes. (*c*) Since every change involves change in the totality of conditions according to the principle of necessity, and inasmuch as all external necessity is included within the totality of conditions, it follows that this totality is its own internal necessity, moves or changes itself, originates its own action, is *causa sui*, spontaneity, freedom. The presupposition lying behind any form of physical necessity is therefore self-determination, which is discovered to be moral necessity (divine or in God) when carefully considered. WILLIAM T. HARRIS.

Ne'cho, in the Bible called **Pharaoh Necho** and in the hieroglyphics **Neku,** king of Egypt, belonged, according to Herodotus, to the twenty-sixth dynasty, a son and successor of Psammetichus I., and reigned, according to Rawlinson, from 610 to 594 B. C. He defeated Josiah, king of Judah at Megiddo 608 B. C., having landed in Syria with a great armament and penetrated into Babylon, but was afterwards routed by Nebuchadnezzar at Carchemish 605 B. C., and lost all his conquests. A canal connecting the Nile with the Arabian Gulf was commenced by him, and by his aid the Phœnicians undertook a circumnavigation of Africa.

Neck'ar, a river of Germany, rises in the Schwarzwald Mountains, on the frontier of Würtemberg and Baden, flows with a tortuous course of 210 miles through a beautiful tract of land between low, vineclad hills, and joins the Rhine at Mannheim. It receives from the left the Eng, and from the right the Jaxt, but it is shallow and difficult of navigation.

Neck'er (JACQUES), b. at Geneva Sept. 30, 1732: went in 1750 to Paris as a clerk in a banking-house; established afterwards a business of his own, and accumulated a great fortune during the Seven Years' war. In 1764 he retired from business, but continued to reside in Paris as the diplomatic representative of his native city, and acquired great authority in financial matters by his *Éloge* on Colbert and *Essai sur la Législation et le Commerce des Grains.* After the removal of Turgot in 1776 and the short administration of Clugny, Necker was appointed director-general of the finances in 1777, and the results of this appointment were both immediate and brilliant. Confidence was restored among capitalists, order was established in the administration, and economical reforms were introduced. These reforms, however, by which the expenses of the court were curtailed, in connection with a certain conceitedness and vanity in his personal bearing, made him much hated among the courtiers, and after the publication of his *Compte Rendu au Roi sur les Finances de l'État* in 1781 he was suddenly dismissed. He returned to Geneva, and bought Coppet, an estate in its vicinity, where he resided for several years, and whence he published in 1784 his *Administration des Finances.* Meanwhile, the administration of Fleury, Calonne, and Loménie de Brienne had brought financial matters in France to a crisis, and on Aug. 25, 1788, Necker was recalled and made comptroller-general and minister of state. His popularity was at this moment immense, and when the king once more dismissed him, on July 11, 1789, because he declined to participate in a royal measure by which the constitution of the third estate as a national assembly was to be annihilated, Paris rose in insurrection, and he returned to his office in triumph after an absence of eighteen days. He was, however, a good banker rather than a great financier, and as a statesman he was wholly unequal to the task set before him. In the National Assembly he was completely outshone, not only in political but even in financial questions, by Mirabeau and others, and when he resigned (Sept. 4, 1790) he had entirely lost not only his popularity as a hero of freedom, but also the respect he enjoyed as a financial authority. He lived afterwards at Coppet, half forgotten by the world, and d. there Apr. 9, 1804. His *Œuvres Complètes* were published in 17 vols. at Paris in 1822.

Neckere, de (LEO R.), D. D., b. in Belgium June 6, 1800; became a Roman Catholic priest of the Vincentian congregation; was in 1830 consecrated bishop of New Orleans. D. Sept. 4, 1833.

Necromancy. See MAGIC.

Necro'sis [Gr. νέκρωσις, a "killing"], the death of a large piece of bone or of a whole bone in the living subject, as distinguished from *caries*, the ulceration or molecular death of bone. Necrosis may result from injury, from periostitis, from phosphorus-poisoning, and from syphilis. It may be superficial, central, or total. Necrosis almost always calls for surgical interference for its complete cure. The dead bone finally separates as a *sequestrum* from the living bone, and until it is quite detached it is worse than useless to attempt to operate. The sequestrum is usually enclosed in a case of new bone, which must be cut through before the removal can take place. If the patient be young and otherwise healthy, the removal of the sequestrum is usually followed by recovery. In all cases a generous diet, with appropriate tonic treatment, is called for.

Nec'tarine [Old Fr. *nectarin*], a tree and its fruit, differing from the peach, from which it is undoubtedly derived, mainly in having a smooth skin instead of a downy one. In some instances nectarines have smooth stones, thus approaching still nearer the apricot than the peach. There are numerous sub-varieties, of which some three-fourths are freestones, the remainder being clingstones. The nectarine is a delicious fruit, but more delicate than the peach, and much exposed to the attacks of the curculio.

Ned'jed, an Arabian word signifying "table-land" or "elevated land," is by Arabian writers used in connection with other names, as the Nedjed of Yemen or the Nedjed of Oman, but is by European writers generally applied only to the large table-land of the Arabian peninsula belonging to the WAHABEES (which see).

Need'ham, Norfolk co., Mass. (see map of Massachusetts, ref. 5–I, for location of county), 11 miles W. of Boston, on the Woonsocket division of the New York and New England R. R., has glue, hosiery, and paper factories. Wellesley township has been set off from Needham since 1880. Pop. of tp. in 1870, 3607; in 1880, 5252; in 1885, 2586.

Nee'dle [Gothic, *nethla;* Ang.-Sax., *nædl;* Icelandic, *nâl*, from the Sanskrit *nah, naddha*, to "bind," whence the Latin *neo* and *nexus*, and Old Ger. *nahan*, to "sew"], in its common acceptation, a small instrument of wire pointed at one end and pierced at the other so as to receive a thread.

The needle, being required for fashioning even the rudest garment, must of necessity be contemporary if not with the first clothed man, at least with the first who strove to shape clothing to his figure. In its earliest form it was doubtless a strong thorn or a sharp splinter of bone, wood, or stone, with which the skins intended to be joined were perforated along their edges, these being afterwards laced together by hand. The next step was to make an eye in the splinter, so that one operation should pierce the material and carry the thread through it; and by degrees needles came to be smoothed and finished with much neatness, as is shown by some excellent pre-historic specimens made of horse's bone which were found in a cave near Brunequel, France, and are preserved in the British Museum. Many bronze needles have been found, varying in length from one to eight inches, the longest having probably been used for hair-pins; those discovered in Egyptian tombs are invariably coarse, though Wilkinson (*Ancient Egyptians*, iii., 384) assures us that finer kinds must have existed.

All through the Middle Ages needles must have been made, and of no coarse quality, judging by the delicate embroidery handed down to us. We read of their manufacture at Nuremberg during the fourteenth century. It was introduced into England under Queen Elizabeth, and the manufacture seems to have flourished, for about 1597 the "Pinners and Needlers" petitioned against the importation of foreign pins and needles. The English needle manufacture is now carried on chiefly at Redditch (Worcestershire) and the neighboring villages, where over 10,000 persons are employed, and where the weekly production of needles amounted to 70,000,000 in 1865, since which time it has considerably increased. The best foreign needles are made at Aix-la-Chapelle, but they do not rival those of English manufacture.

The needle-manufacturer buys his wire in large bundles, each consisting of several coils. The coils are placed on a conical reel, whence they are wound off upon a wheel of eight spokes, so constructed that the wire can, when wound, be easily removed. The large coil thus formed is cut by strong shears, usually worked by machinery, first into two half circles, then into lengths, each of which is a little longer than two needles of the size proposed. A workman can cut 400,000 such lengths, making 800,000 needles, in a day of ten hours. The cut wires, technically called *blanks*, having been taken from a round coil, are slightly bent; the next process, therefore, is to straighten them. About 5000 or 6000 are enclosed in two strong iron rings (Fig. 1), then heated red in a furnace, and allowed to cool gradually. When cool they are removed to an iron plate and rubbed backward and forward with an instrument called a *smooth file*, consisting either of one broad curved bar which is introduced between the two rings or of three narrow bars joined at the ends, into the intervals of which the rings fit. (Fig. 2.) The smooth file is sometimes worked by machinery, in which case the operation of straightening is much facilitated. The blanks are next pointed on small gritstones, of which there are usually about thirty in a grinding-room, placed in two rows and worked by a water-wheel or by steam. A grinder, seated before his rapidly-revolving stone, takes fifty or sixty wires between his thumb and forefinger, and with his thumb, which is protected by a leather shield, presses them against the stone, at the same time causing them to rotate, so as to produce on each a conical point. The wires being pointed at one end, he turns the other and repeats the process. The double-pointed blanks are next flattened in the centre and marked with eye-cavities. A bed of iron supported on a heavy wooden block, which in its turn rests upon one of stone or brick, contains the lower half of a die, the upper half being fixed to a hammer of twelve pounds' weight, movable by a lever. The "stamper," having raised the hammer by means of a treadle communicating with it, lays one blank at a time upon the iron bed, pushing it against a metal guide, so that the centre of the blank comes exactly to the lower half die; he then lets the hammer fall quickly, and the two raised faces of the die produce two opposite indentations on each side of the wire, at the same time flattening out a portion of its substance. Some needles are formed with a gutter below the eye, in which case a different die is used. *Eyeing* is done with a small hand-press, the arm of which is attached to a lever and furnished with two steel piercers or "cutters." A boy takes a number of needles and places them one by one in a notch formed in a small iron slab directly under the cutters; holding his head close to his work, he brings the arm down rapidly, and two eyes are punched out; he then raises the arm and shifts the wires so as to bring another under the press. (Fig. 3.) The needles are now strung or "spitted" upon two fine wires (Fig. 4), the "burrs" or projections caused by stamping are filed off, and the double needles are divided between the eyes by being gently bent to and fro. Each row, still strung on its wire, is grasped by the points in a sort of vise (Fig. 5), and the heads are laid upon a raised plate of metal and filed into shape. Having been much bent by the above processes, the needles are next given to the "soft-straightener," generally a female, who rolls them backward and forward on a plate of steel with the convex face of a smooth steel file; a few turns render them quite straight. Now begin the finishing processes, called "bright work." The needles are heated red in a furnace, then cooled suddenly in water or oil, and so rendered excessively brittle. They are next tempered by exposure to slow heat, during which they are stirred about with a shovel until a blue oxide forms on them, when they are removed and allowed to cool gradually. Each one is next examined by being rolled with the finger on a smooth steel slab, and any that do not roll truly are "hard-straightened" by hammering on an anvil: this work is generally done by women in their own homes. For cleaning or scouring, about 50,000 or 60,000 needles are made into a bundle in the following manner: Several strings are laid across a long wooden tray open at the sides, and over them is placed a large piece of canvas, upon which the needles are arranged in rows and sprinkled with a mixture of oil, soft soap, and emery-powder. The canvas is then rolled up after the manner of a "roly-poly" pudding and secured by the strings. A workman next coils a length of strong twine closely round the roll, removing the temporary strings, and thus forms a firm bundle (Fig. 6), which is put with others in a kind of mangle (Fig. 7), and rolled backward and forward for at least fifty hours. As such incessant friction wears the canvas, the bundles are withdrawn and unmade every eight hours, and the needles, having been washed in soap and water, are repacked in fresh wrappers, putty-powder being substituted for the soft soap and emery. In some factories the needles are "barrel-scoured;" that is, first washed in a slowly-revolving copper barrel containing soap and water, then dried

FIG. 1.

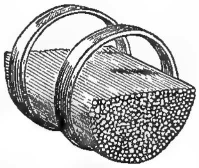


FIG. 2.

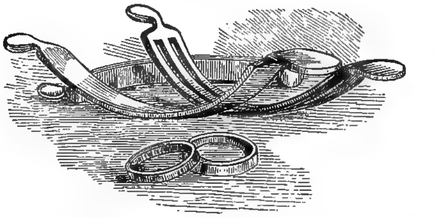


FIG. 3.

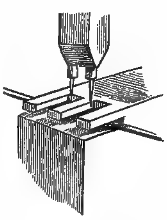


FIG. 4.

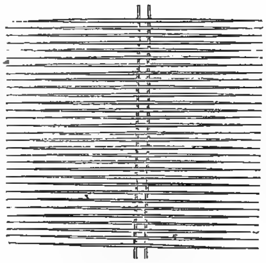


FIG. 5.

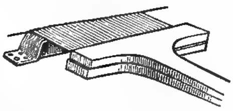


FIG. 6.

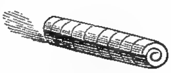
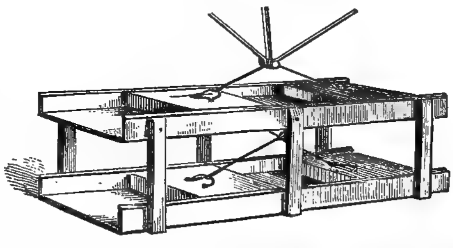


FIG. 7.



in a more rapidly-turning wooden cask half full of sawdust, and finally winnowed by fans. The needles, placed on trays, are now taken to the "bright-shop," where a little girl called the "header" arranges them with their points all one way. Then they are again examined, and broken or defective ones are removed. The eyes are next drilled, for which process they are prepared by annealing. A row of needles are laid on a steel slab, with their eyes projecting over its edge, and a red-hot plate is approached to the eyes until they assume a dark-blue color. The drill, a minute three-sided instrument, attached horizontally to a small quickly-turning wheel, is used by a young woman, who, sitting before it, takes a number of needles and applies it to the eye of each one. The eye is first "countersunk" or bevelled at its lower edge: the drill is then rapidly passed round it, and the needle being deftly turned, the same process is performed on its other side. Drilling is painful work, as there is a constant strain on the sight, and the operator is obliged to maintain a stiff position. The points are now "finished" on a rapidly-revolving honestone, and polished on leather-covered wooden wheels smeared with polishing-paste. The needles are finally counted in quarters of a hundred and made up for sale in numbered packets. Those intended for exportation are packed in air-tight cases.

Many of the needle-making processes are performed at a great saving of time by a machine invented in 1869 by W. Lake. "The wires or 'blanks' for two needles are thrown into a hopper connected with a feeding device, which conveys one blank at a time to the first set of a series of progressive carrying rollers, which take up the blanks in turn and convey them from one to the other. While being so carried the needle-blanks are stamped, the eyes are punched and tested by a 'feeler,' which detects one not properly eyed and stops the mechanism for its removal. The needle is next conveyed to two parallel rotating carrying screws, which conduct it over pointing-grinding rollers that turn the needles while pointing them. They are next carried to a cutter-wheel, which separates the needles, at the same time removing the burr from their heads, and finally they are discharged at the end of the machine." (*Specification of Patent.*) Variations of the ordinary needle are used in sailmaking, bookbinding, glove-sewing, darning, staymaking, etc. JANET TUCKEY.

Needle-Gun [Ger. *Zündnadelgewehr*], a form of breech-loading small-arms designed for military use, and at present the regulation weapon of the German infantry. It is the invention of Nicolaus Dreyse, and is extensively manufactured at Sömmerda, Prussia, his native town. Its efficiency has been demonstrated in all the German wars since 1848. As in the Chassepot, the cartridge is exploded by means of a needle thrust into the detonating mass along the bore of the piece. Though clumsy and complicated, it is a model for precision and rapidity of discharge.

Needles, The, a cluster of rocks on the W. extremity of the Isle of Wight, which take their name from their pyramidal shape. Five in number, they are composed of chalk, dotted with thin strata of flint. The violent wave-action here is constantly changing the form of these rocks, but three of which now rise to any considerable height above the water. The "Needles Light" is situated on the outer part of the farthest of these celebrated rocks, which was previously levelled nearly to the water's edge to receive it.

Neefs (PIETER), b. at Antwerp about 1570; d. in 1651; was a celebrated architectural painter, representing views of the interior of churches and other buildings, sometimes by torchlight or moonlight. The figures in his pictures are generally painted by other masters, sometimes by Breughel and Teniers.

Neele (HENRY), b. in London, England, June 29, 1798; studied law, which he abandoned for literary pursuits; published *Odes and Other Poems* (1817), *Dramatic and Miscellaneous Poetry* (1823), and *Romance of English History* (3 vols., 1827), which were all favorably received and thought to display high genius. In 1826–27 he delivered a course of lectures on the English poets, which, with another volume of tales and miscellanies, were published posthumously as his *Literary Remains* (1830), preceded by a biographical notice, from which it appears that he committed suicide during a fit of insanity Feb. 7, 1828.

Neely (HENRY ADAMS), D. D., b. at Fayetteville, N. Y., in May, 1830; graduated at Hobart College 1849; was tutor there until 1851; ordained in the Protestant Episcopal Church 1852; became rector of Calvary church, Utica, and of Christ church, Rochester, 1855–62; minister of Trinity chapel 1862, and was consecrated bishop of Maine Jan. 25, 1867.

Neely (PHILIP P.), D. D., b. in Tennessee Sept. 9, 1819; d. in Mobile, Ala., Nov. 9, 1868; joined the Tennessee M. E. conference in 1837; was a man of commanding presence and an eloquent preacher; his style was ornate and gorgeous; did much to promote the interests of education, having had charge of the Columbia Female College and acting as agent for Transylvania University; was a member of the Mobile conference at his death. A volume of his sermons has been published. T. O. SUMMERS.

Nee'nah, city and R. R. centre, Winnebago co., Wis. (see map of Wisconsin, ref. 5–E, for location of county), on the Chicago and North-western, the Milwaukee and Northern, and the Wisconsin Central R. Rs., has abundant water-power, a handsome park, and is a great summer resort for tourists. Pop. in 1870, 2655; in 1880, 4202.

Neer, van der (AART), b. at Amsterdam in 1613 or 1619; d. about 1683; was a celebrated landscape painter. His representations of conflagrations at night, of the slow streams between low banks, peculiar to Holland, moonlight scenes, etc. are excellent.

Nees von Esenbeck (CHRISTIAN GOTTFRIED DANIEL), b. at Reichenberg, Westphalia, Feb. 14, 1776; studied medicine at Jena, and was appointed professor in botany at Erlangen in 1818, and at Breslau in 1830, but was deprived of his office in 1852 on account of his participation in the movements of the laboring classes; and d. Mar. 16, 1858. He treated almost every branch of the science of botany, from analytical descriptions of single plants to philosophical speculation on the vegetable kingdom. The principal of his works are—*Das System der Pilze und Schwamme* (1816), *Systema Laurinarum* (1836), *Agrostologia Brasiliensis* (1829), *Die Entwickelung der Pflanzensubstanz* (1819), *Die Naturphilosophie* (1841).

Ne Exeat Regno, Writ of [Lat., "let him not go out of the kingdom"]. According to the rules of early English law, the king by virtue of his prerogative might issue a writ prohibiting a subject from going abroad without license. It has been thought that this was not a rule of the common law, but that it was established in the reign of Henry II. by the Constitutions of Clarendon. A section of King John's Great Charter allowed subjects to depart from the kingdom at their pleasure. In later charters this provision was not found, and it came to be understood as law that a subject did not possess the right of leaving the realm without the king's license. It followed that if a departure without license was intended by a subject, a writ could be issued requiring security that he would not leave the kingdom until such a license was obtained. This rule has now practically become obsolete, subjects being allowed freely to leave the kingdom except in time of war and public danger.

At the present time the writ of *ne exeat* is used simply as a judicial proceeding in the ordinary administration of justice. It is issued by a court of chancery (or equity) to prevent a party to a suit from withdrawing from the jurisdiction of the court, and thus rendering its decree ineffectual. The substance of the matter is, that the defendant becomes liable to give bail or security that he will not withdraw himself from the power of the court to compel him by its process to abide its order. By its aid, bail is obtained in equitable cases, as it is in courts of law, by an order of arrest. It can only be resorted to for the purpose of enforcing equitable demands, except in the case of alimony and of an action for an account. Alimony in the case of a partial divorce was granted in England by the ecclesiastical court, which had no power of exacting bail. The courts of equity, to prevent a failure of justice in such a case, interfered and aided the plaintiff by means of this writ. In the case of mutual account the court of equity has concurrent jurisdiction with the courts of law, and is thus, having jurisdiction, not debarred from issuing the *ne exeat*, though a court of law also has power over the case. It should be added that the claim must be pecuniary in its nature, and so far mature that present payment or performance can be rightly demanded. The court has power to proceed in this manner on the application of a foreigner as well as of a citizen, or where the question is between two foreigners, even though the debt was contracted abroad. All that is necessary to give the court jurisdiction is the presence of the defendant. Accordingly, if a foreign administrator should bring with him into any state trust funds which he had received abroad, and should be about to depart, he might be arrested and compelled to give security.

The equity courts of the respective States assume the same power over this subject that is exercised by the English courts of chancery, except where their inherent authority has been taken away by statute. It has been claimed by some jurists that in the assimilation of the law and equity modes of procedure by the code of New York, the writ of *ne exeat republicâ* has been abrogated by force of express statutory provisions. The better construction would seem to be that it still exists, and can be resorted to in a class of equitable demands not embraced within orders of arrest as usually issued by courts of law. Where this remedy exists it may be granted in the form of an order as well as of a writ. (For details of practice refer to Daniell's *Chancery Practice*, Barbour's do., Wait's do. *in the Courts of Record of the State of New York.*) T. W. DWIGHT.

Negapatam′, or **Nagapatnam,** town of British India, presidency of Madras, situated in lat. 10° 46′ N., on the low shore of the Indian Ocean, has a tolerably good harbor and carries on some trade with Ceylon. Pop. 10,000.

Neg′ative Quan′tity, a quantity taken in a sense opposite to that which we have agreed to call *positive*. The terms *positive* and *negative* are correlative; if we agree to consider a quantity taken in any sense as positive, it will be negative when taken in a contrary sense. Thus, if we agree to call distance estimated to the right *positive*, then will distance estimated to the left be *negative*. (See IMAGINARY.) W. G. PECK.

Negau′nee, city and R. R. centre, Marquette co., Mich. (see map of Michigan, ref. 2–F, for location of county), on the Chicago and North-western and the Marquette Houghton and Ontonagon R. Rs., has extensive iron-mines and a large mercantile interest. Pop. in 1870, 2559; in 1880, 3931; in 1884, 4103.

Neg′ley (Gen. JAMES S.), b. at East Liberty, Pa., Dec. 22, 1826; educated at Western University; was a private soldier in the Mexican war; raised a brigade of three months' volunteers in eight days, and was commissioned brigadier-general Apr. 19, 1861; served in Alabama and Tennessee with the Army of the Ohio; commanded at the battle of Lavergne, Oct. 7, 1862, in which he defeated Anderson and Forrest; was made major-general for gallantry at Stone River; was engaged in the Georgia campaign; resides at Pittsburg, which city he represented in Congress as a Republican 1869–75.

Neg′ligence [Lat. *negligentia*], in law, is the absence of that care and caution, without any positive intent to do injury, which under the circumstances of the particular case a person either assumes by contract or is bound by a rule of law to take as to the person or property of another. If this want of care results in an injury to another, he may have an action for damages; if it involves a wrong done to society, it may constitute a crime. The full treatment of the subject accordingly requires a reference both to the rules of civil and criminal law.

I. *Negligence considered as an Element in a Civil Action.*—The fact that negligence may arise from a breach of contract, or from an act wholly independent of contract, leads to a possible arrangement of the whole subject into two classes of cases, one of which would be negligence arising out of a contract, and the other tortious or purely wrongful negligence. For some purposes this distinction is important. Thus, an infant, having no general capacity to contract, cannot commit an act of negligence depending upon a contract, which he is not authorized to make; on the other hand, he might be liable for acts of tortious negligence wholly unconnected with a contract. Another distinction is, that where an act of negligence occurs in the performance of a contract, no one, in general, can sue upon it except one who is a party to the contract itself or within its purview, though indirectly sustaining damage; while if the negligent act were purely wrongful, any one injured by it, towards whom it was shown that a duty to exercise care existed, might have a remedy.

The subject of negligence is one of great magnitude and importance, having its application to the performance of contracts and to almost every conceivable social relation. The leading principles can only be stated in this article, and reference made to the subjects of most common occurrence. The course of treatment will be to enumerate some of the principal propositions in this branch of the law, and to make such an exposition and application of them as may seem necessary.

(1) Negligence is not to be confounded with fraud. In the case of negligence there is no bad purpose or intent; there is a want of that care and caution which the law under the circumstances requires. In gross cases negligence may be evidence of fraud, but it is not of itself fraud.

(2) The party charged with an act of negligence must have been under a *duty* to the injured party to exercise care. This duty may have been assumed by contract or may be imposed by law. It is frequently created by statute. Wherever the duty to exercise a certain amount of care exists, and through neglect it is not exercised, a party injured in consequence of the breach of duty has his remedy. On the other hand, there might be the same neglect, and one be injured to whom no duty was owing, in which case no action would lie. Thus, if a person should, without paying his fare and without the knowledge of the conductor of a railway train, and against the company's rules, ride upon the train, and a collision should occur through the neglect of the servants of the company, and such person should receive an injury, he would have no action against the company, as there would be no duty to exercise care toward him, as under the circumstances of the case the relation of carrier and passenger would not exist. Assuming that a duty exists, a person from whom it is owing is not allowed to shift off responsibility by delegating its performance to servants or agents. In the event of his employing them he is bound to see that his own obligation is properly discharged. Nor could he be discharged by employing contractors, unless they fulfilled the measure of his duty. Thus, a city bound to repair its streets will be responsible for the acts of its contractors, though in some instances (see MASTER AND SERVANT) an employer is not liable for the acts of a contractor.

(3) An injury occasioned to a person by an act purely accidental on the part of another who was at the time exercising due care is not actionable. Nor is it always so, though there may have been *some* want of care or neglect. There must be that want of care which under the circumstances the law regards as culpable. There is much nicety to be observed in considering in any particular case the question whether there has been culpable neglect. This will depend upon all the facts in the case. Such elements as these must be taken into account: Whether the nature of the act manifestly required much circumspection in its exercise. Thus, the care of a diamond would necessarily be greater than that of a wooden box; the caution to be observed in the transportation of passengers would be increased according to the danger which there might be of possible injury to life or limb. So the surroundings of the parties must be considered; the same article when exposed to loss by theft must be more closely guarded in a city than in the country. In a similar way, as the modes of ensuring safety in railway passenger business become more efficient, it may be negligence not to make use of them after they have generally come into use. The rule in all such cases is that the same care should be taken as a man of ordinary prudence—and in some cases of extraordinary caution—would take, under the same circumstances, in the management of his own affairs.

There has been much question whether the matter of care is not susceptible of precise and arbitrary division in the following manner: slight, ordinary, and great. On this basis, great care is such as is usually exercised under the particular circumstances by men of unusually careful and prudent habits as to their own interests; ordinary care is that which is used under the same circumstances by the majority of the community; and slight care that which is exercised by men of common sense, but careless habits. The absence of these degrees of care would respectively constitute slight, ordinary, and gross negligence. It has been objected to this classification that though it may be philosophically correct, it furnishes no clear and definite rule in the practical administration of justice—that the distinctions are subtle and perplexing, and cannot be explained to the comprehension of an ordinary jury. It is, however, undoubtedly true in some cases that the utmost diligence must be used, while in others this extreme severity is relaxed. For instance, a borrower of a valuable book is justly held to a higher degree of care than if the same article were received by him as a mere depositary at the solicitation of the owner. Still, the depositary must take some care, and not be guilty of extreme negligence. A judge, after stating these and similar distinctions to a jury, may properly ask them if the defendant has taken that care which under all the circumstances men of prudence and caution would take in the conduct of their own affairs. It would not be proper, even where the lowest degree of diligence is to be exercised, to ask them whether the party charged with negligence had taken the same care as he did of his own, but always to refer the standard to that of some class in the community, such as men of average prudence.

(4) The act of negligence complained of must be the proximate cause of the injury sustained. It is not, however, necessary that it should be the sole cause. It frequently happens that the injury would not have happened except from concurring acts, one of which is negligent and the other accidental, or both are negligent. In such a case the inquiry is as to the true cause of the loss, and one or both actors in the result will be liable or not liable as the case may show unavoidable accident or negligence. There has been an important question as to whether this principle would be varied by a fiction of the identification of the injured party, though personally free from fault, with one in whose custody or care he was, and who was himself negligent. Thus, if at a railroad crossing of different lines there

should be a collision occasioned by mutual neglect of the managers of the respective trains, and a passenger upon one of them should be injured, could it be said that he was so identified with the train upon which he was that if the owners of it could not sue for the injury sustained to their vehicles he would also be debarred? The English courts adopt this conclusion, and under such circumstances deny the injured party relief. In the U. S. the question is still unsettled, though in some of the courts (among them, those of New York) the doctrine of the English tribunals is denied. It would, however, be generally conceded that if a person injured by negligence, though himself free from fault, was unable to take care of himself—as being, *e. g.*, a young child or insane—the negligence of the parent or guardian in whose custody he was would be imputed to himself, and there could be no recovery, on the ground of "contributory negligence," to be hereafter noticed. (See subdivision (6) of this article.)

(5) In the practical administration of justice it is an important inquiry whether negligence is to be disposed of as a matter of law or of fact. Another form of statement is, Should it be disposed of at a trial by the judge or decided by the jury? The rule is that in some cases, where the evidence of negligence is plain and uncontradicted, the judge may as matter of law dispose of the whole subject; on the other hand, if the testimony be contradictory, or the decision of the question depend upon a variety of circumstances, or upon the point whether the party charged has exercised the care which men of ordinary prudence in such cases use, the judge should submit the case to the jury, with such instruction upon the rules of law as might be necessary. It may be added that he who charges negligence must prove it, at least so far as to raise a presumption which the person charged is called upon to explain or rebut. It is not necessary that this proof should be supplied by direct evidence. The circumstances under which the injury happened may lead to a presumption of negligence, casting upon the person charged the burden of proof to rebut the imputation. Thus, where the wall of a building standing upon the line of a city street fell into the street on a still day, and without any apparent external cause, and injured one lawfully in the street, it was decided that the facts raised a presumption of negligence either in the construction or proper care of the building, and that if the owner could not rebut this presumption he was chargeable. (*Mullen* v. *St. John*, 57 N. Y., 567.)

(6) Though a person may have sustained an injury which if free from fault he could have made the basis of an action, the law will deny him redress if his own negligence contributed to the injury. This rule depends upon a principle, of public policy. It is in the highest degree expedient that justice should be so administered as to furnish strong inducements to those exposed to danger to use suitable care to guard themselves against its effects. The rule in question has this strong reason to recommend it. Moreover, if the negligence be in the correct sense "contributory"—that is, if the act of neglect be such that without it the injury would not have been sustained—it seems illogical to give the plaintiff a cause of action for a loss or damage which he has brought upon himself. This rule has met with some dissent, and an attempt has been made in some quarters to introduce a doctrine of comparative negligence, holding that if the carelessness of one party was much greater than that of the other, there might be a cause of action. The grounds of this distinction are not satisfactory, and the rule of contributory negligence may now be regarded as quite firmly settled. The mere fact that the act of the plaintiff is contributory to the injury is not sufficient to debar him of remedy. There must be *negligence* on his part, and not merely that of third persons, contributing to the injury. Negligence is not enough unless it is also "contributory." Questions immediately present themselves as to the amount of care which the plaintiff must have taken to avoid the damage. This will largely depend upon the circumstances of the case. He must have used due and reasonable care. If there was danger to be foreseen, he should resort to reasonable means to avoid it. Thus, if he were crossing a crowded street, he should look to see if vehicles were passing with which he might come in contact. If he were crossing a railway, he should in like manner look for a passing train if it could be seen, and take reasonable means to avoid it. But he would only be held to ordinary care. In the case supposed he would not be required to stop his carriage and to alight, or even to stand up in it, for the purpose of satisfying his mind whether a train was approaching, although a very cautious man might do these acts from considerations of personal safety. The defence of "contributory negligence" is extremely common, and the courts have found great difficulty in disposing of certain questions growing out of it. One of these is, whether the burden of proof is on the plaintiff to show due care or on the defendant to prove the want of it. It would seem sufficiently plain that the absence of care is not to be presumed. On the contrary, the fair inference is that the injured party has acted with ordinary care. Some evidence should accordingly be offered of want of care. It is not necessary that this evidence should be direct. Contributory negligence, as well as any other form of carelessness, may be inferred from circumstances. Another point of difficulty has been whether this variety of negligence is to be disposed of as matter of law or whether it is a question of fact. Where a number of circumstances are to be taken into account, it is frequently a matter of fact, though not necessarily where the facts are undisputed. Thus, if a plaintiff should, without any special circumstances justifying his act, leave a railway car when in motion, his act might be so plainly negligent that the court would instruct the jury that he could not prevail. These principles will frequently preclude a child or other person not capable of exercising care from maintaining an action when the proper custodian is guilty of neglect. Thus, if a young child were permitted to play in a city street unattended, and were injured by neglect, it might be precluded from all recovery on account of the neglect of a parent. Still, if the child should unexpectedly be exposed to danger by its own act and without the parent's fault, a different rule might prevail. Persons who are engaged in employments hazardous to others, such as railway companies, are bound to exercise more care towards young children than towards adults, and cannot expect from them the same circumspection in avoiding collisions, or that they will in the same manner be alert to escape from danger. There are cases in which when an adult is unnecessarily exposed to danger by the negligence of others, on the impulse of the moment he acts, as it were, instinctively, and in his efforts to avoid apprehended injury sustains actual harm from another source. Such a case cannot be deemed contributory negligence. The law regards as the true cause of the injury the negligent act of the wrongdoer. For example, if a driver of a stage-coach should drive so carelessly that the coach appeared in imminent danger of oversetting, and a passenger should instinctively leap from the coach and break his limb, he would have his action, though the coach did not turn over and other passengers who remained in it were uninjured.

The rules which have thus been stated as to contributory negligence do not prevail in collisions at sea. (See Road, Law of.) The regular rule of the admiralty law is that in cases of collision by mutual fault the loss is to be divided.

On principles similar to those prevailing as to contributory negligence it is a rule of the common law that though the injured party was not at fault, he cannot recover for any portion of his loss connected with the principal injury which is attributable to his own neglect. Thus, if one be personally injured, he is not to unreasonably neglect to have suitable medical treatment and nursing. So, if his property be deteriorated, he should take reasonable measures to prevent any unnecessary diminution of value. If one knew that the gate from the highway to his cornfield had been carelessly left open by his neighbor, and that his crop was exposed to the incursions of cattle, his duty in general would be to close the gate, and if he failed to do so the loss that he might sustain would be fairly chargeable to his own neglect. This salutary rule of law is applied by the courts with increasing rigor, even to cases of injuries sustained by acts of wilful wrongdoing and open violence. Even in such extreme cases as these the injured party, after the act of violence has passed, should use reasonable means to confine the damages sustained within bounds. If he neglect to use ordinary precautions, the enhanced damages may fairly be regarded as attributable to his own misconduct, rather than as being the legitimate results of the act of the wrongdoer.

At the common law, if an injury occasioned by negligence caused death, no civil action could be brought, although in some instances a criminal proceeding might be instituted. It is plain that no action could be brought in the name of the person killed. Other persons are not pecuniarily damaged, as they could only claim compensation on the ground of loss of service, and the *relation* of master and servant, whether expressly created or implied from that of husband and wife or parent and child, is at an end. This defect in the law was remedied in England by "Lord Campbell's act" (9 & 10 Vict. c. 93; see also 27 & 28 Vict. c. 95), the provisions of which have been substantially re-enacted in this country in most of the States. It extends to cases of death caused not only by negligence, but by other wrongful act, though the great majority of cases to which the statute is applied in the practice of the courts are those of neglect. The substance of the statute is, that the action is to be brought by the executor or administrator of the person killed, for the benefit of the husband or wife or next of kin. The amount to be recovered depends upon the *pecuniary damages* sustained. In some of the States the recovery is limited to a specific sum; *e. g.* $5000. The same general elements are necessary to sustain the action as in cases where the neglect causes injury instead of death.

The principles already referred to in this article will be found applicable, among other instances, to the following: (A) Liability for the proper use of one's individual property, whether land or personal estate. The fact of the ownership of property attaches to it responsibilities both towards individuals and the public. Thus, the owner of real estate is bound to keep it in such a condition that it will not, by reason of any neglect on his part, cause injury to adjoining owners or to persons passing along a highway. The same rule would be applied if persons were invited by him to come upon his premises for purposes of business or pleasure. He would not be under the same obligations to a mere trespasser. If an owner of an open field should leave a pit in it unguarded, and trespassers should cross the field in the night, not knowing of the danger, and be injured, it could not be claimed that the owner was negligent as to them, since he was under no duty to fence the excavation. It would be quite a different case if the pit were so near an unfenced highway that one lawfully passing along it might, while using ordinary care, mistake his way and fall. It is not settled how far from an unfenced highway a pit must be, in order that it may safely be left unguarded. In England there is a statute regulating the subject. Great discussion has taken place upon the question whether if a person should collect upon his land substances which might be the source of danger to others—as, *e. g.*, a large volume of water—he would be *absolutely* bound to keep it there so as not to injure his neighbor, or only bound to use a reasonable amount of care to prevent its escape. After some vacillation of judicial opinion the latter view has gained general recognition.

In regard to personal property the same general rules would apply. An illustration may be found in the case of the ownership of animals. When there is no wilful act of wrong, liability in such a case usually turns upon the question of negligence. The owner of a domestic animal, where it is not a trespasser, is not absolutely bound to prevent its causing injury to others. Knowledge of its vicious propensities must be shown, and consequent negligence inferred in suffering it to go at large or to be in a position to cause injury. The owner of savage animals is conclusively presumed to have knowledge of their vicious propensities, and is accordingly bound so to keep them that they will not damage persons not themselves in fault. In some instances, by statute, owners of animals are made absolutely responsible for their acts causing damage. An instance is that of a dog worrying sheep. If an owner of an animal, knowing it to have a contagious disease, should by negligence allow it to come in contact with the animals of others without sufficient warning, and they should in consequence be infected, he would be responsible. (B) Liability for the due management of public property and public affairs. An important class of cases falls under this general head. These will simply be enumerated, without an attempt to develop them. The class would include such cases as the management by cities of their streets and other public works. The city, being a municipal corporation, would be liable for a culpable want of care causing injury. Similar rules would be applied to towns where they have a corporate character, as in the New England States, for defect in the highways attributable to negligence. (See TOWNS.) The same general rule is to be applied to public officers who are guilty of neglect in the management of their public duties. A distinction is taken in this respect between judicial officers and those who perform mere "ministerial" functions. The latter class is illustrated by the instance of a sheriff or clerk who merely obeys the directions of a court, without exercising discretion. (See OFFICERS.) No action will lie against a judicial officer of the higher grade of courts, known as a court of record, so long as he has jurisdiction, though he act not only negligently, but even wilfully or corruptly. The remedy in such a case is an impeachment or other process authorizing his removal. This rule is deemed indispensable to his independence in exercising his judicial functions. Minor judicial officers are liable to an action when they act with malice and bad faith. The rule of protection accorded to judicial officers is not extended to those having ministerial duties to perform. Where a positive duty is imposed upon them by law, and they have the means at their command to enable them to perform it, they are liable to those who suffer damage from a failure to perform their duties. This same principle would manifestly apply where, having entered upon the performance of their assigned duties, they acted with negligence. In some instances official duties partake both of a judicial and ministerial character. So far as they are judicial and honestly exercised the officer may be protected, though he err in judgment; as to the non-performance of the ministerial branch of his duties, he may be absolutely responsible for neglect. As a general rule, ministerial officers of a higher grade, having power to appoint subordinates necessary to their efficient transaction of business, are not responsible for the neglect of their subordinates as long as they act with due care in making the appointment or in retaining them in office. Thus, a city postmaster is not liable for the abstraction of money from a letter by one of his clerks so long as he is guilty of no neglect in designating him for his position, while at the same time he is liable for any personal act of negligence. (C) Negligence by persons engaged in a profession, trade, or business. This is a topic of a very extensive nature, and would include medical men, attorneys-at-law, bankers and bill-collectors, notaries public acting in a character not strictly official, mechanics, and agents of all sorts in relation to their employers. The general rule as to the obligations of these persons towards those who employ them is to perform their engagements with a reasonable amount of skill, depending upon the nature of the employment. They are bound to possess the average knowledge and skill of men of their trade and profession, and to exercise it in the cases entrusted to them. In respect to notaries public (see NOTARY PUBLIC) it may be remarked that for some purposes they are ministerial public officers and fall within the rules already stated. (See subdivision B.) For other purposes they are merely the private agents of those who employ them, and are liable on like grounds. (D) Cases of persons exercising a *quasi* public authority. Under this head may be grouped railway, telegraph, canal, bridge, and gas companies. These are to a certain extent regulated by statute. The subject is complex, as questions frequently arise as to their duties to the public or to individuals who are mere strangers, or to owners of land adjoining or otherwise affected by their work, and also to their employers or customers. In regard to their duties to the public, reference may be made to their interference in the matter of construction with public highways or bridges. It is, in general, their duty to restore these so far as possible to their original condition. In regard to adjoining owners, it is incumbent upon them to follow the legal maxim, "So to use their own as not to injure another." They should so make excavations as not to cause adjacent lands to fall. Although allowed under statutes, justified by the rules of "eminent domain," to take such land as may be necessary, they are bound to make due compensation. In agricultural districts railroad companies are commonly required by statutes to build the fences between their track and the land of adjoining proprietors, though in the absence of a statute they are under no such obligation. Accordingly, they are not liable in that case for the act of killing a domestic animal trespassing upon the track, without showing some act of negligence beyond the failure to build the fence. As soon as the duty to build the fence is prescribed by statute their failure to construct it becomes an act of negligence, for the natural consequences of which they become responsible. In regard to mere strangers, the rules already stated as to negligence and contributory negligence are sufficiently full for a comprehension of their duties; as to their customers, the law of common carriers of goods or passengers or of bailees will be applicable. These rules will be specially applicable to railway and telegraph companies. (See BAILMENT and CARRIERS, COMMON.) Railway companies carrying passengers are held to an extraordinary amount of care, owing to the dangerous nature of their employment. (E) The rule of "*respondeat superior*" in its relation to negligence by an inferior. It was stated in the law of MASTER AND SERVANT (which see) that the master was liable for the acts of a servant done in the scope of his employment. This doctrine has a very close and constant bearing upon the subject of negligence. Many of the topics already referred to are largely influenced by it. The negligence of owners, or of municipalities, or of railways or telegraph and other corporations, is in the large majority of cases really that of their servants, which is, however, imputed to themselves under the theory that the employer is responsible for the acts of the servant. This theory does not, however, relieve the servant. If the master is obliged to pay for his negligence, there is a remedy in his behalf against the servant. (A more full view of this subject will be found in the article MASTER AND SERVANT.) (F) Miscellaneous cases. Under this head may be collected such cases as the act of ordinary driving or riding on a highway, navigating vessels at sea, the management of fire, firearms, and combustible materials, the sale of substances dangerous to life or health, the use of water-courses, construction of sewers and private drains, the use of machinery, and the like. The subject of driving vehicles on the highway or navigating vessels at sea is governed by well-settled rules, and in the latter case provided by act of Congress. (See ROAD, LAW OF.) Many questions arise as to negligence occasioning the destruction of property by fire. An owner of property has a legal right to destroy it so long as he does not injure another. If he wilfully and recklessly sets fire to his own house or goods, and thereby causes the loss of his neighbor's property, he is responsible. The same rule will apply to the case of culpable negligence. Undoubtedly, an owner may lawfully burn brush, and other substances of which he desires to be rid, upon his own land, and if he uses due care he will not be responsible for any injury which may unexpectedly be caused to his neighbor. This proposition would not justify a plain act of negligence. It may also be said that if a stranger wrongfully sets fire to land not his own, he is responsible for all the proximate consequences of the unlawful act, both as to the property of the party directly injured and to that of adjoining owners. This matter is in some of the States regulated by statute, particularly as connected with railways. The subject of the correct management of water-courses is one of great magnitude, and will be treated of in a separate article. (See WATER-COURSES.) (The subject may be further examined in the treatises of Shearman and Redfield, and in Wharton on do., Campbell on do., Saunders on do. Reference may also be made to Addison on *Torts*, Hilliard on do., and to the digests and reports of cases.)

II. *Negligence as an Ingredient of a Crime.*—It is a general rule of law that an intent is an essential element in the commission of a crime. Still, there are cases in which carelessness or negligence will stand in the place of an evil intent. These seem principally to be cases where a person, being under a public or private duty, neglects to perform it, and thus causes an injury to society. Though there is no positive intent to do wrong, there is culpability in the failure to discharge the duty. Thus, a public officer, being under a public duty to keep a prisoner safely, is criminally liable if he by neglect permit him to escape. Statutes sometimes declare that official neglect in specified cases shall constitute a crime of a particular grade. The same general rule would be applied to a violation of a private obligation causing a wrong to society. Thus, a neglect to cleanse the bed of a river, whereby adjoining lands are overflowed, may constitute a public nuisance. It is a well-known rule in the law of homicide that an act of neglect causing death may amount to the crime of manslaughter, while a positive intent to kill will constitute murder. (See MANSLAUGHTER. See on this general subject Russell on *Crimes*, Bishop on *Criminal Law*, and other works cited in the article CRIME.) T. W. DWIGHT.

Nego'tiable Pa'per. It is unnecessary to consider this subject at length, as it is involved to a considerable extent in the topics of BILL OF EXCHANGE and PROMISSORY NOTES (which see). It may, however, be useful simply to point out the meaning of the phrase as applied to the law of commercial paper, and refer to some cases which are not strictly included within the articles to which reference has just been made.

The expression "negotiable paper" is employed to indicate the fact that there are certain rights of action which are capable of such transfers that the transferee becomes the owner in a court of law, and is able to sue by its rules in his own name. A distinction of great consequence is thus created between rights of action which are *negotiable* and those which are *assignable*. By the general rule of law a right of action is simply assignable in equity, and not capable of transfer in the view of a court of law; negotiable paper is to be regarded as an exception, and is transferable both in law and in equity. In order to make promises "negotiable" they must be made to a person and to his order or to bearer, and must be payable in money, free from all contingency as to the fact of payment or as to the fund from which it is to be made. It will be noticed that if a promise is made by A "to B or to his order," if B orders the amount to be paid to C there is by the very terms of the contract a promise to pay to C, and he may accordingly sue in his own name. Where the promise is not thus negotiable the assignee cannot sue in a court of law in his own name, but must use the name of the assignor. The practical result is, that the assignee must take the claim subject to all defences which might have been urged by the debtor against the assignor. (See ASSIGNMENT.) On the other hand, in the case of negotiable paper, if the transfer is made before maturity, in good faith and for a valuable consideration, the buyer takes it free from all defences which might have been set up as between the original parties, unless the instrument is declared void by statute, in which case it is invalid even in the hands of the purchaser. So if such paper be stolen, a thief may transfer complete title to a purchaser under similar circumstances. The fact that a purchaser acts imprudently or negligently will not, according to the prevailing opinion, affect his title, except so far as such acts may, under all the circumstances of the case, be indicative of bad faith. His ownership depends upon his intent when the paper was acquired. If the stolen paper is acquired after maturity, his title will fail, as suspicion is now cast upon it from the fact that it is still outstanding and not paid when due. The rule that a purchaser of stolen negotiable paper can under any circumstances obtain a good title is exceptional in its nature, and cannot be extended to ordinary chattels. (See SALE.) It has been stated that no one can avail himself of the peculiar rule applied to negotiable paper unless he is a purchaser for a valuable consideration. This fact raises the very important inquiry as to the meaning of the phrase "purchaser for a valuable consideration." Is it necessary that there should be money or its equivalent advanced at the time of the transfer, or will it be enough if the holder took the paper on account of an antecedent debt? It is claimed by some jurists that a transfer on account of an existing debt is not a purchase, since the creditor parts with nothing as a condition of acquiring the paper. They urge that there can be no purchase unless something is parted with at the time of the acquisition. They would admit that if a creditor had at the time of the transfer surrendered something of value, such as a note of his own debtor's, he might be regarded as a purchaser. On the other hand, if he had merely taken the note of another from his debtor by way of security for his indebtedness, and without any surrender or other act amounting in the law of contracts to a new consideration, he could not be regarded as having made a purchase. This is the view of the New York courts and of those in some other States. There are other highly respectable courts that hold that such a transaction is in substance a purchase and precludes all inquiry into the circumstances under which the note so transferred was originally given. It is greatly to be regretted that there should be so little harmony of opinion upon a subject of so much practical importance.

There has been much discussion in recent times upon the point whether the doctrines of negotiable paper can be extended to public bonds, such as those issued by the U. S. or by a State or city, or to bonds of certain corporations—*e. g.* railroads. The inquiry has grown out of the fact that by the rules of the common law a sealed instrument is not in general negotiable, and the question is, whether cases of this kind are to be treated as exceptional. The prevailing opinion now is that the seal upon these public and cognate bonds does not deprive them of negotiability if they otherwise comply with the definition of commercial paper. The fact of their currency in the money-market is sufficient to make it highly convenient and useful to attach to them the ordinary incidents of commercial paper. The same general view should be taken of interest warrants or coupons when they usually pass from hand to hand like money. It is fortunate that the courts have arrived at conclusions so convenient and satisfactory as to the protection of purchasers of property in this country reaching such vast proportions as are included within our governmental, municipal, and corporate indebtedness.

T. W. DWIGHT.

Negri'llos, Negritos, Alfooroos, Arafuras, names given to the various tribes of the Melanesian or Papuan race. Some of the hill-men of Farther India, and possibly the Andaman Islanders, are of this stock. The wild-men of the Philippines are the typical Negrillos. They have woolly hair, longer and less crisped than the negroes. The hair of some tribes grows in patches, like that of some South Africans. The features of most are of a decidedly African cast, but their languages are clearly not African. The skin is sometimes perfectly black. It seems generally but not universally admitted that the straight hair and less uniform features of the black Australian natives, with their peculiarities of language, separate them from the true Negrillo stock. The whole race are referred by Latham to the "Oceanic Mongolidæ." Their languages seem to have some verbal roots in common with the Malays. (See Wallace, *Malay Archipelago; Asiat. Researches*, iv. 393; x. 218.)

Ne'gro [derived through the Spanish or Italian from the Latin *niger*, "black"], the name of one of the prominent races or species of mankind. This race is indigenous to the tropical portions of Africa, and extends from about the fifteenth degree of N. lat., or the southern boundary of the Sahara Desert, to the twentieth degree of S. lat., or the country of the Hottentots and Bushmen, and in the W. from the Atlantic Ocean to near the borders of the Indian Ocean toward the E. It is perhaps the most distinct of all the races, and that in which are perceptible the most generalized characters, or at least those which are most indicative of affinity to and derivation from the apes, of the human genus. These characters are evidenced both superficially and anatomically, as well as morally and physically. The color, as indicated by the name, is very dark, and enough so to have caused the bestowal of the name "blacks" on the race; the mouth is protuberant, on account of the forward trend of the jaws and the thick and outward turned lips; the nose is broad and flat; the forehead flat and receding backward; the hair short and very curly, and commonly designated as woolly, although having no resemblance to true wool, and simply differing from the hair of the white race by the compression and curliness of the filaments; the hair of the face is rather scanty; the thorax more compressed than in the white race; the nates comparatively flattened, and meeting the thighs at nearly a right angle instead of a curve; the arms relatively larger in comparison with the legs, and the distal segments of both (arms and legs) comparatively larger than the proximal (*i. e.* humerus in arm and femur in leg); the knees are more bent outward; the calves weak; the ankles lower; the foot comparatively flat, and the heels longer; the great toes freer and more opposable to the others. Such are the features externally visible claimed by most observers as distinctive of the negro; these are co-ordinated with more deep-seated ones only visible on dissection.

The skeleton furnishes some: The bones are, on the whole, heavier and whiter; the skull is generally high and narrow, the average ratio of breadth to length being between 68 and 71 to 100, although sometimes falling as low as 63, and at others reaching 78; the projecting jaws entail a low facial angle, this being about 65° to 70°; the pelvis is of the oblong type, according to Weber, and is narrow, conical, or cuneiform, and small in all its diameters; the calcaneum or heel-bone is in nearly a continuous straight line with the other bones of the foot, and projects farther backward. The muscles of the limbs (arms and legs) have shorter bellies and longer tendons than in their correspondents in the white race, and those of the calves are less developed.

The brain is essentially similar to that of the white race, but as a rule the gyri and sulci seem to be more symmetrically developed, as well as less numerous and more massive, and the nerves are larger, in proportion to the brain, than in the European. The average size is less. Numerous observations have been made on this organ, and the importance of this subject demands a more extended notice. The following results are epitomized from Drs. Morton and Russell: According to Morton, the average capacity in cubic inches of the cranial cavity of 62 native African negro skulls was 83 inches, and of 12 American negroes 82 inches. Dr. Sanford B. Hunt, surgeon of U. S. volunteers in the late civil war, has recorded the results of autopsies of the brains of 405 whites and negroes made by Surgeon Ira Russell. The conclusions which he drew from these observations were: "(1) The standard weight of the negro brain is over five ounces less than that of the white. (2) *Slight* intermixture of white blood diminishes the negro brain from its normal standard, but when the infusion of white blood amounts to one-half (mulatto), it determines a positive increase in the negro brain, which in the quadroon is only three ounces below the white standard. (3) The percentage of exceptionally small brains is largest among negroes having but a small proportion of white blood."

The following table furnishes the basis for these generalizations:

Number of autopsies	Grade of color.	Average weight of brain.	Maximum weight of brain.	Minimum weight of brain.	Weight of brain.						
					60 ounces and over.	55 and under 60 ozs.	50 and under 55 ozs.	45 and under 50 ozs.	40 and under 45 ozs.	35 and under 40 ozs.	Less than 35 ounces.
		oz.	oz.								
24	White.	52.06	64	44¼	1	4	11	7	1		
25	¾	49.05	61	40	1	...	10	12	2		
47	½	47.07	57	37¾	...	2	13	19	12	1	
51	¼	46.54	59	38½	...	2	10	22	11	6	
95	⅛	46.16	57	34½	...	1	15	50	21	7	1
22	1/16	45.18	50½	40	...	...	3	10	9		
141	Black.	46.96	56	35¾	...	5	42	51	38	3	
405	....	......	...	......	2	14	104	171	94	17	1
Autopsies of others.											
278	White.	49½	65	34	7	28	99	97	39	7	1

Such are the principal characteristics that have been attributed to the negro in contradistinction at least to the European. Most of them hold good as average characters, but it is doubtful whether any are absolute, and some of them are very difficult to gauge and appreciate. Not only are varietal differences observable between the inhabitants of the different parts of Africa, but the individual differences in one and the same tribe are not inconsiderable. All, therefore, that can be justly claimed is that the characters enumerated are expressive of the typical negro, which may severally fail if we examine special individuals of the race.

The larynx of the negro, according to Dr. George D. Gibb (*Memoirs of the Anthropological Society*, ii. pp. 322, 323, 1864), is distinguished by "the invariable presence of the cartilages of Wrisberg [little bodies like small round peas at the top of the back of the larynx, not commonly seen in other races of mankind], the oblique or shelving position of the true vocal cords, and the pendent position of the ventricles of Morgagni;" it is "fairly developed, not unusually prominent in the neck, and the vocal cords are not, perhaps, of the full length of those in the European races, nor of the Tartars."

Numerous physiological characters have also been attributed to the negro as distinctive of his race. It has been claimed that there is a greater uniformity of temperament, and that only the choleric and phlegmatic are developed in the race; that the negro is only capable of a minor degree of cultivation; and that he is less subject to malarious diseases than the white race. These statements are also to be accepted as only generalities, and not as absolute. It is indisputable that the negro in his average characters deviates less from the ape tribe than any other race, and that no high state of civilization has ever originated from among the race. Many tribes exhibit, however, considerable skill in the erection of their huts and the weaving of cloths, etc., as well as in the manufacture of implements for household economy and for war and the chase. Most are fond of music, and have much aptitude for its cultivation, although their taste is different from that of the cultivated European. Their religious ideas are vague. They believe in the doctrine of a future life, but not apparently (or at least to a very uncertain extent) in a system of future rewards and punishments. By some, at least, the idea of the transmigration of souls seems to be entertained. They are very superstitious, and have generally intense belief in charms and witchcraft. These are the typical characteristics of the wild Africans.

The system of slavery has resulted in the alienage of large numbers of the race from their country and transportation to foreign lands—mostly to the southern part of the U. S., the West Indian islands, and Brazil and Guiana. In all these countries they have largely increased, readily assumed the habits and language, as well as religion, of the citizens, and exhibited frequently considerable aptitude for higher cultivation. Although their powers of origination seem to be comparatively small, they readily copy the manners of their superiors, and frequently display much superficial polish. They are very emotional, and chiefly select those religions which appeal most strongly to the senses, such as the Roman Catholic and the Methodist. On some the religion thus adopted appears to have a serious and effective influence, and to regulate their daily life; while on others the effect is very superficial, and extreme religious exaltation does not appear to be incompatible with low moral ideas and actions.

As a natural result of the transportation of large numbers of the race to foreign countries, there has been an intermixture between representatives of the race and those of the dominant races of the countries to which they have been carried. The offspring between the two races are called mulattos. Many generalities have been enunciated respecting the structural and physiological attributes of these mulattos, but often with a very unsatisfactory basis. They are to a certain extent intermediate as to their characters between the two races, but perhaps on the whole exhibit more of the features of the father than of the mother. They are reputed to be bad breeders, but the exceptions at least are numerous. They are said also to be ugly and revengeful in disposition, but this is probably more the result of a feeling of wrong to themselves than an innate peculiarity of race. It is further claimed that they are less hardy than either parent race, and that they very soon die, but on this very point exact and numerous statistics are needed.

THEODORE GILL.

Negropont. See EUBŒA.

Nehemi'ah [Heb., "the Lord consoles him"], **Book of,** an historical book of the Old Testament. Its author lived in the fifth century B. C. He was a Jew, with the title of *tirshatha* ("cup-bearer") to Artaxerxes Longimanus, and governor of Judæa under the Persian rule after the restoration of the Jews. His work is a continuation of that of Ezra, and is the last in historical order of the Old Testament narratives. It is valuable for its description of the restoration of Jerusalem. In the Hebrew canon Nehemiah and Ezra are counted as one book.

Neher (Bernhard), b. at Biberach, in Wurtemberg, 1806, received his first instruction in painting from his father, who was a distinguished artist, and finished his studies in the academies of Stuttgart and Munich (under Cornelius) and in Rome. The first great work he executed after his return was the immense fresco on the *Isarthor* of Munich, representing the entrance of the emperor Lewis the Bavarian into Munich. In 1836 he went to Weimar, where he decorated the Goethe and Schiller galleries with frescoes. In 1844 he was made director of the art-school in Leipzig, and in 1854 of that in Stuttgart. Besides historical subjects, he has painted several of a religious nature.

Nehiroirini, or **Montagnais,** a tribe of Algonkin Indians in Canada, closely related to the Nascapees, and occupying the N. bank of the St. Lawrence from the Saguenay River to the Straits of Belle Isle. At the time of the first French voyages to Canada, in the sixteenth century, they occupied the region around Quebec, but were driven eastward by the Iroquois, and drove the Esquimaux before them into Labrador; were friendly to the French; have had Catholic missionaries since the time of Champlain, and have learned to read and write. Their principal villages are Point Bleu, Chicoutimi, Moisie, and Cascapediac; they numbered 1700 in 1872, and lived chiefly by hunting the caribou.

Nehlig′ (Victor), b. in Paris, France, in 1830; studied painting under Abel de Pujol and Cogniet; resided for a time in Havana, Cuba, and ultimately settled in New York, where he obtained great applause by his pictures illustrative of American history, romance, and poetry, among which are *Gertrude of Wyoming, Hiawatha and Minnehaha,* and *Pocahontas.* He was chosen in 1870 a member of the National Academy of Design, and in 1872 visited the studios and galleries of London.

Neilgher′ry Hills, an almost isolated group of mountains in Southern Hindostan, between lat. 11° 10′ and 11° 38′ N., and between lon. 76° 30′ and 77° 10′, and covering an area of 700 square miles. They consist of granite, covered with a layer of rich black soil ten feet deep, and rise in the highest peak, Dodabetta, to the height of 8760 feet. Their sides are covered with impenetrable jungles of tropical forests, hot, unhealthy, and swarming with wild animals—elephants, tigers, and leopards; but at an elevation of about 5000 feet they form a table-land remarkable for its beautiful and healthful climate, and on this account much frequented by Europeans. The native population comprises, besides the Badahars and other Hindoo tribes, also the Todas, who differ very much from all other races in India, being tall, well formed, and with strongly-marked Jewish features.

Neill (Edward Duffield), b. at Philadelphia, Pa., in 1823; studied at the University of Pennsylvania and graduated at Amherst College in 1842; became a Presbyterian minister at St. Paul, Minn., 1849; was private secretary to Pres. Johnson 1867–68, and afterward appointed consul at Dublin, Ireland; has been a frequent contributor to the religious magazines, and has published *Annals of the Minnesota Historical Society* (1856), *History of Minnesota* (1858), *History of the Virginia Company* (1869), *The Fairfaxes of England and America* (1868), *Terra Mariæ, or Threads of Maryland Colonial History,* and *English Colonization of America during the Seventeenth Century* (1871).

Neill (Thomas H.), b. in Pennsylvania in 1825; graduated at West Point, and was assigned to the infantry (brevet second lieutenant) July, 1847; served mainly on frontier duty and at West Point previous to 1861; in the civil war he organized the 23d Pennsylvania Vols., which he commanded throughout the Virginia Peninsular campaign of 1862; appointed brigadier-general of volunteers Nov., 1862, he commanded a brigade (6th corps) at the battle of Fredericksburg, Dec., 1862; at the storming of Marye Heights, May, 1863; at Gettysburg, July 2–3, 1863; and in command of a division during the Richmond campaign of 1864 and siege of Petersburg; engaged in the battle of Winchester Oct. 19, 1864; brevetted from major to major-general for gallantry. In 1870 he was transferred to the 6th Cavalry with the rank of lieutenant-colonel; commander of cadets at West Point 1875–79; colonel 8th Cavalry Apr. 8, 1879; retired Apr. 2, 1883. D. Mar. 12, 1885.

Neill (William), D. D., b. near Pittsburg, Pa., in 1778; graduated at Princeton 1803; was tutor there 1803–05; was for several years Presbyterian pastor at Cooperstown, N. J., Albany, and Philadelphia; president of Dickinson College 1824–29; secretary and general agent of the Presbyterian Board of Education 1829–31; minister at Germantown 1831–42; editor for some years of the *Presbyterian Magazine,* and author of *Lectures on Biblical History* (1846), *Exposition of the Epistle to the Ephesians* (1850), *Divine Origin of the Christian Religion* (1854), and *A Ministry of Fifty Years, with Anecdotes and Reminiscences* (1857). D. at Philadelphia Aug. 8, 1860.

Neills′ville, cap. of Clark co., Wis. (see map of Wisconsin, ref. 4–C, for location of county), on Black River, has numerous manufactories and mills. Pop. in 1880, 1050.

Neilson (James Beaumont), b. at Shettleston, near Glasgow, June 22, 1792, settled in 1817 in Glasgow as engineer to the first gasworks established in that city, and introduced many improvements in gas-making during the twenty years of his employment there. But that which made his name famous was an improvement in the manufacture of iron—the discovery that if the air-blast for a smelting-furnace be used hot instead of cold a double economy results: the same furnace can produce an increased quantity of pig-iron per week, and the cost of production is very considerably lessened. D. at Queenshill, Kirkcudbrightshire, Jan. 18, 1865.

Nei′sse, town of Prussia, province of Silesia, at the influx of the Biela in the Neisse. It is a fortress of second rank, and contains many military establishments, schools, barracks, magazines, etc. It has large breweries and distilleries, and extensive manufactures of arms, chemicals, tobacco, and linen and woollen fabrics. Pop. 20,507.

Ne′ive, town of Italy, province of Genoa, about 8 miles E. of the city of Genoa. It lies on the seashore at the foot of Monte Moro, which encloses it semicircularly and protects it from the N. wind, and the consequently mild climate makes it a favorite winter-retreat for invalids. The roadstead is not easily accessible, but there is safe anchorage about half a mile from the shore, and, besides an active coasting-trade, many vessels leave this port for America, the Black Sea, etc. Lord Bentinck here embarked his troops for his assault upon Genoa. Pop. 5186.

Nélaton′ (Auguste), b. at Paris June 17, 1807; studied medicine; became professor in clinical surgery in 1839; invented a new method of extracting calculi, which he applied with great success. D. Sept. 21, 1873. He wrote *Éléments de Pathologie chirurgicale* (5 vols., 1844–60).

Neligh, Neb. See Appendix.

Nelles (Samuel Sobieski), D. D., LL.D., b. at Mt. Pleasant, Ont., Canada, Oct. 17, 1823; graduated in 1846 at Middletown, Conn.; became a Wesleyan preacher in Canada, and in 1850 president of Victoria College, Cobourg.

Nellore′, town of British India, presidency of Madras, capital of a district of the same name, is on the Pennar near its mouth, in lat. 14° 27′ N. It is not well built, but is clean, airy, and healthy. Pop. about 25,000.

Nel′son, town of New Zealand, on the northern extremity of Middle Island, at the head of Blind Bay, has a good harbor. It is well built, and its surroundings are very fertile and beautiful. Pop. about 6000.

Nelson, cap. of Nuckolls co., Neb. (see map of Nebraska, ref. 11–F, for location of county). Pop. in 1880, 196; in 1885, 457.

Nelson (A. Homer), b. at Poughkeepsie Aug. 31, 1829; educated in the public and high schools of Poughkeepsie, N. Y.; studied law and admitted to the bar in Duchess co.; county judge 1855–68; representative in 38th Congress; delegate-at-large to the convention of 1867 for revising the State constitution; secretary of state 1867–71; State senator 1882–84.

Nelson (David), M. D., b. near Jonesborough, Tenn., Sept. 24, 1793; graduated at Washington College, Va., 1810; studied medicine at Danville, Ky., and at Philadelphia Medical School; served in Canada as surgeon during the war of 1812; was for some years a skeptic upon religious topics, but ultimately became a Presbyterian minister (1825) in Tennessee, Kentucky, and Missouri; was the founder and first president of Marion College, near Palmyra, Mo., 1830, which, however, existed but a few years; established near Quincy, Ill., an institution for the training of students for the ministry, which also failed; was actively engaged in the anti-slavery cause, and was author of a once popular work, *The Cause and Cure of Infidelity* (1836), which passed through many editions. D. at Oakland, Ill., Oct. 17, 1844.

Nelson (Horatio), Viscount Nelson of the Nile, duke of Bronté, b. at Burnham Thorpe, Norfolkshire, England, Sept. 29, 1758, was the fourth son of Rev. Edmund Nelson, rector of the parish; attended school at Norwich and at North Wolsham; obtained at the age of twelve an appointment as midshipman; accompanied Capt. Phipps's Arctic expedition 1773; served in the East Indies 1775–76; became lieutenant Apr. 8, 1777, and post-captain July 11, 1779; given command of a man-of-war, with which he proceeded to San Juan del Norte, Nicaragua; took Fort San Carlos in the San Juan River; cruised in the North

Sea 1781–82; served again in the West Indies 1782–87; was stationed for the protection of trade near the Leeward Islands; captured four American vessels for violation of the navigation laws, for which conduct he was subsequently prosecuted by their captains; married Mrs. Nesbit, the widowed daughter of Gov. Herbert, at Nevis, Mar., 1787; served under Lord Hood in the Mediterranean 1793–94, at which time he was sent with despatches to Naples, and first made the acquaintance of Sir William and Lady Hamilton; commanded a small squadron on the coast of Corsica which co-operated with Paoli, and took Bastia May, 1794; aided in the siege of Calvi, where he lost an eye; participated in Admiral Hotham's victory over the French squadron Mar. 15, 1795; took the island of Elba; blockaded Leghorn Apr. to Oct., 1795; was made commodore 1796; distinguished himself under Admiral Jervis in the naval victory over the Spanish fleet off Cape St. Vincent Feb. 14, 1797; was appointed rear-admiral Apr., 1797; took part in the blockade and attempted bombardment of Cadiz May to July, and in the unsuccessful attack upon Santa Cruz, Teneriffe, July, 1797, where he lost his right arm; was made a knight of the Bath and received a pension of £1000; took command of the Mediterranean squadron off Toulon May, 1798; followed Napoleon's expedition to Egypt, and destroyed the French fleet at the Bay of Aboukeer (generally called the battle of the Nile), being wounded in the engagement, Aug. 1, 1798, for which victory he was made Baron Nelson of the Nile, and received an additional pension of £2000; proceeded to Naples in September; occupied Leghorn in November; aided the government of Naples in resisting the French invasion and in recovering the capital after it had been taken, but stained his reputation by violating the capitulation concluded June 23, 1799, and hanging Caraccioli, the insurgent admiral; was made duke of Bronté (Sicily); aided in the siege of Malta; returned to England in company with Sir William and Lady Hamilton Nov., 1800; was received with unbounded popular enthusiasm; separated from his wife on account of his attachment to Lady Hamilton; was made vice-admiral Jan., 1801; was second in command of the Baltic fleet in the naval battle of Copenhagen, Apr. 2, for which he was made viscount; took command of the squadron for the defence of England against the contemplated French invasion in July; attacked the French flotilla off Boulogne Aug. 15; resided with the Hamiltons at their seat in Merton, Surrey, during the Peace of Amiens, 1802–03; was appointed commander of the Mediterranean fleet on the resumption of hostilities May, 1803; blockaded Toulon; unsuccessfully pursued a French fleet to the West Indies May, 1805; returned to England in July; again took command of the Mediterranean fleet, and inflicted a total defeat on the combined French and Spanish squadrons off Cape Trafalgar, losing his life in the engagement, Oct. 21, 1805. Lord Nelson was buried in St. Paul's cathedral, Jan. 8, 1806, his funeral being the most magnificent ever seen in England. He left an "adopted daughter," Horatia Nelson Thompson, but the codicil which he added to his will shortly before his death, and by which he recommended her to the care of the king and the Parliament, was kept secret by his brother, Rev. William Nelson, D. D., until the king and the Parliament and the people had completely exhausted their enthusiasm and munificence by the honors and riches they heaped upon him; and when it afterward was made known, it remained almost unnoticed. His tactics he had learnt from Napoleon, "plunging headlong into the enemy's fleet, and doubling upon a part of their line, in the same manner as Napoleon practised in battles on land." (See *Lives* by Southey, Pettigrew, and De Forgues, and his *Letters and Despatches*, edited by Sir N. Harris Nicolas (7 vols., 1844–46).)

PORTER C. BLISS.

Nelson (JOHN), b. in Frederick, Md., in 1791; graduated at William and Mary College 1811; was a member of Congress 1821–23, chargé d'affaires to the Two Sicilies 1831–33, and attorney-general of the U. S. under Pres. Tyler's administration from Jan. 2, 1844, to Mar. 5, 1845. D. at Baltimore Jan. 8, 1860.

Nelson (SAMUEL), LL.D., b. at Hebron, N. Y., Nov. 10, 1792; graduated at Middlebury College in 1813; was admitted to the bar in 1817; became a successful lawyer of Cortland co., N. Y.; judge of the circuit court 1823–31, of the State supreme court 1831–37, its chief-justice 1837–45; in 1845 was appointed a judge of the U. S. Supreme Court, from which he retired in 1872: member of the joint high commission to settle the Alabama claims 1871. D. at Cooperstown, N. Y., Dec. 13, 1873.

Nelson (THOMAS), b. in York co., Va., Dec. 26, 1738; was educated at Trinity College, Cambridge, and before his return, when just twenty-one, was chosen to the house of burgesses of Virginia; was a member of the Williamsburg convention 1774, of the convention of 1775, and of the Virginia constitutional convention of 1776; was in Congress 1776–77 and 1779; signed the Declaration of Independence; served as colonel, and afterwards as a general officer, in the army; was governor of Virginia in 1781; expended his great fortune for the cause of liberty, and at the siege of Yorktown directed the artillery to play upon his own mansion, the supposed head-quarters of Cornwallis. He d. in comparative poverty Jan. 4, 1789.

Nelson (THOMAS A. R.), b. in Roane co., Tenn., Mar. 19, 1812; graduated at East Tennessee College in 1828; was admitted to the bar before he had attained the age of twenty-one, and was appointed district attorney for the first district of Tennessee in 1833; in 1844 he canvassed his district as elector for Henry Clay, and in 1848 for Gen. Taylor; in 1851 was appointed commissioner of the U. S. to China, but for private reasons declined to accept; in 1859 was elected to the U. S. Congress; he adhered to the cause of the Union during the civil war, yet at its close stood a tower of strength for his vanquished South; was one of the counsel who defended Pres. Johnson upon his impeachment in 1868; in 1870 was elected one of the six judges of the State supreme court under the new constitution, but resigned after a little more than a year's service on the bench. D. at Knoxville, Tenn., Aug. 24, 1873. JAMES D. PARK.

Nelson (THOMAS HENRY), b. in Mason co., Ky., about 1824; studied law at Maysville; removed in early manhood to Rockville, and subsequently to Terre Haute, Ind., where he became a political leader of the Whigs and one of the founders of the Republican organization; was several times delegate to national and State conventions, candidate for Presidential elector, for Congress, and other offices, but usually defeated, as he resided in a strong Democratic district; was minister to Chili 1861–66, where he achieved a great personal popularity; was conspicuous in the rescue of numerous victims at the burning of the Jesuits' church at Santiago Dec. 6, 1864; took an active part as mediator between Chili and Spain in the war of 1864–66; was envoy to Mexico 1869–73, and afterward resided as a lawyer at Washington, D. C.

Nelson (Gen. WILLIAM), brother of Thomas Henry, b. at Maysville, Ky., in 1825; entered the navy in 1840; participated in the siege of Vera Cruz 1847; served in the Mediterranean and South Pacific squadrons; was made lieutenant-commander in 1861, and commanded the gunboats on the Ohio River, but soon exchanged the naval for the military service; was made brigadier-general Sept. 16, 1861; organized Camp Dick Robinson, and another at Washington, Mason co.; successful in engagements in Eastern Kentucky; commanded the 2d division of Gen. Buell's army at Shiloh; wounded at the battle of Richmond, Ky.; placed in command at Louisville when threatened by Gen. Bragg; made major-general of volunteers July 17, 1862, and in an altercation at the Galt House Sept. 29, 1862, was shot dead.

Nelson (WOLFRED), M. D., b. at Montreal, Canada, July 10, 1792; became a physician 1811; was surgeon to a Canadian battalion during the war with the U. S. 1812–15; elected to the Canadian Parliament for Sorel 1827; engaged in a rebellion against the British government 1837; won an engagement at St. Denis on the Richelieu River, but was captured and exiled to Bermuda; settled at Plattsburg, N. Y., 1838; returned to Montreal 1842 on the amnesty; was member of Parliament 1844–46; became inspector of prisons 1851; was president of the College of Physicians and Surgeons; twice mayor of Montreal. D. at Montreal June 17, 1863.—His brother ROBERT NELSON, also a physician, headed an insurrectionary party in 1838, and subsequently resided in California and in New York.

Nelsonville, Athens co., O. (see map of Ohio, ref. 7–G, for location of county), on R. R., 60 miles from Columbus, in the great coal-region of Ohio, has mills, furniture-factories, etc. Pop. in 1870, 1080; in 1880, 3095.

Nelum'bium, an interesting genus of water-plants, akin to the water-lilies (Nymphæaceæ), by some ranked as a separate order, the Nelumbiaceæ, by others as a suborder. The genus contains only two or three species. The *Nelumbium speciosum* (the Egyptian bean, nelumbo of the Ceylonese, lotus of Thibet and India) furnishes in China and the East much food. Its seeds, roots, and stalks are cooked, and are very palatable, abounding in starch. This plant is nearly or quite extinct in Egypt, where it was once worshipped. The *N. luteum* of the U. S. has dull yellow flowers (those of the preceding generally are rose-colored). Its roots and seeds (water-chinquapins) are very palatable. It grows in shallow waters.

Nematel'mia [Gr., "thread-worms"], an order of worms, mostly parasitic (entozoic), having cylindriform bodies, an animal distinctly unisexual. Sight, hearing, and respiration appear to have no special organs. One group, the Acanthocephala, contains organisms which resemble cestoid worms in having no alimentary canal. The Gordiacea or hair-worms resemble the trematode worms in having no vent to the intestine. The typical Nematelmia are called nematoid worms (Nematoidea), and have a perfect alimentary canal with both mouth and vent, and suspended in the somatic cavity, and distinct sexes. The three groups indicated above may be regarded as three sub-orders, though many writers apply the name Nematelmia to the last-mentioned group alone.

Nematistiidæ. See APPENDIX.

Nematog′nathi [from νῆμα, νήματος, "thread," and γνάθος, "jaw," in allusion to the filamentous extension of the maxillary bones], an order of teleost fishes distinguished by many peculiarities of the skeleton and brain. The skull has a nearly rectilinear dorsal outline, there being no anterior geniculation; the supra-occipital is confluent with the parietals; the pteriotic bone is simple; no symplectic bone is differentiated; the intermaxillary bones are attached to the inferior surface of the ethmoid; the supramaxillaries are styliform, articulated at their bases, and enclosed in filamentous extensions of the skin, developed as the supramaxillary barbels; the suboperculum is wanting: in the branchial apparatus (according to Cope) the third superior pharyngeal bone is wanting or small, and resting on the fourth, the second directed backward; one or two pairs of basibranchihyals and two pairs of branchihyals are developed; the branchiæ are pectinated; in the scapular arch the coracoid elements are soldered with the proscapula (clavicle of some), and the mesocoracoid is represented by a bridge-like arch; "interclaves" are developed; the post-temporal (supra-scapula of some) is co-ossified with the skull; no postero-temporal or supra-clavicle is represented; the brain has an immense cerebellum, which extends forward over the optic lobes; the optic lobes are quite peculiar in their thalami; the heart has no bulbous arteriosus; the air-bladder connects by a duct with the roof of the œsophagus. These and other characters unite to distinguish the catfishes and related forms from all other types as an independent order. The order is represented by numerous species, most of which are found in the fresh waters of almost all warm and temperate countries, but some are also marine. Although, apparently, in many respects, an ancient type, no forms that can be certainly referred to it have been found in the older rocks. The order has been differentiated into the families: (1) Trichomycteridæ, (2) Siluridæ, (3) Chacidæ, (4) Plotosidæ, (5) Clariidæ, (6) Callichthyidæ, (7) Argiidæ, (8) Loricariidæ, (9) Lisoridæ, (10) Hypophthalmidæ, (11) Aspredinidæ. Of these, the first nine (1–9) have a well-developed operculum, and the four anterior vertebræ coalesced into one; the tenth (10) has also an operculum, but the anterior vertebræ are distinct; while in the eleventh (11) the operculum is wanting, although the anterior vertebræ are modified as in most of the order. The first, sixth, seventh, eighth, tenth, and eleventh families are peculiar to South America; the third, fourth, fifth, and ninth are peculiar to the fresh waters or seas of the tropical parts of the eastern hemisphere; and the second is cosmopolitan. All the North American species belong to the SILURIDÆ (which see). THEODORE GILL.

Nematoidea. See APPENDIX.

Nematoid Worms. See NEMATELMIA.

Nemean Games. See GRECIAN GAMES.

Nemesia′nus (MARCUS AURELIUS OLYMPIUS), a Latin poet, b. at Carthage in the middle of the third century of our era, flourished at the court of the emperor Carus, and wrote didactic poems on hunting, fishing, etc.

Nem′esis [Gr. Νέμεσις], the Greek goddess who personifies the idea of strict divine retribution. In the earlier writers she stands for the guilty conscience, and later she appears as the just dispenser of good and ill fortune.

Neme′sius, a Christian philosopher of whose life nothing is known, except that he was bishop of Emesa and lived about 400 A. D., but of his works one is still extant—Περὶ Φύσεως Ἀνθρώπου. It was for a long time attributed to Gregory of Nyssa, and under his name translated into Latin. The Greek text was first published under the true author's name in 1565 by Ellebodius, afterwards by Matthäi (Halle, 1802). It was translated into English by George Wither (1636), into German by Osterhammer (1819), and into French by J. B. Thibault (1844).

Nemichthy′idæ [Gr. νῆμα, "thread," and ἰχθύς, "fish"], a family of fishes of the order Apodes, represented by a single species, distinguished by its thread-like body and snipe-like bill. The body is extremely elongated and band-like, with the tail tapering into a point, and the anus not far behind the throat, the abdominal cavity, however, extending much farther back; the skin is naked; the head is very much elongated, and the jaws extended into a long and slender bill; the upper mandible is formed by the vomer and intermaxillaries; the teeth are villiform, and on the roof of the bill-like upper jaw, as well as the lower; the branchial apertures are wide and nearly confluent; branchiostegal rays 9 or 10 and extremely attenuated; dorsal and anal fins with simple rays, the former commencing near the occiput, the latter farther back, and with its rays more elongated (the connecting membrane imperfect or very delicate); the caudal obsolete. The single species (*Nemichthys scolopaceus*) for which this family has been constituted is an inhabitant, apparently, of the depths of the Atlantic Ocean at widely distant places, the original specimen having been obtained in the South Atlantic, another one off Madeira, and a third on or near the Banks of Newfoundland. The genus was originally supposed to be related to the swordfishes (Xiphiidæ), but by later writers has been regarded as most nearly allied to the Murænidæ, and even (by Günther) as a member of that family. It attains a length of nearly three inches, and probably more. THEODORE GILL.

Nemours′, de (LOUIS-CHARLES-PHILIPPE-RAPHAEL D'ORLÉANS), DUKE, second son of King Louis Philippe, though born (1814) sixteen years before the revolution which placed the head of the house of Orleans on the French throne. He served with his elder brother at the siege of Antwerp, and in 1836 and 1837 in the two expeditions against Constantine, in the latter of which he commanded one of the three brigades upon which fell the heaviest part of the short but bloody siege; commanding also the rear-guard on the return march, during which great ravages were made in the ranks by the cholera, the prince endeared himself to his soldiers by his self-exposure and devotion to the sick. The occasion of his marriage the year after with a princess of Saxe-Coburg (a relative of the late Prince Albert) became the cause of the deposition of the Soult ministry, owing to the rejection by the French Chambers of a bill of "dotation" which the ministry had brought in. The event was one of the earlier ominous signs of incipient discontent with the reigning family. As the eldest living son, the regency by law devolved on him on the abdication of the king, but the act of the French people which caused the abdication was itself *hors la loi*, and neither the duke nor his junior brothers, then (see JOINVILLE) in high command in Africa, were disposed to have recourse to what might result in civil war. He assumed command of the troops then in the court of the palace of the Tuileries; protected the widowed duchess of Orleans and her children, whom he advised to withdraw at once to St. Cloud, or if needs be to the neighboring stronghold of Mont Valérien. After the fruitless and hazardous appeal by her personal presence in the French Chamber of Deputies, he took measures for the safe withdrawal from France of herself and all the members of the royal family, after which he succeeded himself in reaching England. His life of exile in England was passed in great seclusion, and was marked by devotion, during the continuance of their lives, to the ex-king and queen. Since the abrogation of the decree of exile he has been restored (as likewise the Duke d'Aumale) to his former rank of *général de division* in the French army. Four children, the Comte d'Eu, the Duc d'Alençon, the Princess Marguerite (married in 1872 to the Prince Ladislas Czartoryski), and the Princess Blanche, are living. The duchess d. suddenly Nov. 10, 1857. J. G. BARNARD.

Ne′nagh, town of Ireland, county of Tipperary, has a neat appearance and a lively inland trade. Pop. 5581.

Nen′nius, the supposed author of the *Historia Britonum* or *Eulogium Britanniæ*, a Latin history of Britain from the arrival of Brutus the Trojan, grandson of Æneas, to A. D. 655. According to several passages of this work, the writer was a monk of Bangor, Wales, but no particulars of his career are known, and it is even disputed whether he belonged to the seventh or the ninth century. Dr. Guest (1849) assigns the work which bears the name of Nennius to the eighth century, but supposes the preface to have been written in the ninth or tenth century. The best edition of the text is that edited for the English Historical Society by Rev. Joseph Stevenson (1838). Bohn's "Antiquarian Library" (1848) contains a translation by Gunn. (See *Monumenta Historica Britannica*, 1848, and *L'Historia Britonum*, by M. de la Borderie, Paris, 1883.) R. D. HITCHCOCK.

Neode′sha, city, on R. R., Wilson co., Kan. (see map of Kansas, ref. 7–I, for location of county), has mills and water-power. Pop. in 1880, 924.

Neol′ogist, the name with which in the middle of the eighteenth century the old orthodox party in the Protestant churches designated the champions of the new rationalistic movement. The word was formed in Germany, and means one who introduces new doctrines which have no other recommendation than their novelty. The Neologists in their turn called the orthodox *Palæologists*—that is, people who cling to old ideas which have no other foundation than their antiquity. The position of the two parties was curious, though not without danger to the orthodox, and even to Christianity itself. They both agreed that Christianity was the greatest blessing ever conferred on mankind, and that the Bible was the highest Christian norm, the *regula fidei*. But there the harmony ceased. The Neologists considered education and enlightenment as the only means of progress—yea, of salvation—and anything which could not be acquired by education or grasped by an enlightened understanding they denounced first as a dangerous mysticism, and later as a wicked lie. In this spirit they undertook to interpret the Bible. They never said that it contained anything which was untrue, but they asserted loudly that it contained much which had hitherto been wholly misunderstood. They did not deny the miracles, as far as regarded their historical reality; they only refused to acknowledge their supernatural character. The supernatural, of which they had no need, they explained away, and, shielded behind their high-sounding declamations about the sublimity of Christianity and the great benefit which the human race had derived from it, they nearly succeeded in explaining away Christianity itself without anybody noticing it. The first generation of Neologists taught that when the angels ate with Abraham they dissolved the meat into its last elements and caused it to disappear, thus producing an appearance of eating. The next generation explained that when the angel came to the Virgin Mary it was an inner vision which arose in her soul, very much like the common poetical enthusiasm, only stronger and assuming the character of reality in the uncultivated mind of the maiden. At last, the third generation proposed to use the church buildings as storehouses and magazines, and transform the office of the Christian minister into that of a teacher of useful knowledge—a proposition which was actually made in Denmark, and, what is more singular, actually taken into grave consideration by the government. Against such a proceeding the orthodox were entirely without weapons; they could not even denounce it as heresy or skepticism or atheism; they could do nothing but shake their heads and call their adversaries by the very mild name of Neologists. On the contrary, the Neologists were themselves the accusers, and the orthodox the accused. And it was simply its own shallowness which at last turned the whole movement into ridicule. In the second decade of the nineteenth century all those "Christian" ministers who used the pulpit to lecture on artificial manuring, etc. disappeared, at least in Denmark. It must be observed, however, that *neologism* is not synonymous with *rationalism*, though both terms refer to the same historical phenomenon; they denote different spheres. Rationalism is a theological school with a scientific method; the Neologist—he may be a minister, a bookseller (*e. g.* Nicolai in Berlin), a secretary of state, or anything else—is simply a practical man with common sense for his method. CLEMENS PETERSEN.

Ne'ophyte [Gr. νεόφυτος, "newly planted"], in the early Christian Church, a person newly converted and baptized. Before baptism he was called a catechumen.

Neo-Pla'tonism, in the more limited sense of the word, is the name of a philosophical school which originated in Alexandria in the third century after Christ, was founded on the doctrines of Plato, and denotes the last attempt of the speculative spirit of the Greek civilization to establish a scientific basis for its development. The school was founded by Ammonius Saccas (241 A. D.), further developed by Plotinus (205–270), and continued by Porphyrius (233–305), Iamblichus, Proclus (412–485), and others. In a wider sense, the name is applied to the whole speculative tendency which grew up in Alexandria from the amalgamation of Greek philosophy, Oriental theosophy, and Jewish and Christian theology, and of which the above-mentioned philosophical school is only one individual manifestation, while it produced most remarkable intellectual characters in the most different fields of speculation. Thus, Philo Judæus (42 A. D.), Clemens Alexandrinus (220), Origen (185–254), and the Gnostics are severally representatives of the Neo-Platonic form of speculation. (For the special ideas of the school, see the articles on the above-given names.) The influence which the Neo-Platonic philosophy exercised on Christianity is evident. Origen, Methodius, Synesius, the three Cappadocians in the East, Marius Victorinus, Boethius, and Augustine in the West, had all frequented Neo-Platonic schools. The Fathers often borrowed the expositions of Neo-Platonic writers—Theodoret even employs the propositions of Plotinus concerning Providence, though not without asserting that Plotinus had derived them from Christianity—and Augustine openly avers that Neo-Platonism became to many the bridge which led them to Christianity. On the other side, it must not be overlooked that there was a radical difference between the Christian religion and the Neo-Platonic philosophy which absolutely forbade a complete amalgamation, and which often in practical life burst forth in violent hatred. Julian the Apostate was a Neo-Platonist, and his failure may be considered as indicating the final failure of the Neo-Platonic philosophy. Hierocles was ill-treated in the streets of Constantinople; Hypatia was killed in a church of Alexandria; and generally the Neo-Platonic philosophers were compelled to retreat into obscurity. As an influence, however, Neo-Platonism continued to live in Christianity, more especially through the workings of Pseudo-Dionysius.

Neo'sho, on R. R., cap. of Newton co., Mo. (see map of Missouri, ref. 7–D, for location of county), 315 miles S. W. of St. Louis, has good public schools, several manufactories, and is in the heart of the S. W. lead-mines of Missouri. Pop. in 1870, 875; in 1880, 1631.

Neosho River rises in Morris co., Kan., flows generally S. S. E., enters the Indian Territory, and joins the Arkansas near Fort Gibson. It is some 300 miles long. Its chief tributary, the Cottonwood, is much larger and longer than the Neosho above the junction.

Nepaul', or **Nepal,** an independent state of Hindostan, situated between Thibet and British India, and between lon. 80° 15′ and 88° 10′ E. Area, 53,000 square miles. Pop., according to native estimate, 5,000,000; probably an exaggeration. The southern part of the country consists of a belt of low land covered with tropical forests, which yield many sorts of valuable timber, but which is hot, utterly unhealthy, and infested with wild animals, such as elephants, tigers, and leopards. From this low land the ground gradually rises, first into hills, where rice, maize, millet, sugar, indigo, and coffee are cultivated, mostly on artificial terraces along the hillsides; then into mountains, in whose elevated valleys wheat, oranges, walnuts, grapes, and other kinds of fruits are grown; and then into alps, among which are the highest peaks of the Himalaya—as, for instance, Mount Everest—and on whose pastures large herds of cattle, sheep, and goats are reared. Iron, copper, lead, tin, zinc, and salt have been found and are mined; cotton cloths and earthenware are manufactured; timber, hides, ivory, fruits, sheep, cattle, and elephants are exported. The inhabitants consist of several tribes, of which the Gorkhas, who are of Hindoo descent and faith, form the warrior-caste and hold the government, while the Newars, who are of Mongolian origin and Booddhists, make the artisans of the country; a third tribe, the Marmi, have retired to the mountains, where they live as agriculturists. Between the various tribes there exists a great difference, not only in character and religion, but even in language; but they all have succumbed to the conquering tribe of the Gorkhas, which invaded the country in the middle of last century. Cap. KHATMANDOO (which see).

Nepen'thes, a remarkable genus of pitcher-plants (the sole type of a peculiar order, Nepenthaceæ) of over thirty species, all natives of the southern tropical region of which the Indian Archipelago is the centre, ranging from Madagascar to New Caledonia. Several are cultivated as curiosities in conservatories. They are all woody climbers, with apetalous and inconspicuous diœcious flowers. Their peculiarity is in the leaves; these are rather long and narrow, traversed by a very strong midrib, which is prolonged into a tendril serving for climbing, the apex of this developed into a tubular or oblong pitcher, closed with a hinged lid. Until the pitcher is full grown the lid closes the orifice. A watery liquid, having a slight acid reaction, is secreted in the pitcher in small quantities. At maturity the lid opens, and remains so, more or less elevated on its hinge; the watery secretion still continues, especially if animal matter is introduced, but it may now escape by evaporation. About the rim of the pitcher a sweet secretion forms under favorable circumstances, which is attractive to insects; and dead insects generally abound in the pitcher. The recent researches of Dr. Hooker nearly prove that the liquid within possesses digestive properties, and that its powers of dissolving animal matter are augmented by a peculiar secretion which is hardly if at all poured out until insects or other animal substances are introduced. (For analogous cases see art. PITCHER-PLANTS.) *Nepenthes destillatoria* of Ceylon was the earliest known species. *N. phyllamphora* and *N. ampullaria* of the Archipelago have also been long known in cultivation. Some species are now known from Borneo with pitchers a foot or two in length. A. GRAY.

Nephe'line [Gr. νεφέλη, "cloud"], a silicate of alumina, soda, and potash, crystallizing in the hexagonal system and allied to the feldspars. It occurs in volcanic rocks; in some instances so completely taking the place of feldspar as to form a nepheline rock. *Davyne* and *elæolite* are varieties of nepheline, elæolite deriving its name from its greasy lustre (ἔλαιον, "oil"). EDWARD C. H. DAY.

Nephi, R. R. junction, Juab co., Ut. (see map of Utah, ref. 3-F, for location of county). Pop. in 1870, 1286; in 1880, 1797.

Neph'rite [Gr. νεφρός, "kidney," so named from being formerly worn as a remedy for diseases of the kidneys], or **Jade,** a compact translucent stone, generally greenish in color, variable in composition, but essentially a variety of hornblende. On account of its compactness, excessive toughness, and splintery fracture it is much valued amongst savage peoples as the best material for stone weapons; hence it is sometimes known as axe-stone.

EDWARD C. H. DAY.

Ne'pi [the ancient *Nĕpĕte*], a small but very ancient town of Italy, province of Rome, about 40 miles from the city of Rome, on the post-road to Foligno. It was an important Etruscan town, took part with Veii against Rome, and only became a Roman colony in 400 B. C. It continued a flourishing town till the fall of the Roman empire, and as a distinct duchy plays no inconsiderable part in the mediæval history of Rome. Many antiquities of great interest have been found here. Pop. 2382.

Ne'pomuk (JOHN), a saint of the Roman Catholic Church, the patron saint of Bohemia, b. at Nepomuk, Bohemia, about 1330; studied at the University of Prague; became rector of the church of St. Gall in that city, and was appointed court-preacher to the emperor Wenceslas in 1378. In this position he opposed and reproved with undaunted courage the suspiciousness and cruelty of Wenceslas, but at last—in 1383, according to traditional account, but more probably in 1393—he was imprisoned, tortured, and thrown into the Moldau. His body was found and buried; many miracles were wrought at his grave; legends gathered around his name, and on Mar. 19, 1729, he was canonized by Pope Benedict XIII. The cathedral of Prague contains a magnificent monument of marble and silver to his honor. His festival is held on May 16. (See Abel, *Die legende des heiligen Nepomuk*, 1855; Frind, *Der geschichtliche Johann von Nepomuk*, 1861; also *Der heilige Johann von Nepomuk*, 1879.)

Ne'pos (CORNELIUS), a Roman historian of whose life nothing is known but that he was a friend of Atticus, Cicero, and Catullus; d. under Augustus; wrote various works, all of which have been lost with the exception perhaps of parts of his *De Viris Illustribus*. The work *Vitæ Excellentium Imperatorum*, now commonly used as a schoolbook, and generally ascribed to Cornelius Nepos, was first printed in 1471 under the name of Æmilius Probus, an obscure writer of the fourth century. But in a new edition of 1569, Dionysius Lambinus claimed the authorship of the book for Cornelius Nepos, and identified it as a part of his lost *De Viris Illustribus*, chiefly on the ground that the purity of the language and the simplicity of the style would be impossible with a writer of the fourth century; and this opinion, modified by various hypotheses, has been generally accepted. Editions and translations are very numerous. Among the most useful editions are those of Van Staveren, revised by Bardili (2 vols., Stuttgart, 1820), of Bremi (Zurich, 1827), of Siebelis (6th ed. 1867), and of Nipperdey (5th ed. 1868).

Nep'tune [Lat. *Neptunus*], the principal sea-god of the ancient Romans. Little is known of his original character and myth, as he is completely identified in later times with the Greek Poseidon, who was the god of the Mediterranean, the creator of the horse, and one of the great gods of the maritime Greeks. He was the son of Cronos and Rhea, and the husband of Amphitrite. He is depicted as armed with the earth-shaking trident and attended by a train of sea-nymphs and Tritons.

Neptune. The discovery of this planet is justly regarded as the most remarkable astronomical achievement of the century. Up to about the beginning of the present century it was found that the motions of all the planets could be perfectly accounted for by the attraction of the sun and their mutual attraction on each other. But when, about 1820, Banvard proceeded to construct tables of Uranus, then the outermost known planet, an apparent exception presented itself, and the observations could not be reconciled with the motions computed from the attraction of the sun, Jupiter, and Saturn. We remark that although this planet was discovered by Sir William Herschel in 1781, it was afterwards found that a number of astronomers had actually seen it and observed its position before that time, supposing it to be a fixed star. One of these observations was by Flamsteed as far back as 1695. Banvard, finding that he could reconcile the observations made after 1781 with the theory, omitted the older ones entirely, leaving it to the future to find why they could not be so reconciled. But it was soon found that the planet began to deviate from the tables much more rapidly than could be accounted for by the necessary uncertainty of the data on which the tables were founded. The cause of this deviation was a subject of consideration among astronomers, and it seems to have occurred to several that it might be due to the action of an unknown planet beyond Uranus. But the problem of finding this planet was one which for some time no one ventured to attack. In 1840, however, the deviations had become so wide, amounting to two minutes of arc, that they attracted more attention than before, and three astronomers took up the problem of tracing them to their cause. The first of these was the illustrious Bessel of Königsberg, who commenced work about 1840 by making a critical examination of the correctness of Banvard's computations, and setting one of his assistants, Fleming, at the work of making a careful reduction of the Greenwich, Paris, and Königsberg observations. But the death of Fleming and the ill-health of Bessel prevented the work from being carried further. Mr. John C. Adams was then a student at Cambridge. In the summer of 1841 he became acquainted with the state of this question by reading a report of Mr. Airy, and it occurred to him that it ought to be within the power of mathematics to calculate the position and movements of the disturbing planet from the observed deviations of Uranus, and he determined to undertake the problem as soon as his studies would permit. In the autumn of 1845 he had so far advanced as to have computed an approximate orbit of the hypothetical planet, and about the end of October of that year he communicated the position of the planet to Prof. Airy, within a degree and a half of the real position of Neptune. Had an expert astronomer pointed a telescope of six inches aperture in the direction indicated by Mr. Adams, and swept for the planet, he must have recognized it by its disk after a few minutes' examination. But Prof. Airy had so little confidence in the prediction that he did not take the trouble to look for the planet. In the mean time, a third person entered the field. This was Mr. U. J. Leverrier, then a young man of little over thirty, who had proved his mathematical ability by a very important paper on the secular variations of the orbits of the planets. In June, 1846, he presented to the Paris Academy of Sciences a paper in which he assigned an approximate position of the planet, agreeing very nearly with that already found by Adams. After Airy heard this he began to consider the planet worth looking for, and at his suggestion Prof. Challis, director of the Cambridge Observatory, commenced a search. Instead, however, of trying to recognize the planet by its disk, he commenced the work of preparing an extensive catalogue of the stars in a space of several degrees each side of the computed place of the planet, which would necessarily occupy a considerable time. Meanwhile, Leverrier was engaged in determining more accurate elements, which he communicated to the Academy about the end of August. Being now entirely confident that the planet must be very near the assigned place, he wrote to Dr. Galle of Berlin requesting him to search for it. Galle received the letter on Sept. 23, 1846, and the very same evening went to the telescope, proceeded to compare the stars in the neighborhood of the assigned place with a star-chart of that region which had just been finished. He soon found a star of the seventh or eighth magnitude which was not on the chart, within a degree of the position sent by Leverrier. As it presented a sensible disk, there could be no reasonable doubt that it was the object sought. But, desirous of proceeding with caution, he waited till the following night, when he found that it had actually changed its position among the stars. There was no longer any doubt of the reality of the discovery. After considerable discussion astronomers in general agreed upon the name Neptune for the newly-discovered planet.

Subsequent investigations of the motions of Neptune have been made almost entirely by American astronomers. The first one in the field was Sears C. Walker, then astronomer at the Naval Observatory, Washington. He computed an accurate orbit of the planet from all accessible observations, and then proceeded to inquire whether it had not been observed as a star at some former time, as Uranus had been. Computing the place of the planet for those previous years in which its path was known to have been swept over, he found that on May 10, 1795, Lalande had observed a star almost exactly on the path of Neptune, which was now missing from the heavens, and which must have been the planet. When the news of this discovery reached Europe, search was made among the original manuscripts of Lalande, and it was found that the planet had also been observed on May 8, but finding the two observations discordant, owing to the motion of the planet during the interval, he had rejected his first observation entirely. These observations have been very valuable in fixing the orbit of the planet. This planet, which, so far as is yet known, is the most remote from the sun of all the members of the solar system, moves in an orbit nearly circular, having an eccentricity of only 0.00872; yet on account of the vastness of the dimensions of this orbit, the absolute eccentricity in miles exceeds 25,000,000, and the difference of its distances from the sun in aphelion and perihelion is more than 50,000,000. The inclination of the orbit to the ecliptic is 1° 47′, and its mean radius about 2,746,000,000 miles. The period of revolution of the planet is about $164\frac{3}{5}$ years, and its diameter about 37,000 miles. Its bulk is therefore more than one hundred times that of the earth, but its density is so much less ($\frac{1}{6}$th) that it has only about $16\frac{35}{100}$ths times as great a mass. (For the more exact statement of its element see SOLAR SYSTEM.)

Neptune has a single satellite, discovered in 1847 by Mr. Lassell of Liverpool. Its period is *5d. 21h. 2m. 44s.*, and its mean distance from the planet about 230,000 miles.

S. NEWCOMB.

Neptu′nian, a name formerly given to a school of geologists who maintained that all rocks were of aqueous origin, in opposition to the Plutonic theory, that many rocks were undoubtedly of igneous origin. At a later date these terms were applied respectively to the rocks of aqueous and of igneous origin.

Nérac′, town of France, department of Lot-et-Garonne, on the Baise, has distilleries, wool-spinning factories, and a trade in corn, hemp, linen, etc. Pop. 7429.

Nerbud′da, a river of Hindostan, rises near Ammerakante, in lat. 22° 40′ N. and lon. 81° 52′ E., crosses the peninsula with a nearly straight westward course of 620 miles, and falls into the Bay of Cambay, forming a large estuary. It is a broad and deep river, but its navigation is much impeded by rocks and cataracts.

Ne′reids [Gr. Νηρεΐδες, plu. of Νηρεΐς], the fifty daughters of the sea-god Nereus by Doris, his wife. The ancients regarded them as the nymphs of the Mediterranean Sea, as opposed to the Oceanids, nymphs of the ocean-stream or outer sea. They were worshipped by mariners, and were represented as beautiful and youthful maidens, commonly nude. They are sometimes figured as half woman and half fish, like the mermaids of our later myths. Their names are variously given.

Nereids. See SEA-MOUSE.

Ne′ri, de′ (FILIPPO), known in English as ST. PHILIP NERI, b. at Florence, Italy, in July, 1515; was adopted by a wealthy uncle as his heir; secretly went to Rome to study theology and canon law; distributed his property to the poor 1538; devoted himself to the care of pilgrims and the destitute sufferers in hospitals, in which work he was associated with Ignatius Loyola; took holy orders 1551, and founded the order of "Priests of the Oratory," approved by Gregory XIII. in 1575. D. at Rome May 26, 1595, and was canonized 1622. (See article ORATORY, and Faber's *Spirit and Genius of St. Philip Neri*, 1850.)

Neriad′, town of British India, presidency of Bombay, stands in a fertile and densely-peopled district, and forms the centre of an extensive tobacco-manufacturing industry. It is well built and healthy. Pop. about 40,000.

Neritidæ. See APPENDIX.

Neritopsidæ. See APPENDIX.

Ne′ro, Roman emperor from 54 A. D. to 68, b. at Antium, on the coast of Latium, Dec. 15, 37 A. D., a son of Cn. Domitius Ahenobarbus and Agrippina, a daughter of Germanicus Cæsar and a sister to the emperor Caligula. His true name was L. Domitius Ahenobarbus, but one year after his mother's marriage with her uncle, the emperor Claudius, he was adopted by him in 50, and assumed the name of Nero Claudius Cæsar Drusus Germanicus. In 53 he was married to Claudius's daughter, Octavia, and on Oct. 12, 54, he succeeded to the imperial throne by the intrigues of his mother, who kept Claudius's son, Britannicus, concealed in the palace until Afranius Burrhus, *præfectus prætorio*, had got Nero elected emperor by the prætorian guard. The principal events of his reign were the long war with the Parthians, successfully conducted by Domitius Corbulo; the insurrection of the Jews, put down by Vespasian; the rebellion in Britannia under Boadicea, suppressed by Suetonius Paulinus; the conflagration in July, 64, by which two-thirds of the city of Rome was burnt down, and of which the people accused the emperor, while he accused the Christians, who suffered for it; the rebuilding of the city by the emperor on a magnificent scale, and especially the construction of the new imperial palace, the *Aurea Domus*, etc. But the personal character of the emperor absorbed attention so absolutely that all public events which were not immediately connected with his person, and did not serve to explain his character, were recorded in a confused manner or forgotten. Even his own time, which had borne and educated him, considered him a monster. The most groundless suspicions and the most unnatural jealousies—moods which pass even through the most ill-regulated minds only as fugitive caprices—settled in his soul, and drove him to actions which the cruelest tyrants never have committed save in the frenzy of passion. He killed those whom he feared, Britannicus and his own mother; those who in any manner stood in the way of his whims, among whom were his first two wives, Octavia and Poppæa Sabina; and at last he killed everybody who attracted his attention. In 65 a conspiracy was formed against him, but it failed; Seneca, his old tutor, and Lucanus were sacrificed. But in 68, when he had just returned from a journey in Greece, where he had appeared as a singer on the stage, he was overwhelmed by an insurrection in Gaul, Spain, and Rome itself. He fled, and killed himself in the house of one of his freedmen, a few miles from Rome, June 11, 68.

Nertchinsk′, town of Asiatic Russia, government of Irkootsk, at the junction of the Nertcha and the Shilka. It is the centre of an important mining-district, yielding yearly 2100 pounds of gold, 8500 pounds of silver, and 1,200,000 pounds of lead. Pop. about 5000.

Ner′va (MARCUS COCCEIUS), Roman emperor from 96 to 98 A. D., b. at Narnia, in Umbria, in 32 A. D.; was elected emperor by the senate on the death of Domitian, Sept. 18, 96; carried through some beneficial reforms in the administration; adopted Ulpius Trajanus, commander of the army of the Rhine, and d. Jan. 27, 98.

Nerve-Fibre and Cell. See HISTOLOGY, by COL. JOSEPH J. WOODWARD, M. D., M. N. A. S.

Nerves [Gr. *νεῦρον*, "nerve"] are the cords of communication between the central nervous system and the peripheral parts—the skin, internal surfaces, muscular apparatus, organs of special sense. These cords vary in diameter from a microscopic dimension to ten millimètres; their length also varies immensely, from a few lines to two feet and more. Every nerve, whether microscopic or larger in size, is a compound structure made up of nervous and of connective tissue. The nervous tissue constitutes the nerve-fibres, and the connective tissue makes up the internal and external sheaths of the nerves, enveloping them, and separating the bundles or fasciculi of fibres in the interior of the nerve. Nerve-fibres are of two kinds—such as are simple bands of nervous matter, and those which are composed of three parts. The former sort (so-called fibre of Remak, amyelinic fibre) is found chiefly in the sympathetic nervous system, appearing under the microscope as simple, flattened, ribbon-like bands of nervous matter, bearing nuclei at certain intervals (diameter 3 to 6 mmm.). These fibres are bound together to form nerves by very delicate connective tissue in relatively small amount. Nerve-fibres of the second kind (so-called common or myelinic fibres) are composed of a central round cord of nervous matter (perhaps analogous to the preceding kind of fibre), the axial cylinder, which extends uninterruptedly from the central nervous organs (brain and spinal cord) to peripheral organs—muscles, skin, special sense apparatus. About this is a layer (relatively large) of fatty nervous matter, the myeline or medulla, which we now know, by the researches of Prof. Ranvier of Paris, not to be an uninterrupted casing for the axial cylinder, as formerly taught, but to be completely interrupted by constrictions at intervals of about 1 mm. The third part of the myelinic fibre is the membrane of Schwann, a delicate tube of homogeneous tissue which encloses the myeline, and is constricted with it. The membrane of Schwann and the myeline are thus disposed in short segments around the continuous axial cylinder; and upon each of these segments is found a nucleus belonging to the membrane of Schwann. The diameter of myelinic fibres varies from 3 to 16 mmm. In the large nerves of the extremities these fibres are united into bundles by delicate connective tissue, and these bundles joined together to form the nerves; a relatively thick and strong sheath of this tissue enclosing the entire nerve. In the connective tissue blood-vessels run, and in it there are lymphatic spaces in communication with the sub-arachnoid space of the spinal cord. The terminal parts of nerves consist of various forms derived from the axial cylinder. Such forms are the terminal motor plates in striped muscular fibres, the sharp points in unstriped muscular fibres, points, knobs, and coils in the skin, special organs in the tongue, nose, eye, and ear.

The functions of nerves are general and special. As general functions or properties are recognized—(1) conductibility, (2) excitability. By the former, sensory impressions are conveyed from peripheral parts through nerve-fibres centripetally to the nervous centres; the spinal cord and brain are thus affected by the external world. Again, conduction takes place in a centrifugal direction, motor excitations being sent from the nervous centres to peripheral apparatus; the activity of the organism is made externally manifest. Excitability is the property which nerves have of reacting to impressions independently of the nervous centres—a property which, after section of a nerve, survives for about three days in the distal portion. The special functions of nerves are treated of under other headings. (See Sensation, Eye, Ear, Taste, etc.) Nerves are liable to various diseases, such as inflammation (neuritis), tumors (neuroma), and often receive injuries. (See also Histology.) E. C. Seguin.

Ner'vii, an ancient Belgic race, probably of Germanic or Dutch stock, who desperately opposed Cæsar in several bloody wars (57–52 B. C.). Their chief towns were *Bagacum* (Bavai) and *Camaracum* (Cambrai).

Nerv'ous Diseas'es, affections of the nervous system, which are either organic or functional; *i. e.* diseases produced or accompanied by an anatomical alteration which can be recognized with the naked eye or the microscope, and such as are caused by morbid states not accompanied by any such alterations. It is, however, probable that intimate chemical changes, not to be recognized with our present means of observation, occur in organs which are "functionally" diseased. The growth of physiological and psychological knowledge in the last few years has caused mental affections to be classed with nervous diseases. Besides these, there are the following principal morbid states (many of which are treated of separately in this work under appropriate headings): anæmia, hyperæmia, mal-nutrition of the great nervous centres; hysteria, spinal irritation, epilepsy, chorea, neuralgia, tetanus, catalepsy; inflammations of the brain, spinal cord, and nerves (and their envelopes); tumors and injuries of the same; apoplexy. It should be borne in mind that many nervous diseases, so called, are only expressions of general pathological states, or sympathetic reactions to local morbid states of non-nervous organs. It has been thought that certain nervous diseases, such as insanity, hysteria, epilepsy, etc., become more frequent with increasing civilization. This is not fully established, and yet there can be no doubt that the strains of social life, the struggle for existence, the enormous striving of ambition, the intemperate use of sensual gratifications, cause the above diseases in a more or less direct manner. Nervous diseases—or, more exactly speaking, the liability to nervous diseases—are very easily transmitted from parents to their children, this being most strikingly shown in insanity, hysteria, epilepsy, neuralgia, apoplexy. An important factor in the development of nervous diseases is wrong education, the cultivation of the mental powers during the age of growth; not enough rest, and insufficient (especially fatty) food being allowed. The evil effects of school-life are seen in both sexes, though perhaps more often in the female. *Mens sana in corpore sano* is not a mere adage, but a physiological truth. E. C. Seguin.

Nervous System. See Comparative Anatomy, by Prof. Edward D. Cope, M. D., M. N. A. S.; Histology, by Col. Joseph J. Woodward, M. D., M. N. A. S.; and Nerves, by Prof. E. C. Seguin, M. D.

Nervous System, Ganglionic. See Ganglionic Nervous System, by Prof. E. C. Seguin, M. D.

Nesmith (James W.), b. in Washington co., Me., July 23, 1820; removed in youth to New Hampshire, in 1838 to Ohio, thence to Missouri, and in 1843 to Oregon; served as an officer in Indian wars; was U. S. marshal for Oregon 1853–55; was Democratic U. S. Senator from Oregon 1861–67; was elected to Congress in 1873, and held other important offices in Oregon. D. June 17, 1885.

Nesmith (John), b. in Londonderry, N. H., Aug. 3, 1793; began his career with few resources, but became a successful merchant of New York with his brother Thomas; removed in 1831 to Lowell, Mass., where he became a prominent manufacturer, real-estate owner, and inventor; was one of the founders of Lawrence, Mass.; was lieutenant-governor of Massachusetts 1862, and held other important positions; was distinguished for liberality in charitable causes. D. Oct. 15, 1869.

Nesodontidæ. See Appendix.

Ness City, cap. of Ness co., Kan. (see map of Kansas, ref. 6–D, for location of county). Pop. in 1880, 31.

Nesse (Christopher), b. at North Cowes, Yorkshire, England, Dec. 26, 1621, was educated at St. John's College, Cambridge, and in 1662 appointed pastor to a dissenting congregation in London, where he d. Dec. 26, 1705. He wrote quite a number of books, of which the most important is *A Complete History and Mystery of the Old and New Testaments logically Discussed and theologically Improved* (London, 1690–96, 4 vols.; often reprinted).

Nes'selrode, von (Karl Robert), Count, b. Dec. 14, 1780, at Lisbon, where his father was Russian ambassador; entered very early on a diplomatic career; gained the confidence of the emperor Alexander; was made minister of foreign affairs in 1812, vice-chancellor of the empire in 1829, chancellor in 1844, and governed the relations of Russia with foreign powers to 1856, when, after signing the Peace of Paris, he retired into private life, and d. at St. Petersburg Mar. 23, 1862. He played a prominent part in all the diplomatic negotiations which preceded and followed the downfall of Napoleon I.; adhered stubbornly to the policy of the Holy Alliance; was peaceable, illiberal, a skilful administrator, a shrewd negotiator, very rich, and a great gourmand; but he had no ideas, and the increased influence of Russia during this period was due to favorable circumstances and the personal character of Alexander I. and Nicholas, rather than to the talent of the chancellor. His immense wealth he partly obtained during the negotiations after the downfall of Napoleon; he was very zealous to procure the easiest possible terms for France, and he was liberally rewarded. His relation to Alexander I. and Nicholas partly depended upon hypocrisy; he had a great talent for concealing his own superiority and making others embrace his ideas, in the belief that they themselves had produced them. His *Autobiography*, written in French, and somewhat disappointing as to its contents, was published after his death.

Ness, Loch, a lake of Scotland, in the county of Inverness, in the valley of Glenmore, is 23 miles long and 1½ miles broad, and communicates with the Moray Frith by the river Ness.

Nes'tor [Νέστωρ], the friend of Hercules, the aged hero of the Greeks at the siege of Troy, distinguished alike for valor, wisdom, justice, and eloquence; he reconciled Achilles and Agamemnon. He was a native of the Messenian Pylos, and in his youth fought against the Centaurs. In extreme age he was honored by those seeking advice and direction as though he were of equal authority with the immortal gods.

Nestor, b. in 1056, entered the Petcherskoi convent of Kiev, and d. in 1114. His *Annals of Russia*, the earliest historical work in the Russian literature, written in the Old Slavonian dialect, and commencing with the year 852, is of great interest for the history of Northern Europe, though it has been much interpolated and mutilated by later writers. The best edition of the text is that by Bykkoff (St. Petersburg, 1873). There is a translation into Latin by Miklosisch (Vienna, 1860), and into German by Schlözer, accompanied by commentaries and notes (Göttingen, 1802–09).

Nesto'rians, a portion of the Oriental Church, adherents of Nestorianism (dioprosopysm, two-person-ism), a Christological theory which takes its name from Nestorius, who was not its first nor ablest, but became its most renowned, representative. I. Nestorius was a native of Germanicia in Syria, became a pupil of Theodorus of Mopsuestia (393–428), and from him received the views characteristic of the school of Antioch with which his own name was to be identified. First a monk, then a presbyter in Antioch, his ascetic piety and gifts as a preacher caused him to be chosen patriarch of Constantinople, the great calamity of his life (428–431). Like no few of the great heresiarchs, he began as a zealot of orthodoxy and as a persecutor of heretics. The new patriarch and his presbyter, Anastasius, whom he had brought with him, heard in Constantinople on every hand the darling phrase of the school of Alexandria, "Mary, mother of God"—a phrase which, except with explanations and limitations which totally changed its meaning, the extreme wing of the school of Antioch would not tolerate. The presbyter (428) assailed this phrase and the theology it represented. Proclus, the unsuccessful rival of Nestorius for the patriarchate, eagerly caught at the opportunity of assailing Nestorius through his presbyter. Nestorius stood by Anastasius. Dorotheus, the court-bishop, pronounced an anathema against those who should style Mary the mother of God. At the festival of the Annunciation (429) Nestorius and Proclus preached in the same church against each other. The monks and people rose in fury, renounced fellowship with the patriarch ("We have an emperor, but no bishop"), and treated him with such insolence that in his anger he had the monks scourged, and at a local synod convened in 429 anathematized his opponents as Manichæans.

II. There entered now into the conflict the most formidable foe encountered by Nestorius. This was Cyril, bishop of Alexandria (412–444). His theology was antagonistic to that of Antioch, and his see was the rival of Constantinople. Nestorius afforded him the opening for dealing one decisive blow against both the objects of his dislike. It was a contest between a great theologian and a shallow popular orator, between a sagacious, unscrupulous man of the world and a monk whose excellencies and defects showed the traces of the passiveness and the narrowness of the cloister. Worst of all for Nestorius, there was a statement, necessarily crude in certain aspects, yet in the main strong and sharply defined, of the logical result of the dominant movement of the mind of the Church for ages, over against a set of clumsy propositions, which never touch the real question in discussion, but persistently misstate it, and whose precise force in various respects is an object of dispute to this hour. Cyril charged Nestorius with making two persons, of two natures, and thus denying the proper personal deity of Christ, making him in one person God, in another person man, and not, as he was in truth, in one person, the God-man, so that every act and every passion was personal, though it were according to one or the other nature. Nestorius was charged with teaching a moral, ideal, voluntary *connection* (συνάφεια) of two persons, instead of the natural, real, and inseparable *union* (ἕνωσις) of two natures into one person. At the synod of Alexandria (430) Cyril issued twelve anathemas, to which Nestorius replied in the same form.

III. The third Œcumenical Council was convened by the desire of both parties at Ephesus (431). The emperor Theodosius II., who called it, was friendly to Nestorius. After a delay of fifteen days, in consequence of the involuntary detention of John and the other Syrian bishops, the council proceeded in their absence, in a very hurried way, to condemn and depose Nestorius and fifty bishops who sympathized with him. It acknowledged the anathemas of Cyril as the true doctrine of the Church. The delayed bishops held a separate council, and made decisions reversing all that had been done by the other. Nestorius voluntarily retired to his old cloister. The emperor attempted to unite the parties at the Council of Chalcedon (432), but without success. The deposition of Cyril, Memnon, and Nestorius had been pronounced in form by the emperor, but only in the case of Nestorius did it take effect. The overthrow of Nestorius made it safe for Cyril to accept the advances of the emperor toward a settlement of the controversy. A formula was prepared by Theodoret (433) which confessed that there is, without confusion, such a union of the two natures in the one Christ as to justify the language that Mary is the mother of God. This was signed by Cyril on the one side, and on the other side John of Antioch concurred in the anathema pronounced on Nestorius. Many of the earnest men on both sides, but especially those of the school of Antioch, were dissatisfied with the compromise. The emperor urged it. Theodoret yielded on condition that he should not be required to sign the condemnation of Nestorius. Meletius and Alexander continued their resistance, and were deposed. Nestorius had now lost all favor with the emperor. Even the poor shelter of the cloister was denied him, and he was hunted from one place of exile to another until his death (440).

IV. The Nestorian party did not, however, become extinct. Their school at Edessa, a daughter of the school at Antioch, trained men for the priesthood of the Church in Persia. Ibas, bishop of Edessa (436–457), was one of its great names. Thomas Barsumas, bishop of Nisibis (435–489), labored to secure a permanent place for Nestorianism in Persia. He established a patriarchate in Seleucia, and when the school at Edessa was destroyed by order of Zeno (489) he founded a school at Nisibis. It was the policy of the Persian kings to foster the division between their own Christian subjects and the Christians of the Roman empire. The Nestorians established a distinct church government, and called themselves not Nestorians—which was the title by which their enemies stigmatized them—but Chaldee Christians, with reference to their earlier home and the language which they employed in their church service. At the Council of Seleucia-Ctesiphon (498–99), a statement of their doctrine and of its divergency from what claimed to be orthodox was made, and the Church of Persia was formally separated, making its doctrinal basis the assertion that Christ consists of two substances, two natures, and of two persons or hypostases, in one "partsupo" of filiation, the natures continuing to subsist unchanged, and the persons also. The term "partsupo" (parsopa) has been the subject of a good deal of dispute, as more than any other determining the orthodoxy or heterodoxy of the Nestorians. There is no reason to doubt that it is formed from the Greek πρόσωπον. The Peschito-Syriac uses it to render that word in its sense of face, appearance, outward appearance, manifestation of presence, person (in the popular sense), and in the Nestorian usage it often corresponds with Asseman's definition of it, "nature manifested to the senses." But in connection with "filiation" it seems to correspond very nearly with what is called "hypostatical relation," and would mean that though there are two persons in Christ, there are not two sonships, but that the human derivative sonship coincides so far with the divine essential Sonship as to stand in the unity of the *relation* of the Son, though not in the unity of his *person*—in unity of the partsupo, but not in unity of the qitomo (chauma-hypostasis). The metaphysical difficulty running through the entire Christological controversies of the ancient Church connected itself with the identification or distinction of the ideas of nature and person. Nestorianism affirmed the concrete identity of the two. (See MONOPHYSITES, MONOTHELITES. See Weismann, *H. N. J. I.*, 632; Schröckh, *K. G.*, xviii. 311; Badger, *Nestorians and their Rituals* (1852), ii. ch. vi.)

V. In the sixth century Nestorianism spread into Egypt and Arabia. At the beginning of the eleventh century we find Nestorians in Tartary. (See JOHN, PRESTER.) They ultimately established congregations in India and China. The Nestorian patriarch Zesuzabes entered into a formal compact first with Mohammed, and subsequently with Omar. During the Arabian domination the high places of state were open to them. In the tenth century they were oppressed, and from that time there has been a decline in their intellectual and theological activity.

VI. The Nestorians remained under one ecclesiastical head until in the sixteenth century. In the thirteenth, Innocent IV. and Nicholas IV. had made attempts, which were not successful, to bring about a union of the Nestorians with the see of Rome. The influence of Rome, however, was sufficient to divide them in the choice of their iazelich (the catholic—their name for their patriarch) in 1551. One party favored Sulakas, who under the name of John had been consecrated by Julius III. The others adhered to Simeon Barmas. The partisans of John went over to the Church of Rome, and form the United Nestorians, or, as they are not infrequently named, giving them the title of the ancient undivided body, Chaldee Christians. They number about 90,000 souls, acknowledge the primacy of the pope and the seven sacraments, and observe the ritual of the Greek Church. Their patriarch has his see at Diarbekr. The non-united Nestorians acknowledge three sacraments only, baptism, the Lord's Supper (in both kinds and without solitary masses), and ordination. They have been styled for these and other reasons "the Protestants of the East." They have no pictures or images. Their clergy are allowed to marry. They have a population of about 70,000. The internal energy which once marked the Nestorian churches has almost vanished. The Nestorians of India are called the Christians of St. Thomas, or Syrian Christians. Those on the coast were brought into nominal union with the see of Rome in 1599. These have nearly 100 churches, a population of about 150,000, and a theological seminary at Pulingunna. The Christians of St. Thomas in the interior declined the union with the pope, and when a renewed effort was made in 1653 to bring them into it they fled to the Ghauts and placed themselves under the protection of the rajah. They have between sixty and seventy churches, and number about 70,000. The Nestorian monks and nuns observe the rule of St. Anthony. Their centre is the cloister of Hormoz. Their vows are not strict. It is possible to be freed from them and to marry. In addition to their religious duties, the monks occupy themselves with manual labor; lay sisters provide their support. Some of the cloisters have the monks and nuns in separate cells, under one roof. Flesh, butter, and milk are forbidden. The costume of the brethren and sisters consists of a black upper robe and skirt. The brethren wear a blue turban, the sisters a black veil.

VII. Missions have been attempted by Americans among the Nestorians in Turkey and Persia. Among the laborers in this work the most distinguished has been Dr. Perkins since 1834. The Jesuits are charged with having been at the bottom of the outbreak in which the Kurds and Turks waged a war of extermination against the Nestorians of the mountains in 1843, and by which the Protestant missions were swept away in 1846. Mission efforts have since been renewed with happy results.

VIII. The older literature is given in Walch, *Bibl. Theol. Sel.*; Winer, *Handb.*, and Danz, *Univ. W. B.* (See Smith and Dwight, *Researches* (1833); Grant's *Nestorians* (1841); Wiggers, *Statistik* (1842); Perkins (1843); Wingard, *Pres. State of the Church* (from the Swedish, 1845); Layard, *Nineveh* (1849); *Woman and her Saviour in Persia* (1863); *Christian Year-Book* (1868); R. Anderson, *History of Missions to the Oriental Churches* (1873); Laurie, *Dr. Grant and the Mountain Nestorians* (1874): German, *Die Kirche der Thomaschristen* (1877).) C. P. KRAUTH.

Nests of Birds. The class Aves, or birds, is conspicuously distinguished from all other animals by various peculiarities of form, structure, and manner of life. These combine to make their organization at once the most interesting and—with the exception only of that of man himself—the most striking in its wonderful design in the broad domain of nature. And of all the features that characterize bird-life, and separate it in the most marked manner from every other form of vitalized existence, the most distinguishing are what we call their *nests*. By this term is to be understood not merely the various structures erected by themselves, but whatever else is used by them to promote the development of their matured *ova* or eggs, and by a large portion for the temporary shelter of the young bird after it has been hatched. The employment of nests is universal, and in a certain sense is a peculiarity shared with them by no other class.

Every female bird deposits her matured egg without any apparent development of its hidden germ. The design is obvious and wonderful. By means of its admirable system of air-cells each bird is able, under all circumstances, to avail itself of the peculiar lightness and buoyancy of frame which are so essential to its animal economy. They are necessary for its flight in the air; they alone can secure its freedom of motion on land or in the water. Equally necessary for the continued existence of this class is its means of abundant and uninterrupted reproduction. In the species where these conditions have been incomplete, as in the cases of the dodo, the great auk, and others, the birds have become extinct. Its many exposures of life, its numerous enemies, and the constant dangers to which it is subjected render a large propagation necessary for its preservation. Any manner of reproduction at all resembling the gestation of Mammalia would be wholly incompatible with these requirements, and would interfere with its lightness of body, prevent freedom of motion, hinder it in procuring necessary food, and thus render impossible either its successful reproduction or even its existence.

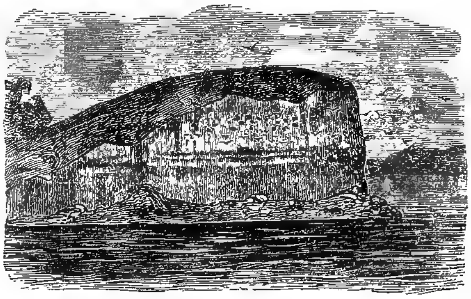
The common *Ortyx Virginianus*, or quail, of Eastern North America has been known to have thirty-six eggs in a single nest, and even though these may have been the contribution of more than one female, such a case strikingly illustrates the peculiar advantages of this manner of reproduction, for the weight of the aggregate product of one nest before maturity is many times that of the parent. To provide for even a single bird of this numerous flock by any internal organ would be inconsistent with its safety. It is all the more apparent that to rear so large a brood requires a receptacle wholly separate and external. This external shelter we call a nest, even though it may be nothing more than the bare rock or the flat housetop on which the common nighthawk (*Chordeiles popetue*) deposits its eggs without any addition to or change in the original condition of the spot. Some nests are wonderful in their design and beautiful in their structure. Others are simple and even rude in form, and many are an unchanged place, suitable in itself and without additional adaptation. Each is complete in itself for its purpose.

The nest, in the economy of the bird, corresponds in its uses and its duties with the uterine organs of all mammals and the marsupial pouches of certain others. It becomes to the bird an external organ for continuing the means of reproduction distinct and separate, and is indispensable for the proper development of the immature young from the first appearance of the germ in the egg to a maturity more or less advanced. This degree of maturity varies immensely, according to the peculiarities of the family. Thus, the young ostrich comes into the world able to shift for itself from the very shell, while the nearly blind and naked offspring of the pigeon is so tender and helpless that it requires to be fed with food prepared for its peculiar wants within the inner organs of its parents. For the preservation of the egg and for the proper development of the young germ there are necessary, besides this external receptacle or nest in which the eggs may be collected, preserved, and hatched, a certain amount of constant and uniform heat. Except in a very few—and these remarkably abnormal cases—the supply of warmth is generated by contact with the body of the parent. In some this is aided by the heat of the sun, and also by the reflected warmth of surrounding objects. In a few very remarkable instances the necessary warmth for the hatching of the egg is derived from vegetable decomposition, and in others from the sun's rays, without any parental intervention except the mere deposition of the egg.

Ingenious attempts have been made to classify the various features and peculiarities, architectural and otherwise, exhibited by different birds in the construction of their nests or in the substitutes made use of in their stead. These have been necessarily incomplete, and only in part successful. In some respects the grouping of these variations of habit and design is not without interest, though the lines of distinct separation cannot always be well defined. Birds classed as "ground-builders," for instance, do not always build on the ground, but very many species, whom natural instincts would thus prompt, are not unfrequently taught by the insecurity of this position to nest elsewhere. One of the most remarkable of these instances is that of the American herring-gull (*Larus Smithsonianus*), which naturally makes a scanty nest and deposits its eggs on the ground. After having been from time to time despoiled of its treasures, it is driven to construct its nest, with much labor and at great inconvenience, among the high branches of a tree. Again, ground-birds may be also what are classed as "miners," or "mound-builders," or may deposit their eggs on the bare surface, making no nest whatever. "Masons" may be also "cementers." Some, without being "miners" in the exact sense, always make use of excavations in the earth, and others, without being themselves "carpenters," usually accept and make use of holes in trees, natural or artificial. Some are true "parasites," always dependent upon other birds for rearing their young, or are only partially so; and again others are at times partially parasites, and on other occasions provide for themselves with remarkable ingenuity and in the most thorough manner. The house-sparrow is a well-marked case of the latter—at times appropriating the nests of other birds, more frequently building its own, and occasionally constructing an elaborate dome-shaped structure.

The "ground-building birds," including all that occupy its surface or penetrate within it, and those that resort to high cliffs and to remote islands, comprise, with more or less exactness, not far from one-half of all the several species, including all the diving birds, nearly all the swimmers, and a large proportion of the shore-birds and waders. The ground-breeding birds that build within the earth are separated into a group by themselves, known as "miners." These include both those which dig out their own burrow and those that make use of natural cavities or of holes made by other animals. Prominent among the true "miners" is the common sand-martin (*Cotyle riparia*). This familiar species, abundant in both the old and the new hemispheres, is found in large colonies, and excavates its burrow on the steep face of a sandbank or a gravel-bed. Its hole is usually not more than two and a half or three feet in depth, yet where its excavation has been dug through a bed of coarse gravel, the channel has been known to be nine or ten feet deep. But this apparently inconsistent action is accounted for by the supposition that the swallow digs on until it finds a locality sufficiently safe for its nest, which is not the case where the gravel is large and coarse, and liable to fall down upon and break the eggs. This bird commences its excavation, clinging with its sharp claws to the side of the bank, by pecking at the sand with its closed bill, wielding it as a miner would use his pickaxe. While standing on the outer edge of its opening the swallow cannot use its claws, but after the hole has been extended a few inches, the loose sand is removed by the mingled action of the feet and wings. Where the firmness of the sand permits, these holes are as circular as if planned with a pair of compasses. The galleries are usually more or less tortuous, and are at their termination enlarged into a chamber in which is placed a loose but soft and warm nest. The kingfisher (*Ceryle alcyon*) is another typical miner, and mines a long tortuous gallery about five feet in length, which is sometimes wholly in one direction, but usually turns at a right angle when at the depth of three feet—sometimes to the left, and at others to the right; at the end of the gallery it excavates a small chamber, in which it deposits its eggs on the bare earth. Occasionally, if the earth is damp, it makes a small floor of miscellaneous materials. The common fork-tailed petrel (*Thalassidroma Leachii*) of our coast is a very interesting "miner" of pe-

Fig. 1.



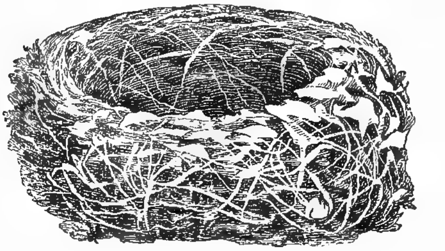
Cotyle riparia (sand-martin).

culiar habits. It digs a winding and intricately tortuous burrow, often of great length, turning now this way and now the other, and at last causing its channel to descend and to double directly under its first gallery, making a large chamber at its terminus, which not unfrequently is directly under the opening, though separated from it by the intervening floor of earth. It makes no nest, but lays its single egg on the bare soil. The ground burrowed by this bird is strongly impregnated with an intense musky odor which betrays its presence, and indicates its locality quite a distance.

The burrowing owl of North and South America, though able to dig for itself when necessity compels, is usually a parasitic miner. There are two species, but their habits are identical. The northern species is found W. of the Missouri Valley from California to Mexico. It lives together in communities, and is often very abundant. It takes possession of the burrows of several species of small quadrupeds where these offer, chiefly occupying those of the prairie dog, which exist in large villages, spread over the country for miles together. The owl lives in these burrows in common with their owners, but is supposed to be an unfriendly companion. In Texas it dwells in deserted rat-holes, and in Northern California in the burrows made by two large species of ground-squirrel. In South America, wherever the biscada is found, this owl makes use of its burrows. In the Banda Oriental, according to Darwin, it depends upon its own labor, and excavates its own burrow on any level spot of sandy soil.

Another marked group of birds which occupy the ground are those which usually construct no nest. In this may be included birds of very different forms and habits. The whip-poor-will (*Antrostomus vociferus*) and all the kindred genera, so far as is known, deposit their eggs on dry beds of leaves in the dark recesses of the forests; the more common nighthawk usually leaves its eggs, that resemble pebble-stones, on the bare rock, to which in color they are closely assimilated; in Philadelphia and in Boston it nests on the flat roofs of stores and dwellings. The loon (*Colymbus torquatus*) chooses a receptacle for its egg on the edges of islands in fresh-water lakes, so near the water that if disturbed it can plunge from its nest directly into and under it. Other divers, as the auks, the penguins, the guillemots, nest in communities, using the bare surface of rocky cliffs or crevices in the rocks, but make no nest. A few of these, like the puffins, burrow into the ground in sandy places to shelter themselves and their eggs from birds of prey and gulls. The gulls and terns nest on the ground, but differ in regard to nest, some building an elaborate one, and others having hardly more than a hollow in the bare sand. Nearly all the waders nest on the ground, and all or nearly all have usually a mere depression in the ground. These are placed usually near marshy grounds or water, though the plovers and a few other kinds prefer higher and dry situations. The whole tribe of grebes nest on the ground, building nests of coarse reeds and water-plants near the edges of water. Occasionally these are overtaken by floods and float. This has caused the impression that they purposely build floating nests, but this is not the fact. With very few exceptions nearly all the North American sparrows breed on the ground. All the species of the several genera of *Ammodromus, Junco, Plectrophanes, Zonotrichia, Melospiza,* etc., with only individual exceptions, nest on the ground. All or nearly all the titlarks, true larks, buntings, and similar forms, the world over, nest on the ground. A few are exceptions. The common house-sparrow and all its congeners nest in various manners, but not on the ground. Some species exhibit the singular peculiarity of always nesting on the ground in certain localities, and in other regions as invariably building in bushes or trees high above it. Thus, the prairie lark-finch in Illinois and Wisconsin always nests on the ground. On the Pacific coast the same species usually nest in trees. The same is noticed in the black-throated bunting, which at the East nests on the ground, but in the Mississippi Valley usually a few feet above it. All the *Spizellæ* nest in trees or bushes with one marked exception. The *S. monticola* always nests on the ground, yet in books this species is called the tree-sparrow.

FIG. 2.



Spizella monticola (called tree sparrow).

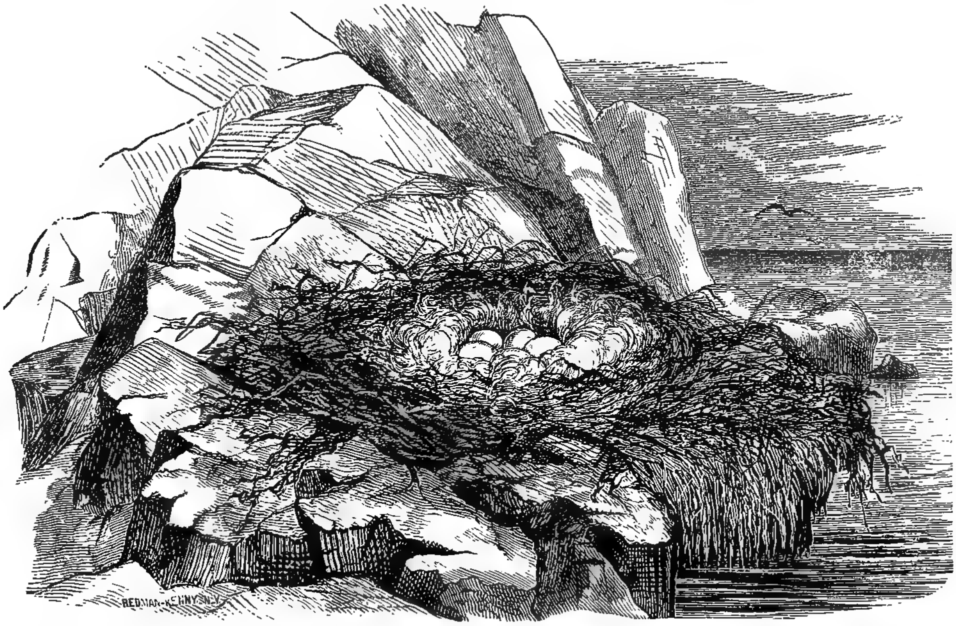
A few among the slender-billed oscines always build on the ground, and some among them nest indifferently on the ground or in different situations. The common brown thrush of North America (*Harporhynchus rufus*) is a remarkable instance of this, in some localities usually nesting upon the ground, and in other districts always above it. *Turdus aliciæ* nests sometimes on the ground, and occasionally in more or less elevated situations. The robin redbreast (*Rubecula familiaris*) of Europe nests naturally on the ground, but there are many instances recorded of striking deviations from these selections. In one a pair of these familiar birds built their nest within the hollow of a Bible that was lying open on the pulpit of an English church. It was left undisturbed, and for several Sundays the birds sat upon the eggs or fed the young during the divine services.

Among our American thrushes, *Turdus fuscescens, T. Pallasi, Cinclus Mexicanus,* etc., always nest on the ground. All the species of the genera *Myiodioctes, Oporornis, Seiurus, Mniotilta, Geothlypis, Helmintherus,* and *Helminthophaga,* except *H. luciæ*, build on the ground. The large family of *Dendroicæ*, except *D. palmarum*, nest in elevated situations, so far as is known. Many ground-building birds resort to means of concealment quite ingenious and interesting. The common quail and the meadow-lark, and other species, sink their nests by the side of a high tussock of grass, and form an archway over the nest with the natural growth. The common snow-bird and the savanna-sparrow often build their nest on the steep side of an excavation under a projecting sod. The song-sparrow and the grass-finch often construct a covered approach to the nest, which is hidden in high grass or by bushes. The Canada fly-catcher, so far as is known, always selects a large tussock of grass in the midst of boggy and almost impassable ground, and in this spot, almost sure to be unapproached, hides treasures rarely found even by the naturalist.

The large families of the sea-ducks, swans, geese, the gulls, terns, albatross, and all the marine birds with hardly an exception, resort to the ground to construct their nests. A very few build in trees, either exceptionally as individuals or as species. Wood-ducks of all kinds, and several of those that frequent lakes and rivers, nest in hollow trees. A few, like the dusky duck, nest indifferently on trees or on the ground, usually selecting the latter. Several kinds of sea-ducks are noted for adding to their nests a warm lining of the softest down plucked from their own breast. This is done by the long-tailed duck, by the smew, by the king-duck, the Pacific eider (*Somateria V.-nigra*), and by the common eider. Of these, however, the smew always nests in hollow trees. Owing to the commercial value and importance of its down the eider (*Somateria mollisima*) is the best known of these, and is cherished and protected in Iceland and on the north-western coast of Europe. It usually constructs in the first place, a rough platform nest of various marine plants, both sexes working in concert, piling up a rude foundation of drift. Over this rough mattress the female spreads a bed of the finest down, freely and liberally taken from her own breast. Sometimes two females make use of the same nest, each freely contributing a supply of down. When the nest is robbed, and the females have no more down to supply, the male bird contributes the needed protection. This is easily recognized by its whiteness. Each female contributes five eggs, and where two share together the same nest, there are usually ten. In islands on the coast of Iceland where the eider has been encouraged and protected for centuries it has become almost domesticated. Mr. C. W. Shepherd, in an account of a recent visit to that island, describes one of these eider settlements on the island of Vigr, on the N. coast. The ducks and their nests were everywhere, on the housetops, on every outbuilding, on the walls, the doorstep—in short, in every conceivable place. They were so tame that they permitted themselves to be stroked on the nest, and even to be robbed of their eggs, a large proportion of which were always taken. And not only is it common to find two female eiders amicably occupying the same nest, but Mr. Shepherd also twice found two pairs of very different species making a common use of the same nest. On an island in an inland lake he found a pair of long-tailed ducks and a pair of scaup-ducks occupying one nest. Not only were there eggs of both species in the nest, but both ducks were actually sitting together upon them in the most friendly manner. On another island in the same lake a pair of Barrow's golden-eye ducks and one of the red-breasted merganser were using together the same nest.

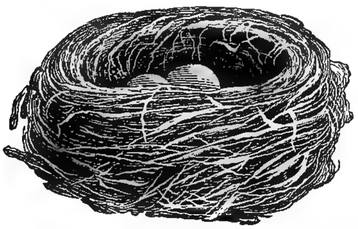
Very many shore-birds, waders, grebes, etc., and also birds which nest on the ground in swampy places, construct large and elaborate nests of reeds, rushes, and other water-plants in a moist and decaying state, chosen because of their pliable condition, and not because a moist nest is desired. On the contrary, notwithstanding the prevalent error, these nests are not used until they are dry, and are abandoned when, owing to rains or floods, they become so damp that they can no longer be occupied. Such nests as those of the willet, the grebes, the bitterns are of this description. Very many of our land-birds, as the song-thrush, the robin, etc., use moist materials in building their nest, but only occupy it when it has become dry. The robin (*T. migratorius*) always works from preference in rainy weather. All or nearly all the Gallinæ occupy nests on the ground, some making a rude nest, others only using a hollow in the earth. The wild-turkey uses great precaution to conceal her nest alike from birds of prey and prowling animals, and from her own mate, hostile to his own progeny. When forced to leave them in search of food, she covers her eggs with leaves, and if approached when on the nest the faithful mother will die sooner than leave her charge.

Fig. 3.


REDMAN-KENNY.S.N.Y.

Somateria mollissima (eider duck).

Fig. 4.

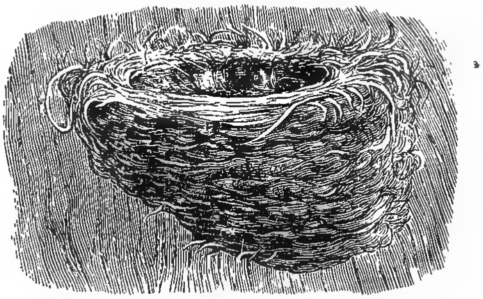


Turdus migratorius (robin).

By far the most remarkable group of ground-nesting birds are the "mound-builders" of Australia and the eastern archipelagoes of Asia, known as the brush-turkey in Australia. All the species of this family belong to the order Megapodiidæ, and are all more or less remarkable for the manner in which the hatching of their eggs is effected. The *Talegalla Lathami* when about to deposit her eggs collects an incredible heap of decaying vegetable matter as their depository, and trusts entirely to the heat engendered by the process of decomposition for the development of her offspring. These heaps are collected by the joint labors of several pairs; they are so large as frequently to contain several cartloads of material, and are always constructed in a perfectly pyramidal form. After the heap has been formed, and a sufficient time has intervened for the generation of the required heat, the eggs are deposited and buried to the depth of two or more feet. The chick when produced is fully feathered, and able to provide for its own wants from the shell. The heat in the centre of these heaps ranges as high as 95° F. Another of this interesting group (*Leipoa ocellata*) deposits her eggs in mounds of sand alternating with layers of dried leaves and grasses. The rays of the sun, added to the heat engendered by vegetable decomposition, supply the necessary warmth. These mounds are nine feet in diameter and three in height. The *Megapodius tumulus* constructs large mounds of earth, often of an immense size, varying from twenty to sixty feet in circumference and from five to fifteen in height. In these the eggs are carefully buried to the depth of six feet. Of the other species of this singular family, some merely deposit their eggs in holes excavated on the seashore to the depth of three feet, but nearly all the members of this family are more unequivocally mound-builders.

Several species belonging to different genera have been grouped together in some systems as "masons," so called because they knead together, in the manner of the house-builder, a rude mortar of tempered earth or clay. It is not a well-marked group, and all its members might claim a place in other connections. Among these French naturalists class the European nuthatch (*Sitta Europæa*), which is properly a "carpenter," or its parasite, because, like the woodpecker, it always nests in holes in trees. This bird contracts the entrance to its burrow by an ingenious protection composed of earth or mud neatly kneaded together with the skill of the potter, and this is strengthened by the addition of small stones. This is used only at the entrance, never within, no matter how large the cavity. The cliff-swallow (*Hirundo lunifrons*) of North America is a true typical "mason," building a remarkably symmetrical nest of plastic earth or clay by the united and industrious efforts of several working in concert where they are in societies, sometimes by only the solitary pair. These nests are constructed with a wonderful celerity by these industrious artisans. In large colonies it is a very interesting sight to witness the rapid construction of one of these nests, a large number working together, but always under the leadership of the female proprietor of the construction, who very evidently directs all their movements. The normal shape of the nest is that of an inverted retort, the larger portion being attached to the cliff or side of a building. It is arched over at the top, and extends down in front in a covered passage-way open at the bottom. In the wild state on the sides of high cliffs the nest is an elaborate and ingenious structure, sheltering its inmates from the weather and from their enemies. Under the shelter of man all this protection is not needed, and under the eaves of barns and other buildings these birds build a simpler, easier, and equally safe nest, but always of kneaded earth. The barn-swallow of America, the house-swallow of Europe, and several other species of *Hirundines* are also true masons. Our own *Hirundo horreorum*, which once nested only in caves or under overhanging cliffs, now attaches its elaborate and curiously wrought nest to the sides of rafters in barns, under the protection of their roof, and even to the porches of dwellings. These are made of the finest mason-work, are put together in the most artistic manner, piece by piece, with an order and a regularity quite curious. And attached to the nest there is often an equally elaborate extra platform designed for the use of the mate, on which it can sit when not collecting food, and where, when the young no longer require the cover of a parent, the latter may stay and keep them company.

FIG. 5.

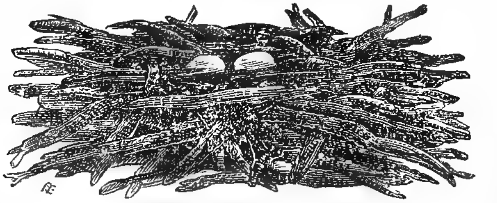


Hirundo horreorum (barn-swallow).

A small but well-marked group of remarkable nest-builders are by some known as the "carpenters." Of these the woodpecker family is the most conspicuous. The bird hollows in the limbs or trunks of trees, with its sharp strong bill, deep excavations for its abode and nest, often using no other material than the hollow wood. Grouped around the true carpenters are a number of species which make use of similar cavities, but either never or only rarely construct them for themselves. The true carpenters are restricted to a few families, and of these the woodpeckers are the most conspicuous. The nuthatches, the wrynecks, and a large proportion of the titmice belong to this group. A few others, the habits of which are imperfectly known, such as the remarkable family of toucans, whose singular large and feeble bill does not favor the idea, are also said to excavate their nests in hollow trees. Woodpeckers, all the world over, are true "carpenters," and all, with only individual exceptions, cut out their nests in wood and bore into trees for their food. Occasionally, a few make use of natural hollows, and on the Western Plains, where trees are wanting, the *Colaptes Mexicanus* is known to dig into the sides of cliffs and to make its nest in the earth. The ivory-billed woodpecker, which is our largest and most powerful "carpenter," digs into the highest and hardest trees of the Southern forests, chiefly breeding in the large cypresses, where, the pair working together, they alternately dig out a capacious cavity in the living wood, which is said to be sometimes five feet in depth.

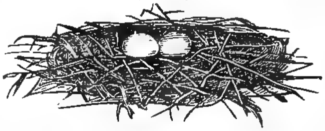
Certain classes of birds build what are styled "platform nests." They are found among only a few families, and their character varies very essentially, some being remarkably large structures, others being of the most frail description. Of the one kind are the huge platform structures of eagles—of the other, the slight nests of the doves and the American cuckoos. All or nearly all the eagles are true platform-builders, the only exceptions being those that use cliffs as substitutes for platforms and add little to their natural advantages. Others, like our own white-headed eagle, when they build in trees, construct large and massive structures of five or six cubic feet, and almost as solid as the natural rock-platform of the golden eagle. The nest of the martial eagle of Southern Africa (*Aquila bellicosa*), as described by Vaillant, is built on the tops of the loftiest trees—flat, constructed in the manner of a level floor, without any perceptible hollow, and made so firmly as to bear the weight of a man without yielding in any part. Strong rafters of various lengths to fit the spaces between the branches are firmly laid for the foundation; these are interwoven with smaller branches, bound strongly together, and over these are heaped a quantity of miscellaneous materials, covered at the top with a smooth flooring of flat pieces of wood closely fitted together like mosaic. In striking contrast with these are the slight nests of nearly all the Columbidæ, the cuckoos, etc. These are platforms of the frailest description, made of a few sticks loosely laid together, and as loosely crossed with other sticks, the whole so rudely made as apparently not strong enough to keep together, and not suitable to preserve the egg from falling to the ground. An example is the nest of the Carolina dove. More substantial than these are the platform nests of nearly all the different species of true herons, but not equal to those of birds of prey in size or strength, and like them having no cavity or depression in the centre. The group of herons known as bitterns, however, are exceptional, and usually nest on the ground.

FIG. 6.



Haliaëtus leucocephalus (bald eagle).

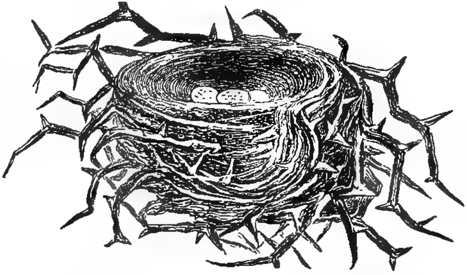
FIG. 7.



Zenaidura Carolinensis (Carolina dove).

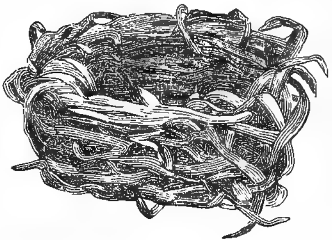
A large group of nest-makers are classed together by Prof. Rennie as "basket-makers." It is not very well marked, and its members are not always distinguishable from other groups known as "weavers," "tailors," and "felt-makers," but it is designed to include birds which, like our common mocking-bird, the cedar-bird, the Bohemian chatterer, the European bullfinch, and others, construct a rude basketwork of sticks, not unlike the common baskets of osier. In these are placed more carefully woven nests of softer materials. Some of these are mere open baskets placed on a flat limb; others are interwoven with the smaller twigs of a branch. The mocking-bird builds as an outer framework for its nest a strong barricade of brambles and thorns, and places within this rude basket an elaborately woven structure made of the finest roots. The common bullfinch (*Pyrrhula vulgaris*) of Europe builds a typical open basket placed on a platform of her own rearing of birch-twigs, or on a flat branch of a spruce tree she weaves a loose basket of flexible, fibrous roots. The yellow-headed blackbird (*Xanthocephalus icterocephalus*) exhibits great ingenuity, variety, and skill in the construction of elaborate basket-like structures. The *Turdus bicolor* of Southern Africa unite in communities to build a huge basket-like structure, with numerous cells or apartments for the nests of different pairs. These are like an aggregation of smaller baskets, each a separate nest with a tubular gallery leading into it from the outer side. The number of these cells varies from six to twenty, and over all is woven an inverted basket for a roof, wrought of twigs. We include among basket-makers the remarkable nest of the Mexican fly-catcher (*Pitangus Derbianus*), more striking for the use made of it by other and smaller species than for its own peculiarity of structure and disproportionate size. This bird, not larger than our common king-bird, builds a structure of enormous size, sometimes three or four

FIG. 8.



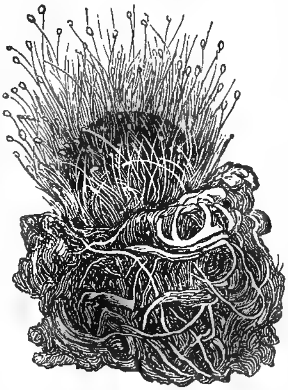
Mimus polyglottus (mocking-bird).

FIG. 9.



Xanthocephalus icterocephalus (yellow-headed blackbird).

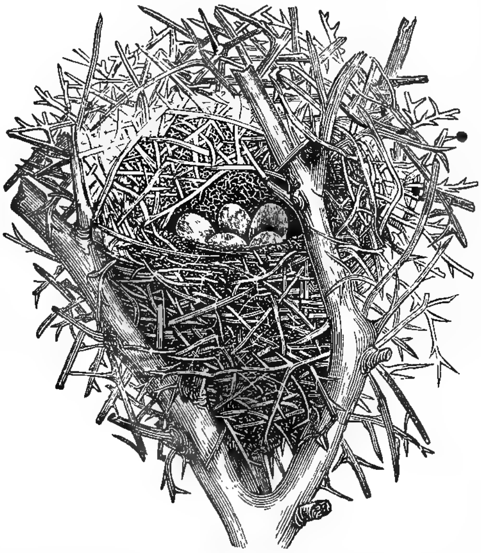
FIG. 10.



Pitangus Derbianus (Mexican fly-catcher).

feet in length and about two in breadth. The cavity is on the top and of suitable size. The huge structure is loosely made of coarse materials, twigs, dried plants, leaves, etc. In its chinks and cavities smaller birds seek shelter, and are permitted to build their own nests in peace and safety, the warlike proprietor of the whole "driving far off each thing of guilt and sin" in the form of hawk, owl, or other bird of prey, but never molesting its tenants who seek shelter for themselves and offspring within its walls. The magpies, both of Europe and America, build a curious basket barricade around their nest, evidently as shelter against birds of prey.

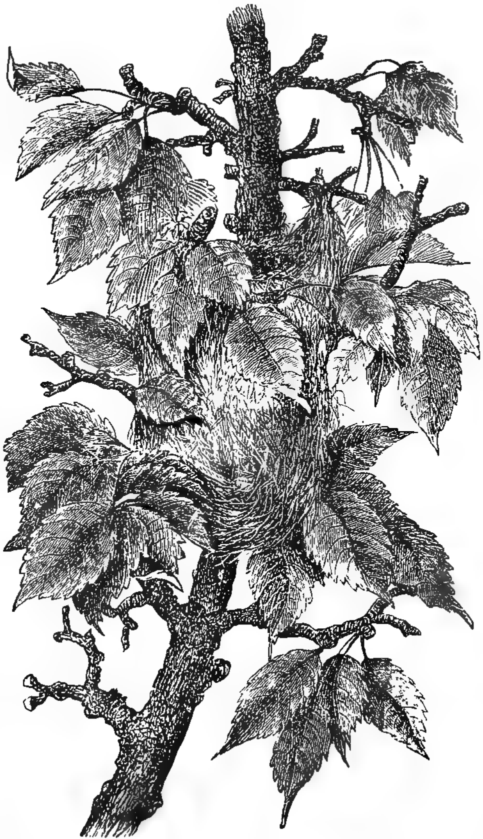
FIG. 11.



Pica caudata (magpie).

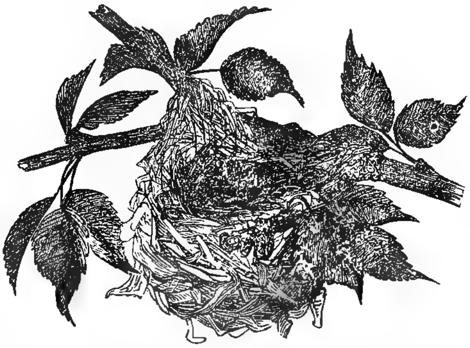
The "weaving" birds construct nests, for the most part, more or less pensile, but of very various styles and shapes. Among the most familiar of these may be mentioned the orchard oriole and the Baltimore oriole of Eastern North America, and Bullock's oriole of the Pacific coast. All the orioles are first-class weavers, and their nests partake somewhat of the peculiarities of the basket-makers and the so-called tailor-birds, and are all conspicuous for the wonderful skill with which they are wrought, their beauty of design, and the strength with which the materials are intricately woven together. The nests of the orchard oriole are hemispherical in shape and open at the top; they are suspended from small twigs at the ends of branches, while the materials of which they are made are woven and interwoven through and through in a manner truly wonderful, and with as much intricacy and exactness as if sewed with a needle. Taking one of these nests to pieces, Wilson found that one of the fibres of dry grass of which the nest was woven, and which was thirteen inches in length, had been hooked through and returned no less than thirty-four times. The nests of both the Baltimore and of Bullock's oriole are pendulous and nearly cylindrical pouches, interwoven to and suspended from the extremities of hanging

FIG. 12.



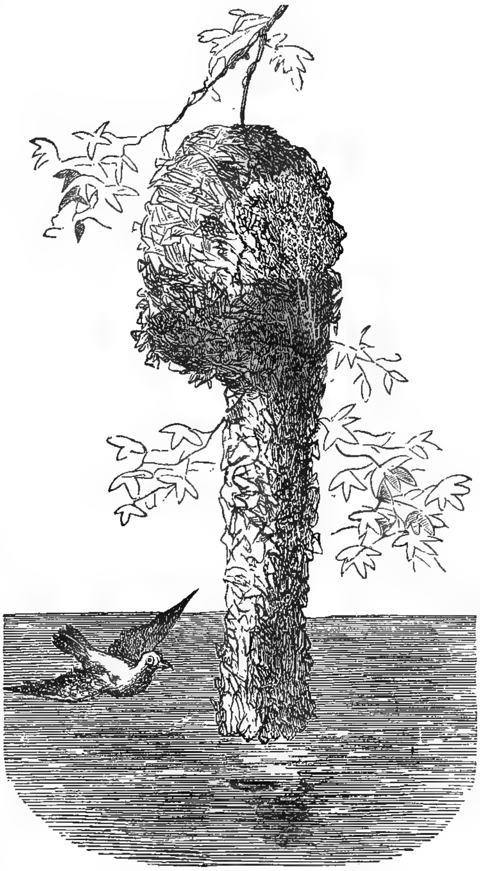
Icterus Baltimore (Baltimore oriole).

FIG. 13.



Vireo solitarius (solitary vireo).

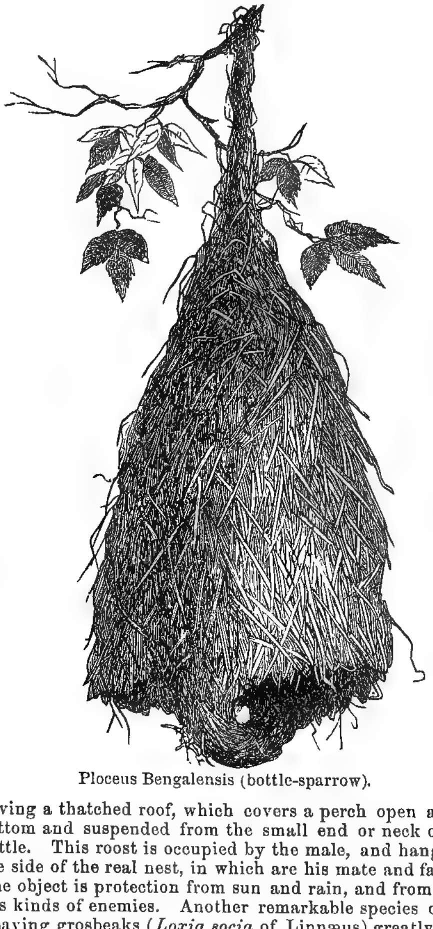
FIG. 14.



Ploceus oryx (pensile grosbeak).

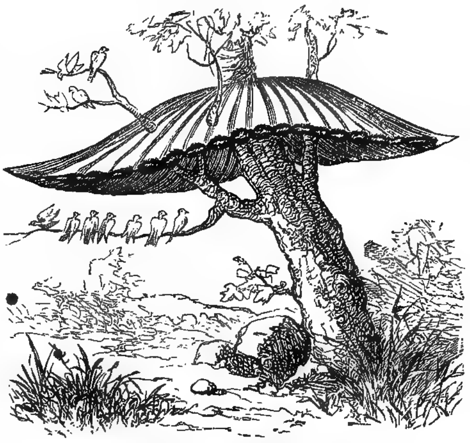
branches, and constructed by the interweaving of the filaments of several flax-like plants into a fabric of surprising strength. The nests of the Baltimore orioles are woven with incredible rapidity, the bill of this bird having curiously articulated jaws, enabling it to interweave the materials with a facility and celerity that would seem almost impossible. The Vireos, of which there are in North America sixteen different species, all, so far as we know, construct a curious pensile nest, hemispherical in shape and peculiar to the genus. Simpler in design than the nests of the *Icteri*, they are still structures of remarkable beauty and ingenuity. They are wrought into the shape of a deep cup, and are usually suspended from the fork of two twigs, around and over which the upper margin of the nest forms a continuous covering. Working down from this fold, the materials are neatly woven into a hemisphere truncated at the top. The pensile grosbeak of Africa (*Ploceus oryx*) suspends a very curious basket, woven of straw and reeds, from the end of a branch, usually over a stream of water. This is in shape like an oblong bag, with the entrance from below. Within and on one side of this is the real nest. These birds build in communities, according to earlier writers, of several hundred pairs. This is probably exaggerated, as Pringle, the African traveller, does not mention a larger number than twenty seen together. Their obvious design is to secure the offspring from the dangers of the weather and from various enemies, such as hawks, snakes, monkeys, etc. The entrance is always from below, and is through a long cylindrical gallery fifteen inches in length, that hangs down from the spherical nest like the tube of a chemist's retort. The bottle-nest sparrows of India have nests of equal ingenuity and better known. These are made pendent to branches of trees by small loops, and are formed in a very ingenious manner of a peculiar kind of long grass woven together in the shape of a bottle. These swing from the ends of long flexible branches, and effectually secure their inmates from harm. Their entrance is from below. Besides this curiously pensile nest, the male birds also construct an elaborate covered roost, which is wrought of the same kind of long, flexible, tough grass. This is a bottle-shaped basket, having a thatched roof, which covers a perch open at the bottom and suspended from the small end or neck of the bottle. This roost is occupied by the male, and hangs by the side of the real nest, in which are his mate and family. The object is protection from sun and rain, and from various kinds of enemies. Another remarkable species of the weaving grosbeaks (*Loxia socia* of Linnæus) greatly excel all of the family, at least in the extent of their workmanship. They build an enormous structure, in shape resembling an open umbrella, wrought, in the manner of a thatched roof, of Bushman's grass without any intermixture, and so completely woven as to be impervious to rain. Under the shelter of this canopy each pair build their own particular nest, placed under the eaves. Each individual nest is three or four inches in diameter; they are all in contact with one another around the eaves, and each nest has its own individual aperture forming the entrance.

FIG. 15.



Ploceus Bengalensis (bottle-sparrow).

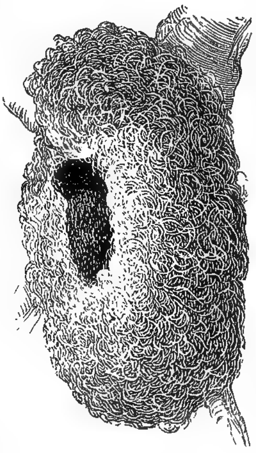
FIG. 16.



Ploceus socius (social weaver).

The tailor-bird of India, which enjoys a somewhat exaggerated reputation for ingenuity and skill, owing to accounts now believed to be more fanciful than real, is at least known to bend over one end of a leaf and to sew it securely to the stem-end, and to place its tiny nest in the hollow thus created. However curious and ingenious, this is not more remarkable than the contrivances of many other less noted species. Thus, our own Northern blue yellow-backed warbler (*Parula Americana*) constructs its nest of the long gray lichens of our Northern forests, gathering up and fastening together in a loop the long hanging branches of this moss to make its nest, often using no other material, and in this manner creating a very beautiful structure, the entrance to the cavity being usually on one side. Even more strikingly beautiful is the nest of the yellow-throated warbler of the Southern States (*Dendroica dominica*), of which our cut presents a remarkable illustration. Here the long pendent moss of the Southern swamps is carried up and fastened in loops; mosses three feet in length are fastened together into a woven bag of half the original length. In the centre of this curious structure, the natural appearance of which is unchanged, is hidden the tiny nest wrought of the softest vegetable down. The wonder is how such a nest can ever be discovered by human eyes.

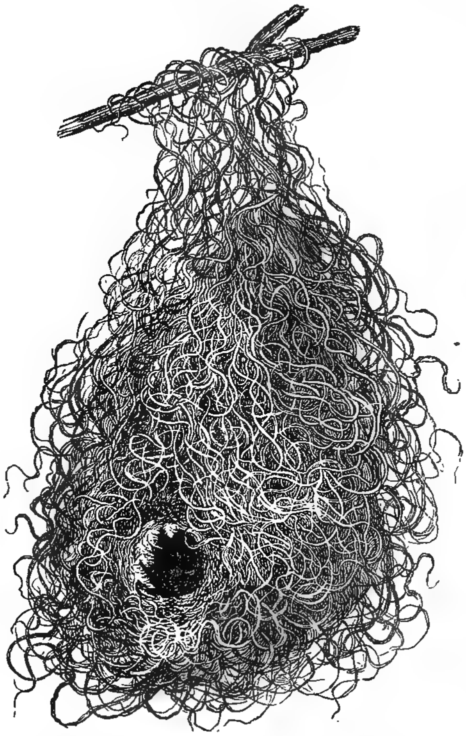
FIG. 17.



Parula Americana (blue yellow-back).

Another interesting group, styled by Prof. Rennie the "felt-makers," is distinguished not so much by the architectural peculiarities of their nests as by the remarkable changes they create in the character of the materials they use. These are included in only a few families, but the latter are individually very numerous. The group includes two kinds, the true felt-makers, who create a composite material, and those that use only a single material. There is, however, very little difference in the appearance of the product, and many species indifferently use a single or a composite felting. The finches of both the Old and the New World are typical felt-makers. Of these the canary, the several goldfinches, and the chaffinches may be mentioned as examples. Fine wool, of either vegetable or animal origin, serves as the base of this felting, and with this various other substances, such as mosses, lichens, spiders' webs, bits of cotton, bark, etc., are intermingled, and with won-

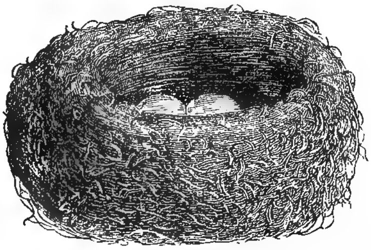
FIG. 18.



Dendroica dominica (yellow-throated warbler).

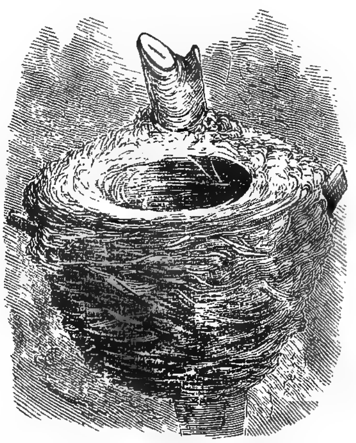
derful exactness felted and compacted together into a texture apparently homogeneous and uniform. With some, these felted nests are wholly composed of this single material, as in the nests of various humming-birds, where, besides an external covering of lichens, a means of concealment rather than an essential part of the nest, the whole is made of this one material. In the nests of the finches there is always an external framework, filled out and lined with felting. In these greater strength is given to the fabric by binding the whole with strong wiry grasses, fibrous roots, etc., and especially by binding the nest firmly into the fork by twining among the twigs bands of strong felting. The nest of our goldfinch (*Carduelis tristis*) is a striking illustration. All the Polioptilæ of North America and the West Indies are superior felt-makers. Their nests are large for the birds, remarkably deep, and with thick soft walls made of downy materials, but abundantly strong for the occupants, which are among our smallest species. The nests are models of architectural beauty and ingenuity of design. They are deep and purse-like in shape, not pensile, but interwoven with small upright twigs, usually near the tree-top, swaying with every breeze, but the depth of the cavity and the small diameter at the opening prevent the eggs from rolling out. The black-capped species of St. Lucas (*Polioptila melanura*) uses the living tendrils of a wild vine as the framework of its nest, interweaving with them its soft felted nest so intricately as to render them inseparable.

FIG. 19.



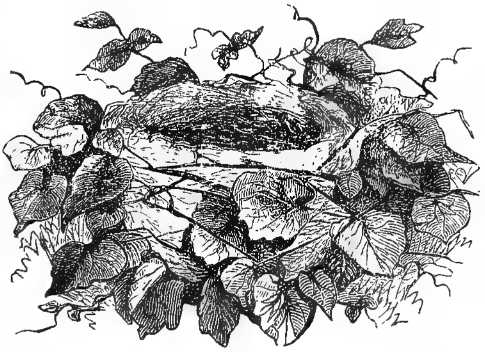
Fringilla cœlebs (chaffinch).

FIG. 20.



Carduelis tristis (goldfinch).

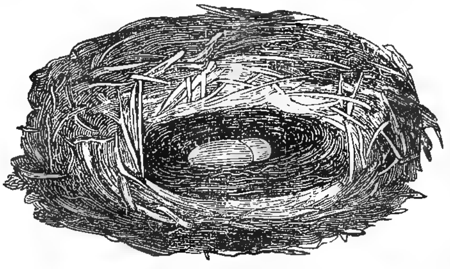
FIG. 21



Polioptila melanura.

Prof. Rennie recognizes as a distinct group what he calls "dome-builders," but nearly all might easily be ranged in one of the other groups. They consist of a great number of species and belong to a variety of families, and either occasionally or uniformly construct covered nests entered by holes in their sides. With many species the domed cover of their nest is not a uniform feature. The Carolina wren at times builds a domed nest, and quite as frequently constructs one open at the top. The golden-crowned thrush and the black and white creeper have almost always a covered nest, yet both occasionally build without any cover. The house-sparrow usually has an open nest, but also occasionally builds one with an arched covering. In the West Indies, and in tropical countries generally, domed nests are a predominating feature, and are undoubtedly an instinctive provision against the violence of tropical rains. Travellers in South America describe the nest of a common species known locally as the baker-bird, so called because it constructs a nest in the form of a baker's oven. This is placed in the most exposed situations, but at a considerable height. The nest is described as made of tempered clay, and as having a lateral opening twice as high as wide, and in the interior divided into two chambers by a partition beginning at the entrance.

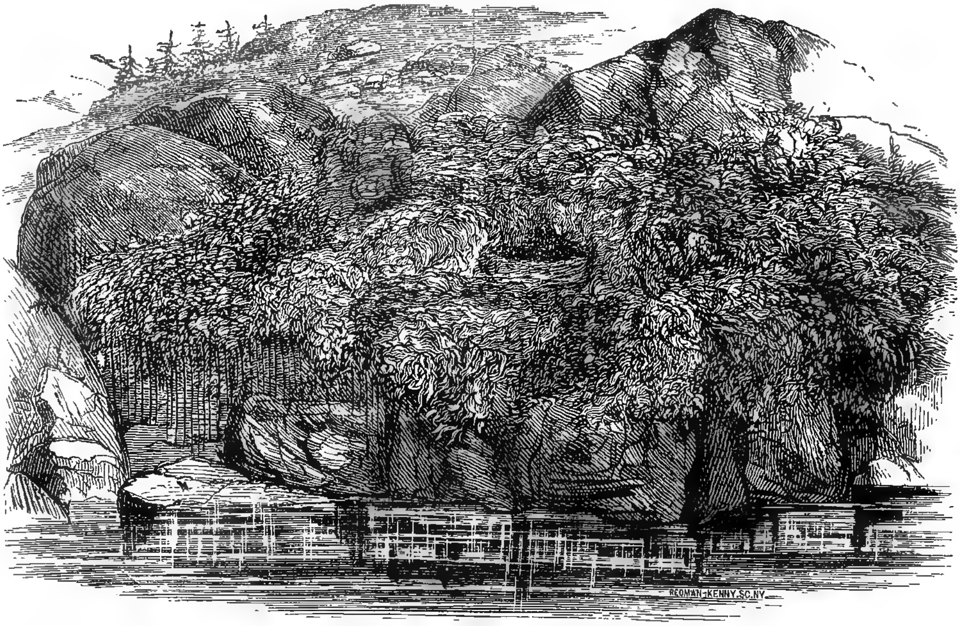
FIG. 22.



Seiurus aurocapillus (golden-crowned thrush, or oven-bird).

The *Cinclus Mexicanus* of North America builds a domed nest of a very peculiar and striking character. It is hemispherical in shape, of uniform contour, and usually built on a rock on the edge of a mountain-stream. Externally, it is composed of green moss in a living state, having within a strong, compactly built apartment arched over and supported by twigs, with a cup-like depression at the bottom composed of fine roots and twigs firmly bound together. These structures are a little less than a foot in diameter and from six to eight inches in height. Both spe-

FIG. 23.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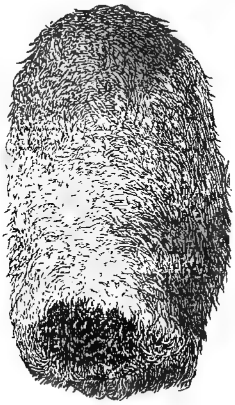
Cinclus Mexicanus (water-ouzel).

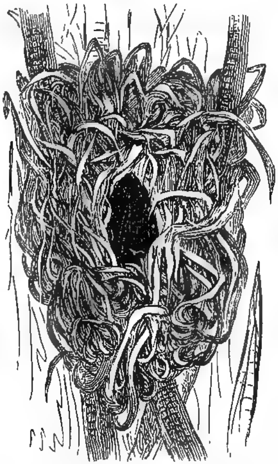
cies of cactus-wrens of California and Cape St. Lucas build curious domed nests of great size and purse-like in shape. These are composed of long flexible grasses, and are lined with feathers. Both species of *Cistothorus* build circular domed nests, that of *C. stellaris* ingeniously interwoven, externally of long wiry grasses and finer sedges, lined with soft vegetable down. That of *C. palustris* is a stronger structure, built in higher situations of coarse sedges firmly interwoven and cemented with mud.

FIG. 24.



Campylorhynchus affinis (cactus-wren).

FIG. 25.



Cistothorus palustris (marsh-wren).

Another singular peculiarity, found only in species belonging to a few genera, is the employment of cement-like secretions in the construction of their nests, and these are grouped together as "cementers" in certain systems. In some cases it is difficult to determine whether the birds generate their own cement or make use of adhesive substances that exist in nature. Thus, we find the nests of humming-birds and of several other kinds of birds covered over with a coating of lichens and mosses, and thus made to resemble the moss-covered bark of the trees on which they are built, and apparently this covering is made to adhere by means of some adhesive cement; but that this is secreted by the bird itself we do not know. We infer, rather than know, that certain swallows temper the earth of which they construct their nests with their own adhesive secretions. In regard to other cases our knowledge is more positive. The chimney-swallow fastens its simple cradle of twigs against the inner walls of a hollow tree or the inside of the chimney, and glues together, twig by twig, the nest itself, by means of a powerful cement which it secretes from its own throat. The edible nests of the esculent swallow are without doubt constructed with the aid of similar secretions. These nests are apparently made of some homogeneous material, and this is presumed to be the product of some glutinous marine-plants. It is also supposed that this material is prepared within the internal organs of the swallow, but this, though probable, is rather conjecture than ascertained fact.

This article would be incomplete without some reference to the various forms of parasitic reproduction found among birds, by means of which they wholly avoid and throw upon strangers the rearing of their offspring. Some are only parasitic in so far as they appropriate the nests of strangers. Of these the most take possession of deserted nests of other birds. Some only occasionally drive off the rightful owners and possess themselves of their property. A few kinds are not known to build any nests of their own, but always take possession of the nests of others, and therein deposit their eggs and rear their young. Of this last class is the brown jay of Central America. A few very remarkable parasitic forms, like many of the cuckoos of the Old World and all the *Molothri* of America, after the deposition of the egg in the nests of other birds, take no charge of their own offspring, but leave them entirely to the nurture of strangers. T. M. BREWER.

Neth'erlands, The [Dutch, *Nederlanden*; Fr. *Pays Bas*], kingdom of Western Europe, situated between lat. 50° 45′ and 53° 35′ N., and between lon. 3° 24′ and 7° 12′ E., bounded W. and N. by the North Sea, which forms two large inlets, the Zuyder-Zee and Dollart Bay, E. by Germany, and S. by Belgium. It comprises an area of 12,648 square miles, with a population of 4,012,693 (1,983,164 males and 2,029,529 females). The average density of the population is 329.8 per square mile, being greatest in South Holland, where it is 716 per square mile, and nearly the same in North Holland, where, however, the population is mostly concentrated in towns. The country is divided into the following 11 provinces:

	Area.	Population.	Capital.
North Brabant	1,980	466,497	Bois-le-Duc.
Gelderland	1,965	466,805	Arnheim.
South Holland	1,166	803,530	The Hague.
North Holland	1,070	679,990	Amsterdam.
Zealand	690	188,635	Middleburg.
Utrecht	534	191,679	Utrecht.
Friesland	1,282	329,877	Leeuwarden.
Overyssel	1,291	274,136	Zwolle.
Groningen	790	253,246	Groningen.
Drenthe	1,030	118,845	Assen.
Limburg	850	239,453	Maestricht.

Its connection with Luxemburg is merely a dynastic union, the king of the Netherlands being also grand duke of Luxemburg, which country he received in 1815 as a compensation for Nassau; but the Netherlands possess extensive and important colonies in the East Indies, Java, Madura, Bali, Lombok, Ternate, Amboyna, Banda, Timor, and parts of

Sumatra, Borneo, and Celebes, with a population estimated at 24,000,000; and in America, Surinam or Dutch Guiana, Curaçoa, St. Eustatius, Aruba, Bonaire, St. Martin, and Saba, with a population estimated at 100,000. The country is low and flat, and forms the delta of the Rhine, Meuse, and Scheldt. Where the Rhine enters the Netherlands from Germany it is a powerful stream, half a mile broad, but after sending to the S. the Waal and the Leck, which connect with the Meuse, and to the N. the Yssel and the Vechte, which fall into the Zuyder-Zee, it disappears among the sandbanks of the North Sea. The Meuse and Scheldt divide also into different arms, and cut up their basin into a number of islands; indeed no other country is so peculiarly intersected by rivers and canals. Of the canals, constructed partly for drainage, partly for communication, may be mentioned as important for traffic the North Holland Canal, 52 miles long, 120 feet broad, 20 feet deep, constructed 1819–25, and connecting Amsterdam with the North Sea, and the Voorne Canal, from Voorne to Helvoetsluis, shortening the outlet from Rotterdam. Far more important is the NORTH SEA CANAL (which see). In many cases the river-bottom is higher than the adjoining surface, and large tracts of the country lie below the level of the ocean. Along the sea the land is in some places protected against inundation by lines of naturally formed sandbanks, the so-called dunes, but in places where no such sandbanks exist, and along the rivers, it has been necessary to construct huge dikes, 30 feet high, 70 feet broad at the base, and built of granite brought from Norway, or of clay, peat, and timber. By these dikes, which must be watched very closely or the sea and the rivers which formed the country will again destroy it, by a thorough system of canals, and by a number of ingenious and expensive hydraulic works, the Netherlanders have succeeded in reclaiming the whole delta and transforming it from a swamp to a highly productive soil. There are some tracts of waste land in Drenthe and Overyssel, but otherwise the country consists of fine meadows and fields. In 1881 the live-stock comprised 271,000 horses, 1,434,400 cattle, 792,000 sheep, and 329,058 hogs, and the production of cheese, butter, and meat of excellent quality is one of the principal occupations of the people. The fields are generally divided into small holdings and cultivated like gardens. Rye, barley, and wheat are raised, but more especially oil-seeds, tobacco, hemp, flax, and vegetables. The cultivation of flowers and garden-vegetables was introduced into England, the Scandinavian countries, and Russia from the Netherlands. The country is naturally treeless, but plantations are frequent. Peat is generally used as fuel. The only other mineral of special importance found in the country is a peculiar kind of clay well adapted for pottery. Of the manufactures, the most celebrated are those of linens (Hertogenbosch), earthenware (Delft), gin (Schiedam, Rotterdam, and Weesp); but those of paper, leather, oil, sugar, cottons, silks, powder, etc. are also very extensive. The motive-power most generally used is the windmill, which forms a prominent feature in every Dutch landscape. The fisheries are very important. Herring, cod, turbot, ling, anchovies, oysters, etc. are taken in the adjacent parts of the sea, and it is estimated that about 20,000 families support themselves by this industry. In the present century, however, the herring fisheries have declined somewhat. Between the fourteenth and sixteenth centuries the herring shoaled in the Danish waters; afterwards it moved to the northern coast of the Netherlands; now it is found on the south-western coast of Norway. Yet 25,000,000 herrings are annually taken in the Zuyder-Zee. The commerce of the country, at one time the most important in the world, has also declined during the last two centuries, though it is still very extensive and active. It is principally carried on between the colonies of the country and the coasts of the Baltic. In 1881 the value of imports amounted to 919,000,000 florins; that of exports to 690,000,000. In 1882 the Dutch ports were entered by 8776 vessels, of 4,538,000 tons burden, and cleared by 8785, of 4,532,000 tons burden. In 1882 the mercantile marine of the country comprised 837 vessels, with a tonnage of 362,000. The interior traffic is carried on to a very great extent on waterways, and not less than 7000 vessels are inhabited by families. The general aspect of the country is one of comfort and happiness. The inhabitants, of whom 2,469,814 are Dutch Reformed, 1,439,137 Roman Catholics, 107,123 Christian Reformed, 81,693 Jews, 44,227 Mennonites, etc., are characterized by industry, cautiousness, perseverance, frugality, the utmost cleanliness, and a certain sedateness of manner. There is great wealth among them, and it is well diffused. The same may be said of their intellectual fortune. The three universities of Leyden, Utrecht, and Groningen are celebrated institutions, and the part which Dutch scholars have played in the development of modern civilization is very conspicuous. At the same time, the mass of the people is better instructed in the Netherlands than in any other European country. There is a standing army of 62,000 men; the navy comprises 84 steamers, 16 sailing vessels, and 70 gunboats, carrying 773 guns and manned by 6886 men. In 1883 the public debt amounted to 1,018,992,550 florins; the receipts to 111,162,297; the expenditures to 139,915,990. The receipts from the colonies were 124,908,632 florins, the expenditures 114,761,528.

Language and Literature. (See DUTCH LANGUAGE AND LITERATURE.)

History.—The Netherlands or Low Countries denoted, when first spoken of in history, the whole plain extending from the foot of the Vosges and the Ardennes to the North Sea, and comprised not only the present kingdom of the Netherlands, but also Belgium and the northernmost parts of France. It was inhabited by three distinct though kindred tribes—the FRISIANS (which see) to the N., the Batavians, of Germanic stock, in the centre, and the Belgæ, of Gallic stock, to the S. The Belgæ were subjugated by Cæsar; the Batavians were at first allies of Rome, but after the unsuccessful attempt of Claudius Civilis in 67 A. D. to unite the Batavian communities into an organized empire, they too were conquered by the Romans; the Frisians submitted after repeated defeats and rebellions. In 357 the Batavians are spoken of as forming part of the Roman army in the battle of Strasbourg against the Germans, and as displaying great valor. But after this time their name disappears from history. The Belgæ gave way to the Franks; the Saxons pushed onwards from the E.; new though kindred tribes took possession of the soil; only the Frisians withstood. On the establishment of the great Frankish empire under the Carlovingians the whole plain was incorporated and the population christianized. But by the division of the empire of Charlemagne the country was divided, the southern part falling to France, the central to Lothringia, and the northern to Germany, and for centuries the different parts followed the different destinies of the main bodies to which they belonged. Meanwhile, the feudal system got a foothold in the country. Dukedoms, Brabant, Limburg, Luxemburg; countships, Artois, Flanders, Holland; bishoprics, Mechlin, Utrecht, etc., were formed, and the remote position of the country made the feudal lords more independent of the royal or imperial power here than anywhere else. On the other hand, the situation on the ocean and the mouths of three great rivers invited to commerce, and alongside the feudal lordships flourishing cities grew up and surrounded themselves with strong fortifications. By a marriage the countship of Flanders became united to Burgundy in 1384, and subsequently the Burgundian dukes succeeded, partly by force, partly by craft, in gaining possession of the whole country, which they governed well. By another marriage the Netherlands, with the other Burgundian dominions, came into the possession of the house of Hapsburg in 1477, and Charles V. took a great interest in the development of Dutch industry and commerce. By the division of his empire between Austria and Spain the Netherlands fell to Spain, and it was a good consequence of this combination, so fatal in other respects, that the Dutch retained their full share in the new commerce which was opened up by the discovery of America and the establishment of the Spaniards in the East Indies. On the whole, it was not so much the interests of the two countries which clashed as the different character of the people and its ruler. The Reformation had made a deep impression and spread widely in the Netherlands, and Philip II. determined to root it out. The result was a war which lasted over eighty years (1566–1648), and ended with the humiliation, not to say the ruin, of Spain, and the establishment of the Netherlands as one of the principal powers of Europe. The salient points of this struggle were the formation at Utrecht (Jan. 23, 1579) of a union between the seven northern provinces, Holland, Zealand, Utrecht, Friesland, Groningen, Overyssel, and Gelderland, and the recognition by Spain of this union by the armistice of twelve years concluded in 1609. (For further details see the articles on MARGARET OF PARMA, ALVA, THE DUKE OF, JOHN (DON) OF AUSTRIA, FARNESE (ALEXANDER), the Spanish governors, and WILLIAM OF NASSAU and MAURICE OF NASSAU, the Dutch leaders.) By the Peace of Westphalia (1648) the independence of the republic of the United Provinces was formally acknowledged, while the southern provinces, nearly corresponding to the present kingdom of Belgium, remained with Spain and within the Roman Catholic Church. The prosperity of the young state was prodigious. For about a century it was absolute master of the sea. It crushed the Spaniards and acquired possessions in America and the East Indies. It checked the Portuguese and kept down the English. After the battle of Goodwin Sands (Nov. 29, 1652) its admiral, Van Tromp, paraded a broom at his masthead along the English coast as a token that he had swept the Channel, and in June, 1667, De Ruyter sailed up the Thames and blockaded the port of London. In the Baltic also the Netherlands became perfect masters by the Peace of Copenhagen (1660), by which the Swedes held the one coast of the Sound and the Danes the other, thus leaving the course tolerably easy for the Dutch; and at the same time that they actually held in their hands the commerce of the world, their achievements in science (philology, theology, natural philosophy) and art (painting) gained the admiration of all Europe. Their resistance to the arrogance of Louis XIV. was their greatest glory. (Details of this contest will be found in the articles on Louis XIV., William of Nassau, Turenne, etc.) After that period the importance of the republic gradually decreased, not because its activity and prosperity really declined, but simply because it was superseded by England; and when in 1782, led by jealousy and considering the opportunity good on account of the American Revolution, it declared war against England, its maritime supremacy received a final blow from which it never recovered. Meanwhile, two parties had developed in the interior politics of the state—one not unwilling to raise the office of the stadtholder into royalty and make it hereditary in the family of Orange-Nassau, while the other, the so-called "patriots," strove to abolish it altogether and establish a pure republic. When in the winter of 1794–95 the French army, after conquering the Spanish Netherlands, entered the territory of the United Provinces, it was hailed by the patriots; the stadtholder, William V., fled to England, and the Batavian republic was proclaimed May 16, 1795. The country paid dear, however, for its new constitution, which, moreover, was changed several times according to the whims of Napoleon. In 1806 the Netherlands was made a kingdom under Louis Bonaparte (the kingdom of Holland); in 1810 it was incorporated with France. Meanwhile, the state of its finances had become nearly desperate. The Congress of Vienna established the kingdom of Holland once more, gave the crown to the house of Orange-Nassau, and joined the former Spanish Netherlands with it. But this last measure proved a new source of trouble. The southern provinces were agricultural, Roman Catholic, and French or Flemish speaking. The discrepancy between the two parts of the new state, both in political interests and in national character, was so palpable that when in 1830 the southern provinces rose into rebellion the great powers of Europe immediately consented to the separation, and the kingdom of Belgium (which see) was erected, though not until much blood and more money were squandered by the attempts of the king of Holland at maintaining his government. The revolutionary movement of 1848 finally occasioned some change in a liberal direction in the constitution, but since that period the country has been quiet, prosperous and progressing. Some conflicts with the natives of the colonies have taken place, but they have been unimportant, and have not affected the mother-country. (See Bilderdijk, *Geschiedenis des Vaderlands* (12 vols., 1832–39); Motley, *The Rise of the Dutch Republic* (3 vols., 1856); *The History of the United Netherlands* (4 vols., 1860–67); *The Life and Death of John of Barneveld* (2 vols., 1874.) CLEMENS PETERSEN.

Nets are made simply by the aid of a flat piece of wood and a needle with two eyes, and a notch at each end. The strings are wound from end to end of the needle, the notches preventing the twine from slipping as it is slowly looped and knotted around the flat piece of wood. The process of netmaking is thus very simple, but tedious and slow. In 1802 the French government awarded a prize of 10,000 francs to M. Buron for an automatic machine to make nets, but the machine does not appear to have come into practical use. In 1820, Mr. James Paterson of Musselburgh, near Edinburgh, invented a net-loom, and in this place a netmaking establishment now runs 300 of these looms, somewhat modified and perfected.

Nettement′ (ALFRED FRANÇOIS), b. at Paris July 22, 1805; became a frequent contributor to various papers and periodicals of critical and literary sketches written from a legitimistic standpoint; founded in 1848 *L'Opinion publique*, which was suppressed after the *coup d'état* in 1852; concentrated himself on larger historical works—*Histoire de la Littérature française sous la Royauté de Juillet* (2 vols., 1854), *Histoire de la Conquête d'Alger* (1856), *Histoire de la Restauration* (8 vols., 1860–72), and d. at Paris, Nov. 15, 1869.

Net′tle [Ang.-Sax., *netele*], a popular name for many plants, mostly covered more or less densely with poisonous stinging hairs. They belong to the order Urticaceæ, and mostly to the genus *Urtica*. The species are very numerous, and many are tropical, some of the latter having severe and even dangerous stinging powers. The stalks of some kinds abound in a strong fibre, which, especially in Asia, has a considerable use in the arts. The common nettle-fibre is employed like hemp in Italy. This species (*Urtica dioica*) is naturalized in the U. S. from Europe. Its young shoots make an excellent potherb, and when older are sometimes put into beer. The most common stinging nettles of the Eastern U. S. are, besides the above, the *U. urens*, also European, *U. chamædryoïdes*, *capitata*, and *gracilis*, and *Laportea Canadensis*, which last is reported to yield a good fibre. The false nettle of the U. S. is *Bœhmeria cylindrica*, a stingless herb. The so-called DEAD-NETTLE (which see) is not a nettle at all. In the East Indies the Neilgherry nettle, *Girardinia Leschenaultii*, one of the most actively stinging of the true nettles, yields an excellent fibre, which brings a high price in England. The common nettle, finely chopped up and mixed into a coarse flour-broth, is a good food for young turkeys.

Nettle-Rash, or **Hives** [Lat. *urticaria*], consists of elevations of the skin of the size of a pea or bean or larger. These elevations are usually white, or white with a red centre, or white with a red margin, or red, or white with a small vesicle in the centre. The disease is of an acute character; the elevations spring up quite suddenly, and disappear after hours or days. Frequently they return; some people do not get rid of the predisposition to them for many years. They return in irregular, sometimes in regular intervals, daily or every two days, without, however, having anything in common with intermittent fever. The anatomical condition of the skin is that of an inflammation with effusion. The cause of this is either external or internal. External causes are the contact with nettles, the influence of insects, a hot bath, the sun, mechanical and chemical influences of different character. In predisposed persons gentle pressure with the finger, or friction, or irritation by a subcutaneous injection of an indifferent medicine, is sufficient to produce it. Internal causes are such as irritate the nerves of the digestive organs, the genito-urinary organs, or the blood-vessels, certain articles of food, such as champagne, beer, sausage, strawberries, raspberries, currants, oysters; medicines, such as quinine or cod-liver oil. The recurrence of menstruation, the application of leeches to the womb, are causes which are frequently observed. Now and then nettle-rash can be traced to no cause, and in such cases a general irritability of the nervous system must be assumed to produce it. Not infrequently, therefore, it sets in with fever, sometimes with a chill, always with burning and itching. The treatment is simple, but not always efficient. Locally, the use of glycerine, cold-cream, mild solutions of carbolic acid in water (1 or 2 : 100), salt-water bathing will relieve the itching. The diet must be regulated—no coffee, spice, beer, not much meat. The stomach must be improved by alterative treatment or bismuth or muriatic acid, according to circumstances. Mild purgatives will be beneficial—in very bad cases now and then an emetic. Insects must be removed and menstruation regulated. In chronic cases arsenic has been given with but little effect. When a paralytic condition of the nerves of the blood-vessels is the cause, a physician may feel induced to give quinine or ergot. A. JACOBI.

Net′tleton (ASAHEL), D. D., b. at North Killingworth, Conn., Apr. 21, 1783; graduated at Yale College 1809; studied theology at New Haven; was licensed to preach in 1811, and ordained in the Congregational denomination in 1817. Declining all offers of settlement over churches, he devoted himself to labors as a travelling evangelist, and in the course of ten years (1812–22), he had labored with great zeal, eloquence, and success in revivals in nearly forty towns in Western Massachusetts, Connecticut, and New York. He edited a popular collection of *Village Hymns* (1824), visited Virginia 1827–28, again preached in New England and New York 1829–30, preached in Great Britain and Ireland 1831, and was appointed professor of pastoral duty at the newly-founded theological seminary at East Windsor, Conn., in 1832. He declined the office, but settled at East Windsor, and lectured occasionally to the students for several years. Dr. Nettleton's sermons were chiefly extemporaneous, and in theology he was a prominent ally of Dr. Bennet Tyler in his opposition to the "New Haven school" of Congregational doctrine, then represented by Dr. N. W. Taylor. D. May 16, 1844. His *Remains and Sermons* were edited by Dr. B. Tyler, who also published a *Memoir* (1844), republished at Edinburgh under the title *Nettleton and his Labors* (1854), revised by Dr. A. A. Bonar, who added numerous extracts from Nettleton's sermons and addresses.

Net′tle Tree, a name of the *Celtis australis*, a handsome tree of S. Europe, belonging to the Ulmaceæ, formerly regarded as a part of the collective order Urticaceæ, and valued for its wood, much used in turnery. It has several congeners in various parts of the Old and New Worlds, the common species of the U. S. being called Hackberry (which see). In Australia, etc. there are nettle trees more properly so called, with very sharply stinging leaves and shoots.

Neu-Bran'denburg, town of Germany, in the grand duchy of Mecklenburg-Strelitz, on Lake Tollens. It is a handsome and well-built town, with breweries, distilleries, manufactures of paper and cards, and a fine ducal palace. Pop. 8406.

Neu'burg, town of Bavaria, on the Danube, has breweries and distilleries and manufactures of porcelain and saltpetre. Pop. 7690.

Neufchatel', Neuchatel, or **Neuenburg,** a canton of Switzerland, bounded by France and the Lake of Neufchatel. Area, 306 square miles. Pop. 100,000. It is traversed by several ranges of the Jura Mountains, separated by longitudinal valleys stretching from the S. W. towards the N. E. The lower parts of these mountains are generally well adapted to the cultivation of wheat, wine, and fruits; the higher afford good pasturage, where many cattle are reared and much cheese is produced, or they are covered with forests yielding good timber. But the chief occupation of the inhabitants is nevertheless manufacturing, especially watchmaking, which employs about 12,000 persons. The first watch was made here in 1681; in 1752 the country had 464 watchmakers; 3456 in 1792; 3744 in 1814. About 900,000 watches are made annually, of which about 30,000 are exported to the U. S. Up to 1848 the country formed the principality of Neufchatel, and belonged to the king of Prussia; in that year it became a member of the Swiss confederacy. The population is French and Protestant, and is distinguished for its ingenuity, its industry, and its high moral tone.

Neufchatel, town of Switzerland, capital of the canton of the same name, is beautifully situated on the shore of the Lake of Neufchatel. It is well built, and has important manufactures of watches and laces, and a large trade in wine. Pop. 15,612.

Neufchatel, Lake of, in Switzerland, 25 miles long and from 3 to 5 miles broad, sends its waters through the Aar to the Rhine.

Neu'haus, town of Bohemia, on the Nezarka, has 8703 inhabitants.

Neu'hausel, town of Hungary, on the Neutra, was formerly an important fortress, but its fortifications have been demolished. Pop. 10,584.

Neu'hof, von (Theodor), Baron, b. in 1686 in Westphalia; studied at Cologne, whence he fled on account of a duel; fought in the Spanish army in Africa, and was taken prisoner by the Moors in 1717. Eighteen years afterwards, when the Corsicans rose in rebellion against the Genoese and asked for help from the dey of Algiers, two regiments were sent to their support under the command of Neuhof, and in November of the next year (1736) the Corsicans chose him their king, under the name of Theodore I. He succeeded in negotiating a Dutch loan, and maintained himself for two years; but having been expelled by the French in 1738, he fled to England, was imprisoned in London by his creditors, and not liberated until a short time before his death (Dec. 11, 1756) by a subscription headed by Sir Robert Walpole.

Neuilly', town of France, department of Seine, 1½ miles from the W. extremity of Paris, on the right bank of the river Seine, which is here crossed, on the prolongation of the avenue through the Champs Elysées, by the noble stone bridge built by Perronet. (See Bridge.) It was the favorite summer residence of Louis Philippe, who occupied the royal château erected in the reign of Louis XV., which was destroyed by the mob Feb. 25, 1848, the right wing alone being saved, which yet forms an object of interest to visitors. The beautiful grounds about Neuilly, once the favorite resort of Parisians, are now laid out in walks skirted by charming villas. Neuilly has a varied manufacturing industry, comprising starch, chemicals, straw goods, porcelain, etc. Pop. 25,235.

Neu'komm (Sigismund), b. at Salzburg, Austria, July 10, 1778; received for some time the instruction of Haydn; was director of the German opera and music-teacher in St. Petersburg, Moscow, Paris, Rio Janeiro, etc.; lived generally, when he was not travelling in Germany, Switzerland, Algeria, etc., in the house of Prince Talleyrand in Paris and London; produced about 800 compositions—operas, oratorios, symphonies, cantatas, etc.—and d. at Paris Apr. 3, 1858. His oratorios, *David* and *Mount Sinai*, are often performed in England.

Neu'mann (Johann Nepomuk), D. D., b. in Bohemia Mar. 28, 1811; educated at the University of Prague, and in 1834 came to the U. S.; was ordained a Roman Catholic priest at New York in 1836, and entered the Redemptorist order. In 1852 he was consecrated bishop of Philadelphia; in 1855 was named a domestic prelate of the pope; founded various schools and church institutions. D. Jan. 5, 1860.

Neumann (Karl Friedrich), b. at Reichmannsdorf, Bavaria, Dec. 22, 1798, of Jewish parents; studied at Heidelberg, Munich, and Göttingen, and was converted to Lutheranism; went in 1827 to Venice to study Armenian in the convent of San Lazaro, thence to Paris to study Chinese; made a journey to India and China in 1829–30; brought back a large collection of Chinese and Hindoo books, which are now partly in Berlin and partly in Munich; was appointed professor of Oriental languages at Munich in 1831, but dismissed in 1852 on account of his liberal views in politics; removed in 1863 to Berlin, and d. there Mar. 17, 1870. He was a very prolific writer on various topics. His principal works are—*Mémoires sur la Vie et les Ouvrages de David, Philosophe Armenien* (1829), *Lehrsaal des Mittelreichs* (1836), *Asiatische Studien* (1837), *History of Vartan by Elisæus,* and *Chronicle of the Armenian Kingdom in Cilicia, by Vahram* (1830), translated from the Armenian. He also wrote *Geschichte der Vereinigten Staaten von Amerika* (3 vols., 1863–66), and *Hoein Schein, or the Discovery of America by Buddhist Monks* (1874).

Neu'münster, town of Prussia, province of Holstein, has large breweries, dyeworks, tanneries, and manufactories of woollen and linen fabrics. Pop. 11,623.

Neural'gia [Gr. νεῦρον, "nerve," and ἄλγος, "pain"]. Pain in the course of a nerve is a symptom of many morbid conditions. The track and distribution of a cerebral, spinal, or visceral nerve may be the seat of the pain, which is sharp, occurs in paroxysms repeated at intervals of a few seconds or a day, the pain between the paroxysms disappearing or being replaced by soreness or dull pain. The suffering is often very intense. One curious feature of neuralgic pain is its occurrence on one side of the body only at any one time. Usually no redness or inflammation is visible in the affected region, though an exception to this rule is observed in neuralgia of the face, during attacks of which the eye is red and lachrymose. The parts which are the seat of pain are usually over-sensitive during the paroxysms, and numb between them; there may even be loss of sensibility. Along the track of the affected nerve one or more tender points are usually found. Neuralgias are divided (1) on the basis of their distribution, (2) on the basis of their causes. The former, or topographical classification, includes the following varieties among others: facial, occipital, brachial, intercostal neuralgia, sciatica. According to the second or ætiological classification, there are—malarial, gouty, anæmic, hysterical neuralgias; neuralgias from injuries to nerves, from inflammation of nerves, and from disease of the nervous centres. Besides, in the present state of science, there are cases of neuralgia for which no cause can be made out—idiopathic neuralgia. The rational treatment of neuralgia consists in treating the pathological states which cause it. E. C. Seguin.

Neurine. See Appendix.

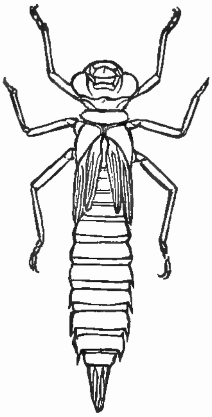
Neuri'tis [Gr. νεῦρον, "nerve"], inflammation of nerves. Neuritis presents itself as (1) parenchymatous neuritis, (2) interstitial neuritis, and (3) peri-neuritis. Parenchymatous neuritis consists in a multiplication of the nuclei of the membrane of Schwann of common nerve-fibres, with simultaneous disintegration of the myeline and destruction of the axial cylinder, the connective tissue between and around the fibres undergoing relatively little change. This lesion is seen in the Wallerian degeneration of nerves after section, and has been observed (Charcot) after disease of the spinal cord. (2) Interstitial neuritis consists in the development of young cells from the nuclei of the connective tissue of the nerves, and the formation of more connective tissue from these young cells, the increase of connective tissue causing compression of the nerve-fibres. To the naked eye the nerve appears larger, more or less translucent (instead of dead white), and is tougher. Such a neuritis is produced by injuries, extension of inflammation from other parts; it is found in the Greek elephantiasis. The neuritis may be localized, but tends to extend above and below the starting-point; it may lead to myelitis. (3) Peri-neuritis is that form of inflammation of nerves in which the general sheath of the nerve and the circumjacent connective tissue are the seat of trouble. There occur increased cell-formation, effusion of lymph or serum, and escape of the white globules of the blood. The nerve appears to the naked eye larger, reddened, œdematous, and may be unnaturally fixed in its bed of connective tissue. The causes of peri-neuritis are partly unknown; cold may cause it, as well as injuries, and it is possible that the gouty disposition produces it. The symptoms of neuritis are pain, numbness, loss of function, expressed by paralysis and anæsthesia. E. C. Seguin.

Neu′rode, town of Prussia, province of Silesia, has manufactures of flannels. Pop. 5800.

Neurop′tera [Fr. *névroptère*]. The net-veined insects or Neuroptera (*νεῦρον*, a "nerve;" *πτερόν*, a "wing") comprise the white ants, the May-flies, dragon-flies, and ant and aphis lions, and caddis-flies. They are usually recognized by the large net-veined wings, the cross or smaller veins being usually very numerous, and the hinder pair of nearly the same shape as the anterior pair, though sometimes the hinder pair are very small or wanting, as in some May-flies (*Cloë*, etc.). The mouth-parts are constructed on the same type as the Orthoptera and Coleoptera; the mandibles are usually large and adapted for biting; the first maxillæ are well developed, while the second maxilla, or labium, is in the dragon-flies enormously developed, and the palpi or feelers are converted into hooks for seizing and retaining other insects. Great changes in form occur in the thorax, but it may be said to be unusually large, with all three segments quite equally developed, as in the lace-winged flies and their allies (Hemerobiidæ); but in the dragon-flies and May-flies the prothorax (or first thoracic ring) is very small, and in the dragon-flies the flanks of the middle thoracic segment almost take the place of the prothorax. The legs are generally weak, not adapted for walking, the Neuroptera depending mostly on their wings as locomotive organs. In a few cases, as the *Mantispa*, a form mimicking the *Mantis*, an orthopterous insect, the fore legs are, as in that insect, large and spiny, adapted for seizing and retaining their prey, consisting of other insects.

The body of Neuroptera, though sometimes short, is apt to be very long, especially the abdomen. This region consists of eleven rings, ten being the normal number in the higher groups of winged insects. The ovipositor is quite varied in structure, and Lacaze-Duthiers, who has published an extensive work on the ovipositor of insects, states that the structure of the neuropterous ovipositor is simpler than in other insects. He discovers three types of structure, the simplest occurring in the *Libellula*, where the appendages form a pair of pincers. Indeed, it is impossible to satisfactorily define the Neuroptera, as the different groups vary so much in form. This is due largely to the lowness of the type, and to the great degree of geological extinction, which has left great gaps between some of the families. Our knowledge of the Neuroptera has been much extended by the labors of Dana and Scudder in this country, and by others in Europe, who have detected in the Carboniferous and Devonian rocks a few fossil forms which combine some of the characters of existing families with peculiar characters of their own. These fossil forms, represented by imperfect fragments and portions of wings, rarely perfect, were usually much larger than their living descendants. So far as concerns the families now living, they differ in some cases from one another nearly as much as the Neuroptera from the Orthoptera, though it is to be borne in mind that no true Orthoptera (grasshoppers, etc.) occur as low down as the Neuroptera, which are the only insects yet found in the Devonian formation.

Fig. 1.



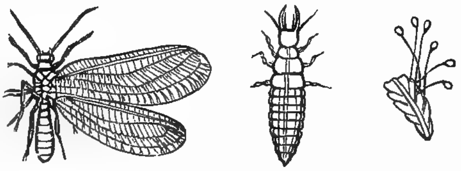
Larva of a dragon-fly.

A number of strange wingless forms, the spring-tails and bristle-tails (Thysanura), though wingless and differing in some important characters, separating them from the other Neuroptera, yet have some fundamental characters which seem to unite them with the latter. The mouth-parts, which vary greatly, when well developed are framed like those of the Neuroptera; the bristle-tail is much like a larva of *Perla*, and seems to bear the same relation to the winged *Perla* and other Neuroptera that the wingless lice do to the higher Hemiptera, of which they form the lowest division. The earliest changes of the embryo in the spring-tails or Podurans (*Isotoma*) are nearly identical with those of the thousand-legs or myriapods. The yolk undergoes total subdivision as in the latter, the eggs of no other insects being known to undergo total segmentation. In this respect, and in the fact that one pair of jaws (maxillæ) are wanting in the embryo, the Poduræ closely resemble the millipedes, though not the centipedes. For this and other reasons the *Thysanura* should perhaps form a group equivalent to the Neuroptera, instead of a subdivision of the latter. In most works the Thysanura are not included among the Neuroptera. They differ, besides the want of wings, in most of the genera having the mouth-parts very imperfect and drawn within the heads. or, as in *Anura*, quite wanting; and in the presence of the spring, which is, however, one pair of blades of the ovipositor of other insects—an organ wanting in some Thysanura (*Anura* and *Lipura*).

The winged Neuroptera are divided by some writers into the so-called Pseudo-neuroptera (including the families Termitidæ, Perlidæ, Psocidæ, Embidæ, Ephemeridæ, Libellulidæ) and the true Neuroptera, comprising the Sialidæ, Hemerobiidæ, Panorpidæ, and Phryganeidæ; but we regard the so-called Pseudo-neuroptera as comprising the most typical Neuroptera—*i. e.* the dragon-flies and May-flies.

The nervous system of the Neuroptera differs much in different groups. In *Corydalus* Leidy describes, besides the brain (supra-œsophageal ganglion), which is relatively much smaller than in other insects, the optic and antennal nerves proceeding from the brain. There are three thoracic and eight abdominal ganglia, which are of very uniform size and connected by double commissures. The alimentary canal in most of the genera which have been studied, especially in *Corydalus*, is divided into a long œsophagus, which widens posteriorly into a spacious crop (proventriculus), which extends as far back as the fifth abdominal segment. The large intestine has a large twist, and abruptly dilates into an oval or pyriform cæcum. In some genera there is a sucking stomach opening into the œsophagus, as in the Lepidoptera and Hymenoptera. It is an interesting fact that in *Corydalus* this sucking stomach is only present in the pupa, and is aborted in the imago or adult. The crop or gizzard is often large, and armed internally with teeth, as in the grasshoppers. In the larva of *Corydalus*, which is carnivorous, the stomachal teeth—*i. e.* those of the crop—are present, but in the pupa, which is inactive, taking no food, they are wanting, but reappear in the winged adult. In *Perla* there is no gizzard, nor is there any in the dragon or May flies, while in the rapacious Panorpidæ the round gizzard is lined internally with a brown chitinous membrane covered with stiff hairs. In *Lepisma* (Thysanura) the gizzard is provided with six teeth. The two salivary glands differ much in the Neuroptera. There are generally six or eight long, flexuous urinary tubes. The ovaries consist of many-chambered tubes, and the testes consist in many species of two tufts of long or round follicles.

Fig. 2.



Adult, larva, and egg of *Chrysopaperla* of Europe.

The Neuroptera comprise a less number of species than any of the other groups except the Orthoptera. A large proportion, more so than in any other sub-order, are aquatic in their early stages. Out of twelve living families, five pass their larval stage in the water. This is a very large proportion of aquatic forms. This fact leads us to the consideration of the various modes of respiration among these forms. The terrestrial species and those forms which are aquatic only in the larva state breathe in the normal manner through the breathing-holes (stigmata) in the side of the body, but in the aquatic larvæ there are usually external appendages, either leaf-like or simply filiform, which are permeated by tracheal branches which absorb the air and convey it to the body. In the larvæ of the caddis-flies (Phryganeæ), which are long and slender, somewhat like caterpillars in appearance, there are a number of fleshy filaments scattered in groups over the body. In *Perla* the bunches of breathing filaments are attached to the under side of the body of the larva and pupa, and in *Pteronarcys*, a large Perla-like form, the gill filaments are even retained in the adult or winged state—an exception in this respect to all other insects. In the May-flies the so-called gills are beautiful objects, being broad, delicately fringed, leaf-like organs attached to the sides of the abdomen. In the smaller dragon-flies (*Agrion*, etc.) the body terminates in three leaf-like appendages permeated by tracheæ, but in the larger forms (*Libellula*, etc.) there is a strange modification of the respiratory organs. The rectum itself is provided internally with numerous folds, which are traversed by a large number of fine tracheal branches. The water is admitted into the alimentary canal, the oxygen absorbed, and the water then expelled as if by a syringe, and with sufficient force to propel the creature forward several times its own length. Thus, the apparatus combines both respiratory and locomotive functions. In a singular genus of May-flies (*Bætisca*) the branchiæ are also internal. The larva of *Corydalus* has both branchiæ and spiracles with large and numerous tracheæ. The reason for this unusual combination is given by Hagen, who says "that it lives, like *Sialis*, some weeks out of the water before its transformation." Among the more remarkable forms of Neuroptera, and of most interest as foreshadowing the social ants, is the termes or white ant. Not only are there two kinds of males and females, as Fritz Müller has lately shown, but the neuters or soldiers are both male and female, according to the same authority. Smeathman has given us the best account of the vast colonies of white ants found in Africa. Besides the males and females, he has indicated two wingless forms—the soldiers, which have large square heads and long powerful mandibles, and the workers, which have small round heads and minute mandibles. Certain of the workers have a horn on the head (*Nasuti*). Müller says of a Brazilian species that "besides the winged males and females, which are produced in vast numbers, there are wingless males and females, which never leave the termitary where they are born, and which replace the winged males or females whenever a community does not find in due time a true king or queen." In some species, according to F. Müller, the laborers (*Calotermes*) and in others (*Anoplotermes*) the soldiers are wanting. Müller believes that the wingless forms are modified larvæ. Müller also confirms Smeathman's statement that in the company of the queen there always lives a king. *Termes fatalis* Linn. raises conical hillocks of great strength and solidity, often ten or twelve feet high. Our American species is *Termes flavipes* of Kollar. It is frequently injurious in houses, and bores out grapevines and decaying trees.

The May-flies are interesting from the short life of the imago, and from the nature of the mouth-parts, which are partly aborted and unfitted for taking food. They live but a few hours or a single day after acquiring wings, but in the early stages two or three years. The dragon-flies are beneficial as scavengers, both in the larval, pupal, and winged states, as they spend their lives in devouring smaller insects. They lay their eggs in masses attached to floating objects. The larva is remarkable for the large labium, forming a mask which covers the face. It is let down, exposing the jaws, when the insect seizes its prey. The pupa is active, as in the grasshoppers. Another neuropterous insect of a good deal of importance in an economical point of view is the aphis-lion, or larva of the lace-winged fly (*Chrysopa*). It is armed with powerful jaws, within which, in a groove, slide the accessory jaws (maxillæ). With these sabre-like jaws they pierce the body of the aphis, holding them aloft, and suck their blood. The eggs are laid on long stalks among the aphides. The larva spins a spherical white silken cocoon, the pupa being inactive and rudely resembling that of a fly, while the adult insect is green, with beautiful gauze wings and golden eyes.

Another type of Neuroptera is the caddis-fly. Some of the smaller forms so closely resemble some of the smaller moths (Tineæ) that they would be easily mistaken for them. The larvæ often resemble caterpillars in form, except that they have no abdominal legs. They have the curious habit of constructing cases of bits of leaves, pieces of stick, or grains of sand. The case of *Helicopsyche* is often mistaken for a snail-shell. When about to transform into the pupa state, the larva closes the mouth of its case with a grating or a silken lid, or spins a silken cocoon.

Synopsis of the Families of Neuroptera.

1. Wingless, minute, with the ovipositor changed into a spring; mouth-parts internal: *Poduridæ* (spring-tails).
2. Wingless, mouth-parts partly external; body long, ending in two bristles or a forceps: *Campodeæ*.
3. Body long, covered with scales, and ending in three long bristles: *Lepismatidæ* (bristle-tails).
4. Moth-like, wings folded on the sides; larva in cases: *Phryganeidæ* (caddis-flies, case-worms).
5. Mouth-parts forming a beak; tail ending in a forceps; or wingless: *Panorpidæ* (scorpion-fly).
6. Wings gauzy; larva with long jaws: *Hemerobiidæ* (aphis and ant-lions).
7. Prothorax large and square: wings large, net-veined: *Sialidæ*.
8. Wings very large, both pairs alike; larva with a mask: *Libellulidæ* (dragon-flies).
9. Wings large, net-veined; prothorax square. Species fossil: *Hemeristina*.
10. Wings very unequal in size; mouth-parts aborted; larva with broad leaf-like fringed gills along sides of abdomen: *Ephemeridæ* (May-flies).
11. Perla-like, but with raptorial, spiny fore legs. Fossil: *Palæopterina*.
12. Body flattened; prothorax large; wings folded flat on the back; abdomen ending in two long caudal filaments: *Perlidæ*.
13. Aphis-like; prothorax small; wings small, with few veins, or wingless: *Psocidæ* (death-tick, etc.).
14. Body linear, flattened; wings with few veins: *Embidæ*.
15. Body ant-like; wings long and large, parallel and finely net-veined; social, workers and soldiers, besides true males and females: *Termitidæ* (white ants).

A. S. Packard, Jr.

Neurot'ics [Fr. *névrotique*; Gr. *νεῦρον*, a "nerve"], a term lately introduced into medicine to refer generically to such drugs as are capable of primarily affecting the functions of intellection, sensibility, or motility. Alcohol, the ethers, chloral, potassium bromide, amyl nitrite, the drugs of the opium type, quinine, strychnine, hemlock, Calabar bean, aconite, digitalis, etc., are all prominent examples of the character of such drugs. Edward Curtis.

Neu'satz, town of Austria, province of Serbia, on the Danube, opposite to Peterwardein. In 1849, during the Hungarian revolution, it was almost wholly destroyed, but it is again a flourishing town. Pop. in 1880, 21,325.

Neuse River, formed by the union of Eno and Flat rivers in Wake co., N. C., flows in an indirect S. E. course for about 300 miles to Pamlico Sound. It is navigable except at low water by steamboats to Waynesborough, and at high water to a much higher point.

Neu'siedl, Lake of, in Hungary, near the northwestern frontier, is 23 miles long and 7 miles broad. Its water contains much soda, vitriol, and salt, and has a brackish and loathsome taste. The western bank is hilly, the eastern bank is low and marshy. The lake sometimes dries up entirely, as was the case in 1693, 1738, and 1865; but in 1870 the basin again became filled with water through the Hàuzàg marsh, and the farms and plantations which Archduke Albrecht had laid out under the name of New Mexico were all submerged. Under sudden risings of the water a canal conducts it to the river Rabuity.

Neu'sohl, town of Hungary, at the confluence of the Grau and Bestritza, is in a rich mining-district, with manufactures of arms and of beetroot-sugar. Pop. 5661.

Neuss, town of Rhenish Prussia, on the Erft, here connected with the Rhine by a canal, has manufactures of woollens, cotton, and leather. Pop. 17,495.

Neu'stadt, or **Wie'ner-Neu'stadt,** town of Lower Austria at the commencement of the canal of same name, and on the Vienna and Grätz Railway, 26 miles S. of Vienna. It is surrounded by a wall and a deep ditch. In 1834 the town was nearly destroyed by fire. It has since been handsomely rebuilt, and is the seat of a military academy founded by Maria Theresa. (See Olmutz and Znaim.) It possesses the largest sugar-refineries in Austria, and its manufacturing interests are rapidly increasing. Pop. 23,775.

Neustadt, town of Prussia, province of Silesia, has manufactures of linen fabrics, especially damask. Pop. 7980.

Neustadt-an-der-Hardt, town of Rhenish Bavaria, on the Speyerbach, has manufactures of gold and silver ware, oil, vinegar, paper, and leather. Pop. 11,411.

Neu'stadt-E'berswalde, town of Prussia, province of Brandenburg, on Finnow Canal, has a copper-mill, and manufactures of iron, steel, and brass ware. Pop. 11,524.

Neu'städtl-an-der-Waag, town of Hungary, on the Waag. It carries on a considerable trade in corn, wool, wax, and sheepskins. Pop. in 1880, 5164.

Neu-Stettin, town of Prussia, province of Pomerania, manufactures woollens, linens, and tobacco. Pop. 8604.

Neu-Stre'litz, capital of the grand duchy of Mecklenburg-Strelitz, is a handsome and well-built town, and contains a fine palace with a library of 80,000 volumes, a theatre, and educational and benevolent institutions. Pop. 9407.

Neu'titschein, town of Austria, province of Moravia, on the Titsch, has manufactures of linens, woollens, and flannels. Its vicinity produces cattle and flax. Pop. 10,274.

Neu'tra, town of Hungary, near the Moravian frontier, on the Neutra, is the seat of several civil and ecclesiastical authorities and has a fine old castle. Pop. in 1880, 8660.

Neutrality. See International Law, by Pres. T. D. Woolsey.

Neutral Trade. The liabilities and rights of neutral trade, altogether the most important title of international law for nations that have any maritime commerce, have been considered in International Law. We add here but a single remark, that war must inevitably interrupt the intercourse not only between belligerents, but between either of them and neutrals. In former times this was of great importance, but by no means of so great as at present. By the rules of the Declaration of Paris in 1856 for all the nations that are parties to them, these inconveniences of war to neutrals are in some degree counterbalanced by settling the rule that an enemy's goods, if not contraband, are safe on a neutral vessel not intending to break blockade. But whether other rules are not desirable to prevent trade in contraband articles with the ports of either enemy, may well be questioned. To the writer of this article some such rules seem to be highly necessary. T. D. Woolsey.

Neu′wied, Rhenish Prussia, on the Rhine, has manufactures of woollens, leather, tobacco, and hardware, and has schools in care of the Moravians. Pop. 9656.

Nevada, ne-vah′da, one of the Pacific States of the Union (see map of Ariz., Cal., N. M., Utah, and Nev., in article California), lying between 35° and 42° N. lat. and 114° and 120° W. lon.; bounded N. by Oregon and Idaho, E. by Utah and Arizona, S. W. and W. by California; extreme length from N. to S., 483 miles; greatest breadth from E. to W., 423 miles; area, 110,700 square miles.

THE GREAT SEAL OF THE STATE OF
NEVADA
ALL FOR OUR COUNTRY

Seal of Nevada.

Nevada, by census of 1880, ranked 38 among the States in population, 38 in value of agricultural products, and 38 in value of manufactures.

Face of the Country.—The greater part of Nevada is included in the Great American Basin, which has for its walls the Sierra Nevada on the W. and the Wahsatch Mountains on the E. It is bounded N. and S. by cross-ranges, and has no outlet for its waters. This vast basin is a tableland about 4000 feet above the sea, and mountains rise from 1000 to 8000 feet above its level. About 12,000 square miles in the S. E. of the State are outside of this basin, and belong to the Colorado River Basin. The Sierra Nevada Mountains constitute the W. boundary of the State. They throw out one spur, however, the Washoe Mountains, which have a N. E. direction. Most of the mountain-chains are parallel to each other, and have a general course from N. to S. The principal chains, beginning at the W., are the Virginia Mountains, W. of Pyramid Lake; the Lake range, between Pyramid and Winnemucca Lakes; the Truckee Mountains, E. of Winnemucca Lake; the Trinity and Antelope Mountains, which form the W. boundary of the Lower Humboldt River and Lake valley; the West Humboldt Mountains, and, separated from these by a broad valley, the East Humboldt Mountains; S. of the Humboldts are the Toyabe Mountains, and a parallel range, the Santa Rosa. The Pah-Ute and Coyote Mountains, also outliers of the Toyabe range on the W., extend northward toward the Humboldt River and Lake. E. and S. E. of the East Humboldt range are the Edwards Creek Mountains, the New Pass range, the Shoshone and Reese River ranges, the Hot Creek, Reveille, and Smoky ranges, the Diamond, Egan, Ungoweah, and Goshoot Mountains, parallel ranges, with valleys between. In the S. W. is an isolated range, the White Mountains. The Colorado valley has numerous abrupt ranges rising from its plateaux, and three peaks of considerable height—viz. Tem Piute, Pahranegat, and Picohe. The most important ranges of the Colorado region are the Muddy, Vegas, Spring Mountain, and Kingston Mountains. Some of the peaks of the West Humboldt and South Toyabe ranges rise to the height of 10,000 to 12,000 feet. The E. slope of the Sierra Nevada and the Humboldt, East Humboldt, and Toyabe ranges have a considerable number of streams, which, however, disappear very suddenly from the surface, and reappear as lakes or pools farther on. The principal rivers are the Truckee, which rises in Tahoe Lake and flows N. E. and N. W. into Pyramid Lake; the Humboldt, which is formed by the confluence of several small streams in the N. E. of the State, and after a general S. W. course falls into Humboldt Lake; Walker River, in the S. W., which after a circuitous course falls into Walker Lake; Carson River, discharging into Carson Lake; Quinn's River, in the N. W.; Reese River, in the central portion of the State; the Rio Virgin, in the S. E., and the Colorado, which forms for a considerable distance a part of the S. E. boundary. The principal lakes are Pyramid, 33 miles long and 14 wide; Walker, nearly as large; Carson, 12 miles in diameter; Humboldt, somewhat smaller; Winnemucca, 18 miles long, 8 wide; Lake Tahoe, one-third of which is in Nevada, 1500 feet deep, 6000 feet above the sea; and numerous shallow lakes of large extent in the rainy season, but dry or nearly so in the dry season. Among these are several known as mud-lakes—Franklin Lake, Preuss Lake, Pahranegat Lake, etc.

Mineralogy.—Gold is not an abundant metal in Nevada, but some of the argentiferous ores contain a large amount of gold in combination. The percentage of gold in these ores varies from 21 to 52 per cent. of the entire metallic product. Silver is, however, the staple mineral product of Nevada. The silver lodes are found in almost every part of the State, some yielding from $65 to $100 to the ton, others ranging from $450 to $2500 or more to the ton. Of these the mines on the Comstock vein or lode have proved the most valuable. The number of mines in the State is very large, and new ones are constantly being opened. The other minerals of Nevada are lead and copper in various forms, iron in numerous forms, as magnetic, spathic, specular, common iron pyrites, arsenical and magnetic pyrites, etc.: it is not as yet mined to any extent; antimony, arsenic, possibly quicksilver, manganese, sulphuret of zinc, graphite or plumbago, sulphur (pure), gypsum, rock-salt, nitrate of potassa, carbonate of soda in immense quantities, borax, lignite or brown coal, kaolin, sulphate of magnesia, agates, amethyst, epidote, tourmaline, chalcedony, jasper, carnelian, fluorspar, selenite, etc. There are numerous mineral springs and some geysers in the State.

Soil and Vegetation.—While the State will never be largely agricultural, it possesses a sufficiency of arable lands to supply with the aid of irrigation, and possibly without, the needs of such a population as it is destined to have, and its mountain-slopes and some of its valleys will prove to be among the best grazing-lands of the Pacific region. Its timber-lands proper, those on which grow the lofty pines of the sierras, are of very moderate extent. A part of the lower portions of the mountain-regions and some of the valleys along which the rivers flow are covered with a smaller growth of piñon or nut-pine, cottonwood, birch, willow, dwarf cedar, etc. Of the sixty-five natural families of plants catalogued in the State, many are represented by a large number of genera and species. Lupines, clovers, vetches, and nutritious grasses are the most characteristic plants of the State.

Zoology.—The animals are those of the Pacific Slope; the grizzly bear, the Mexican bear, cougar, wild-cat, lynx, Rocky Mountain sheep, antelope, deer, two or three species, and most of the smaller game, including the sage-hare, sage-grouse, etc., are the most characteristic mammals. The larger lakes are stocked with trout, salmon trout, etc.

Climate.—It is characterized by great extremes. In winter snow falls upon the summits of the mountains, though there is not much in the valleys. The air is dry, the winds are strong, and, though the sunshine is bright and pleasant at midday, the nights are often intensely cold. In January the mercury falls to from 10° to 16° below zero in the valleys, and much lower in the mountains. The last of February the approach of spring is announced, though there may be piercing winds and sharp frosts, chilling rain and snow in March, or even in April. Thunder-storms of great severity occur in April and May and into June. When these have passed away, the dry season prevails until October. The temperature rises to 100° or 105°. It falls every night to between 70° and 80°, and does not average in July and August more than 90° at midday. In the E. part of the State there are frequent thunder-storms in summer and till Sept. 15, and the heat is longer continued and more oppressive. There is less intense cold, very little snow or frost in winter in South-eastern Nevada, and the culture of cotton and the sugar-cane has been attempted there. The climate is remarkably healthy and invigorating.

Agricultural Products.—The crops of this State are comparatively meagre. The census of 1880 showed of wheat 69,298 bushels: corn, 12,891 bushels; oats, 186,860 bushels; barley, 513,470 bushels. The wool clip of 1880 was 655,012 pounds.

*Farm Animals.**—By the census of 1880 there were in

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* On farms only.

Nevada 32,087 horses, 172,221 cattle, 133,695 sheep, and 9080 swine.

Manufactures.—These are confined almost wholly to the milling and mining industries, except in the smaller manufactures carried on by individual enterprise. The total manufacturing products of Nevada in 1880 amounted to $32,534,605, employing 5232 hands in 594 establishments, and paying $4,497,251 in wages, on a capital invested of $9,947,113. There were 143 quartz-crushing mills, 27 saw-mills, and 14 grist-mills. The statistics of the U. S. Mint show that $77,000,000 in silver and $15,000,000 in gold have been coined from Nevada.

Railroads.—Nevada had in operation, Jan. 1, 1882, 890 miles of railway, costing $16,570,715, with net earnings of $833,918, and paying in interest and dividends, $687,750. The Central Pacific is the principal trunk line, running for 450 miles of its course through the State.

Finances.—The valuation of taxable property, Jan. 1, 1881, was: real estate, $17,742,714; personal, $9,855,944; total, $27,598,658. Rate of State tax, 55 cents on $100, producing $196,070 in 1880; total raised by taxation, State and local, $871,673; amount of State debt, Nov., 1881, $507,000; aggregate indebtedness, State and local, $1,024,523.

Commerce.—Nevada's isolated position and her total lack of water-communication render her commercial facilities inferior to those of most of the States.

Banks.—In Oct., 1881, there was in operation in Nevada 1 national bank, with a capital of $75,000; circulation, $36,000: U. S. bonds to secure circulation, $40,000; deposits, $114,237. There were also 6 other banking institutions, with capital of $89,000 and deposits of $617,119, and 9 private bankers, with $547,827 capital and $2,705,441 deposits.

Education.—In 1880 the number of children of school-age (six to eighteen years) was 10,592, of whom 8918 were enrolled in public schools, with average daily attendance of 5385. Total expenditure for public schools in 1880, $212,164, of which teachers' salaries amounted to $131,019. Nevada has but 1 university, which had 24 students in 1880. In 1882, Nevada had 29 newspapers and periodicals.

Churches.—The Methodist Episcopal denomination has 11 churches, 8 ministers, and 635 members; Protestant Episcopal, 9 churches, 328 members; Roman Catholic, 3 churches, 8 priests, and about 5000 Catholic population; Presbyterians, 5 churches, 247 members; Baptists, 3 churches, 52 members; Congregationalists, 1 church, 30 members; Jews, 1 synagogue, 29 members.

Population.—In 1860, 6857; 1870, 42,491; 1880, 62,266 (white 53,556, colored 8710, including 5416 Chinese, 2803 Indians, and 3 Japanese).

Principal Cities and Towns, Pop. 1880.—Virginia City, 10,917; Gold Hill, 4531; Carson City (cap.), 4229; Eureka, 4207; Austin, 1679; Tuscarora, 1364; Reno, 1302; Winnemucca, 763; Elko, 752; Pioche, 745; Cherry Creek, 566.

COUNTIES.	* Ref.	Pop. 1870.	Pop. 1880.	COUNTY TOWNS.	Pop. 1880.
Churchill	3–D	196	479	Stillwater.	
Douglas	3–C	1,215	1,581	Genoa	313
Elko	2–E	3,447	5,716	Elko	752
Esmeralda	4–D	1,553	3,220	Hawthorn.	
Eureka	3–E	......	7,086	Eureka	4,207
Humboldt	2–D	1,916	3,480	Winnemucca	763
Lander	3–D	2,815	3,624	Austin	1,679
Lincoln	4–E	2,985	2,637	Pioche	745
Lyon	3–C	1,837	2,409	Dayton	391
Nye	3–E	1,087	1,875	Belmont	284
Ormsby	3–C	3,668	5,412	Carson City	4,229
†Roop	2–C	133	286		
Storey	3–C	11,359	16,115	Virginia City	10,917
Washoe	3–C	3,091	5,664	Reno	1,302
White Pine	3–E	7,189	2,682	Hamilton	203
Total		42,491	62,266		

History.—Nevada is a part of the territory ceded to the U. S. by Mexico by the Treaty of Guadalupe Hidalgo, Feb. 2, 1848. It was at first a part of California Territory, and was subsequently attached to Utah; it was constituted a Territory Mar. 2, 1861, with somewhat smaller boundaries than at present. The constitution was ratified, and Nevada admitted into the Union as a State, Oct. 31, 1864. Additions were made to its territory by congressional enactment in 1866.

Governors.

TERRITORY.	
James W. Nye	1861–64
STATE.	
Henry G. Blaisdell	1864–71
Louis R. Bradley	1871–79
John H. Kinkead	1879–83
Jewett D. Adams	1883–87

REVISED BY A. R. SPOFFORD.

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* Reference for location of counties. See map of Nevada, in article CALIFORNIA.

† Now part of Washoe county.

Nevada, on R. R., cap. of Story co., Ia. (see map of Iowa, ref. 4–G, for location of county), on the Chicago and North-western R. R., has a soap-factory, a steam flouring-mill and elevator. The State Agricultural College is located 9 miles W. Principal business, stock and corn raising. Pop. in 1870, 982; in 1880, 1541.

Nevada, R. R. junction, cap. of Vernon co., Mo. (see map of Missouri, ref. 6–E, for location of county), 90 miles S. W. of Sedalia, has some manufactures. Pop. in 1880, 1913.

Nevada City, on R. R., cap. of Nevada co., Cal. (see map of California, ref. 3–B, for location of county), 16 miles from the Central Pacific R. R., with which it is connected by a branch track, has good school advantages, and numerous quartz-mills in constant operation. The climate is unsurpassed. Pop. in 1880, 4022.

Nevers', town of France, capital of the department of Nièvre, stands on the Loire, here crossed by an elegant stone bridge of twenty arches. The town is old and ill built, with narrow, crooked streets, but it has beautiful promenades, extensive manufactures of iron goods, copper ware, chemicals, porcelain, cloth, and linens, and large tanneries, breweries, and cannon-foundries. It contains several good educational institutions—a college, a female seminary, and a polytechnic school. Pop. in 1881, 23,846.

Neviansk', town of European Russia, government of Perm, on the eastern side of the Ural Mountains, is the centre of a very rich mining district, producing gold, copper, platinum, and iron of superior quality. Pop. 20,000.

Nev'in (JOHN WILLIAMSON), D. D., LL.D., b. in Shippensburg, Franklin co., Pa., Feb. 20, 1803; graduated at Union College 1821; studied theology at Princeton Seminary, where he remained as tutor, and wrote his *Biblical Antiquities* (2 vols., 1828). He was professor of Hebrew and biblical literature in the Presbyterian Theological Seminary at Allegheny City (1829–39), where he edited a weekly literary journal entitled *The Friend* (1833–34); became president of the Mercersburg Theological Seminary 1840, and was president also of Marshall College 1841–53. He published in 1843 *The Anxious Bench,* which occasioned much controversy on the subject of revivals; and in 1844 a translation of Dr. Schaff's inaugural address, *The Principle of Protestantism,* which gave rise to what is known as the "Mercersburg theology," of which Dr. Nevin continues to be the chief exponent. Also *The Mystical Presence* (1846), which increased, in its doctrinal aspect, the controversy alluded to: *The History and Genius of the Heidelberg Catechism* (1847), and *Antichrist, or the Spirit of Sect and Schism* (1848). Dr. Nevin edited the *Mercersburg Review* (quarterly, 1849–53); resigned the direction of the Theological Seminary 1851, and the presidency of Marshall College on its removal to Lancaster and consolidation with Franklin College in 1853. He was president of Franklin and Marshall College 1866–76.

Nev'is, one of the Lesser Antilles, in the West Indies, belongs to Great Britain, and comprises an area of 45 square miles, with 11,735 inhabitants. Sugar, molasses, and rum are the chief products; Charlestown is the principal town.

New (JOHN C.), b. in Vernon, Jennings co., Ind., July 6, 1831; graduated at Bethany College, Va., in 1853; began the study of law in Indianapolis, but was never admitted to the bar. He served as State senator and as adjutant-general of Indiana, and subsequently became cashier of the First National Bank of Indianapolis. In the spring of 1875 he was appointed by Pres. Grant U. S. treasurer, and was assistant secretary of the treasury 1882–84.

J. B. BISHOP.

New Al'bany, city, important R. R. centre, port of delivery, and cap. of Floyd co., Ind. (see map of Indiana, ref. 11–F, for location of county), on the Ohio River, 3 miles below Louisville, on the Louisville New Albany and Chicago R. R., and on a branch of the Jeffersonville Madison and Indianapolis R. R., is finely situated, has costly and splendid public buildings, including a court-house, city hall, opera-house, Masonic and Odd Fellows halls, has a fine railroad dépôt, a female college, an excellent fire department, a street railroad, gasworks, market-houses, a large river commerce, and numerous manufacturing establishments supplied with unrivalled water-power from the falls of the Ohio, 2 miles distant. Pop. in 1870, 15,396; in 1880, 16,423.

New Albany, cap. of Union co., Miss. (see map of Mississippi, ref. 4–H, for location of county), 192 miles N. E. of Jackson, has an academy. Incorporated in 1850. Pop. in 1880, 250.

New Am'sterdam, the old name of New York City. The village was called Manhattan until the arrival of Gov. Stuyvesant, in 1647, when it was called New Amsterdam.

On its capitulation, in Sept., 1664, to the English, its name was changed to New York.

New'ark, town of England, in the county of Nottingham, on a navigable branch of the Trent, carries on a very large trade in malt, flour, corn, wool, and cattle. Pop. in 1881, 14,083.

Newark, New Castle co., Del. (see map of Delaware, ref. 2–H, for location of county), on the Philadelphia Wilmington and Baltimore R. R., is the seat of Delaware College and Delaware Agricultural College, and has an academy. Pop. in 1870, 915; in 1880, 1148.

Newark, city, important R. R. centre, and port of entry, cap. of Essex co., N. J. (see map of New Jersey, ref. 2–D, for location of county), on the Passaic River, 9 miles from New York City, with which it is connected by five different railroads. The city has an abundant supply of water (taken from the Passaic River above tide-water), and many churches, schools, and public institutions, a paid fire department, electric lights, and an electric fire-alarm telegraph. Its municipal government consists of a mayor, a common council (one-half of which are elected annually), an educational board, water and tax commissioners, and an excise board. There are a number of handsome and costly public buildings.

Its manufactures represent an extensive industry, embracing hats, carriages, jewelry, leather, saddlery, harness, brass and iron castings, thread, springs, and axles. The census of 1880 reported 1319 manufactories; capital, $25,679,885; average number of hands employed, 30,046; wages paid during the year, $13,171,339; value of products, $69,252,705. The streets are paved with Telford granite and round stones, and the drives, especially to Lewellyn Park, 4 miles distant, are interesting. Pop. in 1870, 105,059; in 1880, 136,508; in 1885, 152,988.

O. Woodruff, Associate Ed. "Daily Advertiser."

Newark, R. R. centre, Wayne co., N. Y. (see map of New York, ref. 4–E, for location of county), situated on the Erie Canal and the New York Central and Hudson River, the Northern Central, and the New York West Shore and Buffalo R. Rs., has a German college, an academy and union school, furnaces, a glove-factory, canned-fruit factory, several tanneries, malt-houses, flouring-mills and planing-mills. Pop. in 1870, 2248; in 1880, 2450.

Newark, city and R. R. centre, cap. of Licking co., O. (see map of Ohio, ref. 5–F, for location of county), on the Licking River, the Ohio and Erie Canal, the Baltimore and Ohio and the Pittsburg Cincinnati and St. Louis R. Rs., 33 miles N. E. of Columbus, well built and well situated in the midst of a fertile agricultural region, near extensive coal-fields, has a graded school system, important manufactures, and a flourishing trade, chiefly in coal, grain, and live-stock. Pop. in 1870, 6698; in 1880, 9600.

Neway'go, cap. of Newaygo co., Mich. (see map of Michigan, ref. 6–H, for location of county), on the Newaygo Division of the Chicago and W. Michigan R. R., has excellent schools, saw- and shingle-mills, sash-factory, and flouring-mill; it has the best water-power in the State. Pop. in 1870, 703; in 1880, 1097.

New Bed'ford, city and important R. R. centre, one of the capitals of Bristol co., Mass. (see map of Massachusetts, ref. 5–I, for location of county), 55 miles S. of Boston, in lat. 41° 38′ N., lon. 70° 55′ W., and on the Acushnet River. It was formerly the chief seat of the American whale fishery; has a Friends' academy, a domestic missionary society, St. Joseph's Hospital, an orphan asylum, a free public library of 30,000 vols., a paid fire department with steam fire-engines, an electric fire-alarm telegraph, and a street railway. The city is supplied with water and gas, and has railroad connection with Boston by two routes, and a line of propellers to New York.

Manufactures.—The census of 1880 reports 330 manufactories; capital, $7,681,082; average number of hands employed, 5812; wages paid during the year, $2,058,751; value of products, $9,835,955. Its industries include a cotton-mill, print cloth-works, an iron-foundry, copper-sheathing works, gas, cordage, twist drills, Prussian blue, paraffine candles, oil and candle works, shoe-factories, manufacturing photographic establishments, glass-works, tannery, flour-mills, paint-works, etc. Pop. in 1870, 21,320; in 1880, 26,845; in 1885, 33,393.

Newbern, v., cap. of Pulaski co., Va. (see map of Virginia, ref. 7–D, for location of county), on the Norfolk and Western R. R., in the "blue-grass" district of S. W. Virginia. Pop. in 1880, 212.

Newberne, city, on R. R., cap. of Craven co., N. C. (see map of North Carolina, ref. 4–J, for location of county), 90 miles from Hatteras Inlet, was settled by the Swiss in 1710, and contains a free academy, tobacco-factories, several lumber-mills and turpentine distilleries. It is a port of entry, the custom-house for Pamlico district being located here. A large traffic in early vegetables for the Northern markets is carried on. Pop. in 1870, 5849; in 1880, 6443.

Newberry (C. H.), R. R. junction, cap. of Newberry co., S. C. (see map of South Carolina, ref. 5–D, for location of county), 47 m. N. W. of Columbia, has 2 academies, steam-mills, tanneries, etc. Pop. in 1870, 1891; in 1880, 2342.

Newberry (John Strong), M. D., LL.D., b. Dec. 22, 1822, at Windsor, Conn., of an old and distinguished Puritan family. He graduated from Western Reserve College in 1846, and from Cleveland Medical College in 1848. The years 1849 and 1850 were spent in travel and study in Europe. In 1851 he established himself as a physician in Cleveland, where he soon acquired a large practice. Finding that the cares and duties of his profession left no time for the scientific studies to which he had been devoted from boyhood, in 1855 he accepted an appointment as acting assistant surgeon in the army, and accompanied as surgeon and geologist the expedition under Lieut. R. S. Williamson, U. S. A., in the exploration of the territory lying between San Francisco and the Columbia River. In 1857–58 he was attached, in the same capacity, to the expedition under Lieut. J. C. Ives, U. S. A., which made the first exploration of the Colorado River, the most interesting and important of the surveys of our Western territory. In 1859, Dr. Newberry accompanied Capt. J. N. Macomb, U. S. Engineers, in the exploration of the country bordering the upper Colorado and San Juan rivers. During the war, Dr. Newberry was a member of the U. S. Sanitary Commission, and to him was delegated the organization and direction of all its operations in the valley of the Mississippi. In 1866, Dr. Newberry was appointed professor of geology in the School of Mines, Columbia College, New York—a position which he still holds. In 1869 the geological survey of Ohio was organized, and he was placed at its head. Under his direction the work has been vigorously prosecuted to completion, and several vols. of the final report, embodying much new and interesting scientific material, have been published. Dr. Newberry has been honored with membership in most of the learned societies of this country and in many of Europe; was one of the original corporators of the National Academy of Sciences; has held the office of president of the American Association, and is now president of the New York Academy of Sciences. The publications of Prof. Newberry have been numerous and valuable. They are chiefly in the departments of geology and palæontology, but also include papers on botany and zoology. The most important are —a report *On the Geology, Botany, and Zoology of Northern California and Oregon* (4to, pp. 300, pl. 48), *The Geology of the Colorado Expedition* (4to, pp. 148, 1860), *Geology of the San Juan Expedition* (4to, pp. 200, 1875), *The U. S. Sanitary Commission in the Valley of the Mississippi* (8vo, pp. 536, 1871), *Reports of the Geological Survey of Ohio*, *Our Later Extinct Floras* (1869), *Catalogue of the Plants of Ohio* (1860), *Fossil Plants collected on the N. W. Boundary Commission* (1863), *The Rock Oils of Ohio* (1859), *Fossil Plants from Chinese Coal-bearing Rocks* (1865), *Circles of Depositions in American Sedimentary Rocks* (1873), *Iron Resources of the U. S.* (1874), *Surface Geology of Ohio* (1874), *The Structure and Relations of Dinichthys* (1875), etc.

New Bloomfield, cap. of Perry co., Pa. (see map of Pennsylvania, ref. 5–F, for location of county), has foundry, carriage-manufactory, etc. Pop. in 1870, 655; in 1880, 673.

New Braun'fels, cap. of Comal co., Tex. (see map of Texas, ref. 5–H, for location of county), on R. R. and the Comal River, has an academy, wool manufactory, flour-mills, carriage-shops, etc. Pop. in 1870, 2261; in 1880, 1938, mostly German.

New Brigh'ton, Castleton tp., Richmond co., N. Y. (see map of New York, ref. 8–A, for location of county), on Staten Island, also containing West New Brighton P. O. It has a paper-hanging factory, a fancy dyeing establishment, a silk-printing factory, and a dyeing and printing establishment, probably the largest in the U. S. Here are the "Sailor's Snug Harbor" for aged mariners and an institution for destitute children of seamen; the first-mentioned institution was founded in 1801, has very extensive buildings, 160 acres of land, and a large revenue. There are many fine residences of New York business-men in the village. Pop. in 1870, 7495; in 1880, 12,679.

New Brighton, Beaver co., Pa. (see map of Pennsylvania, ref. 4–A, for location of county), on Beaver River, 29 miles N. N. W. of Pittsburg, on the Pittsburg Fort Wayne and Chicago R. R., has one of the best water-powers in the U. S., a public library, extensive chain-manufactory, a woollen and a twine factory, a lead-keg factory, a pottery, machine-shops and foundries, flouring-mills and a planing-mill, a moulding-factory, an extensive greenhouse, etc. Pop. in 1870, 4037; in 1880, 3653.

New Brit'ain, a group of islands in the Pacific Ocean, lying E. of New Guinea, between lat. 4° and 6° 30′ S., and between lon. 148° and 152° 30′ E. The group consists of several small islands and one large one, named New Britain, and comprising an area of about 10,000 square miles. They are all mountainous and contain active volcanoes, but fertile, covered with forests, and producing palms, sugar-cane, and bread-fruit trees. They are inhabited by a tribe of Papuans of very dark complexion, in a somewhat more advanced state of civilization than the Polynesian tribes generally. The islands were first visited by Dampier in 1616. The Duke of York group of islands, area about 40 square miles, between the islands of New Britain and New Ireland, formerly belonged to New Britain, but are now called Bismarck Archipelago, and are occupied by Germany.

New Britain, city and R. R. centre, Hartford co., Conn. (see map of Connecticut, ref. 4–D, for location of county), 9 miles S. W. of Hartford, on the New York and New England R. R., has a public library of 4000 vols., a park containing 74 acres, the State Normal School, gas- and water-works, manufactories of iron, brass, and compressed bronze castings, builders' hardware, cutlery, hosiery, joiners' tools, white lead, etc. Pop. of tp., including city, in 1870, 9480; in 1880, 13,979, including 11,800 in city.

New Bruns'wick [named in honor of the house of Brunswick, the present royal family of Great Britain], a province of the Dominion of Canada, British North America, bounded on the N. by the province of Quebec and the Bay of Chaleurs, on the E. by the Gulf of St. Lawrence, Northumberland Strait, and the Bay of Fundy, on the S. by the Bay of Fundy, and on the W. by the State of Maine. It lies between 44° 30′ and 48° 5′ N. lat. and 63° 47′ and 69° 5′ W. lon.; area, 27,037 square miles.

Surface.—New Brunswick has been described as a "flat sandstone plain." There are, however, ranges of hills in various parts, sometimes high enough to be called mountains. W. of the river St. John, along the coast, the country is in some places arable, but in others hopelessly barren. (*Report of Geological Survey of Canada,* 1870–71.) N. of this there is a range of hills which supports some inhabitants. Still farther N. there is a rather level plateau containing extensive peat-swamps. This region has some excellent soil and is well peopled. E. of the St. John the surface is more broken and the coast is bold. The isthmus that joins Nova Scotia to this province is only 13½ miles across, and is quite low and level. N. of the isthmus the coast abounds in good harbors. The highlands of Eastern New Brunswick have occasional bodies of heavy timber-growth, but the soil is generally thin; the valleys, however, are remarkably fertile. Notwithstanding the great extent of comparatively worthless land, New Brunswick is an important agricultural province. It is well watered, and produces excellent crops of wheat, oats, barley, buckwheat, fruit, potatoes, root-crops, peas, and especially hay. The forests contain great quantities of pine, spruce, fir, hemlock, cedar, larch, ash, beech, birch, maple, and other valuable trees.

Geology.—Two-thirds of the surface of New Brunswick, including the part nearest Nova Scotia, is of the Carboniferous formation. The strata are very flat, and the coal is near the surface, but the coal-seam is thin, and is only wrought at one point, near Grand Lake in Queen's co., where the seam is twenty-two inches thick and yields a good quality of bituminous coking coal. Albert co. has, however, a valuable and very remarkable product known as albertite coal, which is not a true coal, but a solidified asphalt, and is the richest gas-producing substance yet found. It yields about 57 per cent. of very valuable illuminating gas—14,500 cubic feet per ton, or its equivalent, 100 gallons of crude distilled oil. It leaves an excellent coke. It is mined chiefly at Hillsborough on the Petitcodiac River, near the head of the Bay of Fundy. (It is also found at points in Ritchie co., West Va., and in Colorado, always occurring in veins, and never in beds like true coal.) It is a beautiful substance, and leaves but little ash. It is exported in large quantities. Carleton co. affords excellent iron and manganese. Plumbago, copper, and lead are found. Limestone, gypsum, sandstone, marble, and roofing-slate are extremely abundant, and some of them are quite extensively wrought. The salt-springs, bituminous shales, and various mineral waters have a prospective rather than a present value. Freestone of great beauty is quarried and sold extensively in the U. S.

Zoology.—New Brunswick abounds in wild animals. Bears, wolves, deer, moose, caribou, wolverenes, lynxes, and various other game and fur animals are found. Ducks, geese, grouse, and a great variety of seafowl are abundant. The smaller birds are in general much the same as those of Northern New England. Among the sea-fish may be mentioned the cod, herring, mackerel, haddock, hake, lobster, bass, and smelt, while trout and salmon are very numerous in the fresh waters. The Bay of Fundy abounds in the lower forms of animal life, and is a favorite dredging-ground for naturalists.

Waters.—The bays of Fundy, Verte, Chaleurs, and Miramichi are remarkable for their excellence as fishing-grounds, and the first mentioned no less so for its marvellously high tides. The rivers St. Croix, St. John, Petitcodiac, Miramichi, and Restigouche are all navigable to a greater or less extent, and most of them in their lower courses are noble salmon-streams. They are all very useful in floating down timber, and many streams have falls and rapids which furnish unfailing water-power. The more important bays and rivers are described under their alphabetical heads.

The *climate* is much like that of Maine, but much more foggy and moist, especially along the Bay of Fundy. The climatological reports of the director of the magnetic observatory at Toronto furnish excellent means of comparison of the ranges of temperature and of the rainfall in New Brunswick with those of Ontario and Quebec. By this it appears that while its summers are much cooler than those of Canada in general, its winter temperature is not nearly as low as that of Quebec and Montreal. The rainfall is much greater than in any other part of the Dominion except Nova Scotia and the Pacific coast.

Public Health.—In general the province is very healthful. Nearly one-third of the mortality is from consumption. Pneumonia, bronchitis, throat diseases, influenza, and rheumatism are the next diseases in prevalence. Skin diseases abound, especially among the inhabitants of French descent, and the excessive use of buckwheat as food is the cause popularly assigned. Leprosy has also its victims, and for these the government has a lazaretto at Tracadie.

Internal Improvements.—Among these may be enumerated the European and North American Railway, from St. John to Bangor, Me., of which 91 miles are in New Brunswick; the Fredericton Railway to the last-named road is 22 miles long; the New Brunswick and Canada Railway, from St. Andrews to Woodstock and to Houlton, Me., having with its branches over 113 miles of track in this province; the Intercolonial Railway, from St. John to Halifax, N. S., has in this province a total of over 330 miles completed. The work of extending this road through to the N. part of the province, to connect with the Grand Trunk system, has been completed in spite of many obstacles. St. John has street railways running to its principal suburbs. Horse railways are seen in the mining districts, and carry the products in some instances to tide-water directly from the mines. The provincial and Dominion governments make handsome appropriations for the construction and repair of roads, bridges, and river and harbor improvements. In this connection notice should be taken of the laudable measures passed by the legislature to preserve the fisheries, game, and forests of the province. There are great areas of crown-lands which the government sells to actual settlers on the most liberal terms. The Canadian canal commission recommend the construction of a canal from Bay Verte to the Bay of Fundy, 15¼ miles long, 40 feet wide, and 15 feet deep, to cost $3,250,000. This would save 600 miles of dangerous navigation for vessels going from St. John to the Gulf of St. Lawrence.

Industries.—This article has already incidentally indicated the more important industries—the collection and manufacture of lumber and other forest products, the fisheries, agriculture, and mining of coal, building-stone, and ores. There are also some manufactures of woollens, leather, iron, oils, etc. The building of ships is also an important pursuit. On Dec. 31, 1882, New Brunswick's registered shipping amounted to 1064 vessels, tonnage, 308,961. Commercial pursuits are quite important. The rearing of domestic animals is an important industry. The fisheries in 1881 employed 7315 men, 205 vessels, and 4284 boats.

The *government* of the province consists of a lieutenant-governor, a council of 9, consisting of a president, an attorney-general, a secretary, a surveyor-general, a chief commissioner of the board of works, and four councillors; the legislature consists of 18 members of a legislative council or upper house, and 41 members of the house of assembly. There is also a full staff of officers for the administration of the provincial government. New Brunswick sends 10 senators and 16 members of the house of commons to the Canadian Parliament.

Finances.—The receipts of the province are from the Dominion subsidy, from crown-lands, fees, from rates, export and import duties, etc. The chief expenses are for public works, education, benevolent objects, etc. The finances are in a very sound condition. Taxation is merely nominal.

Counties and Population in 1881.—New Brunswick is divided into 14 counties, as follows:

Counties.	Population.
St. John	52,966
Charlotte	26,087
King's	25,617
Queen's	14,017
Sunbury	6,651
York	30,397
Carleton	23,365
Victoria	15,686
Restigouche	7,058
Gloucester	21,614
Northumberland	25,109
Kent	22,618
Westmoreland	37,719
Albert	12,329
Total	321,233

Of the population of New Brunswick, a large percentage is of French descent, coming from the old Acadian stock. Another large proportion of the people are descended from the loyalists or Tories who left the U. S. during and just after the Revolutionary war. There are quite a number of Indians, who are partly civilized, very peaceable, and are mostly Roman Catholics. Of religious denominations, the Roman Catholic has a plurality, but the Anglicans, Baptists, and various branches of the Methodists are influential and numerous. The chief towns are St. John, the largest city, Portland, St. Andrew, Fredericton, the capital, and Woodstock.

Education is liberally provided for by the province and the parishes. The public schools are under a provincial board of education, and the representatives in the federal Parliament have successfully resisted the attempt of certain parties in the Parliament to interfere with the affairs of the provincial schools. The University of New Brunswick is situated at Fredericton, the capital. Mount Allison Wesleyan College at Sackville and a Roman Catholic college near Memramcook are reported to be prosperous. There are several flourishing schools, academies, and seminaries, sustained by denominational and private enterprise. A training school for teachers has been established. There are also common, superior, grammar, and model schools. There were in 1873, 26 newspapers in New Brunswick.

History.—New Brunswick was formerly a part of Acadia, an old colony of France, which included Nova Scotia also. It was first colonized in 1604. At the capture of Quebec it passed into the hands of Great Britain, to which it has always been loyal. Miramichi was settled by Scotch immigrants in 1762. New Brunswick was set off as a province from Nova Scotia in 1784. One of the greatest disasters which ever befell the colony was the great forest-fire of Miramichi in 1825, which burned over 6000 square miles of timber, destroying several fine towns, many vessels, and probably not less than 160 human lives. The first railroad was opened in 1860. New Brunswick entered the Dominion of Canada at its inauguration in 1867.

CHARLES W. GREENE.

New Brunswick, city and R. R. centre, cap. of Middlesex co., N. J. (see map of New Jersey, ref. 4–D, for location of county), in 40° 30′ N. lat. and 74° 30′ W. lon., 30 miles from New York City, on the S. W. bank of the Raritan River, at the head of navigation, at the E. terminus of the Delaware and Raritan Canal, and on the New York division of the Pennsylvania R. R. It is favorably located, the upper portion being well laid out and containing many fine residences. It was chartered as a city Sept. 1, 1784, and is the seat of Rutgers College, with a library of 12,000 volumes, and of a theological seminary, with a library of 5000 volumes, both under the Reformed (Dutch) Church. It has a grammar schools, 2 private classical schools for boys, a seminary for females, several factories of India-rubber goods and of paper hangings; also machine-shops, foundries, and various other manufactures. Pop. in 1870, 15,058; in 1880, 17,166; in 1885, 18,258.

Newburg, city and R. R. centre, one of the capitals of Orange co., N. Y. (see map of New York, ref. 7–I, for location of county), on the W. bank of the Hudson River, 60 miles N. of New York City, in lat. 41° 31′ N., lon. 74° 1′ W., contains a public library, a free academy, grammar schools, a home for the friendless, a hospital and home for aged women, extensive machine-shops, steam-engine manufactories, a cotton and saw mill, a lawn-mower manufactory, a bleachery, shipyard, and various smaller manufacturing interests. The theological seminary of the Associate Reformed Church is located here. The city has connection with New York City by numerous steamboat lines, the New York West Shore and Buffalo R. R., and a branch of the Erie R. R., while on the opposite side of the river the New York Central and Hudson River and the Newburg Duchess and Conn. R. Rs. offer facilities for reaching all points. The old Hasbrouck house, which was occupied by Gen. Washington during the Revolutionary war, at which place the proclamation disbanding the army was promulgated, is located here. Pop. in 1870, 17,014; in 1880, 18,049.

Newburgh, Tenn. See APPENDIX.

New′buryport, a city, R. R. centre, seaport, and one of the capitals of Essex co., Mass. (see map of Massachusetts, ref. 1–I, for location of county), 35 miles N. E. of Boston, on the Eastern R. R., contains the Putnam Free School and several public schools, a public library and free reading-room, several extensive cotton-mills, numerous shoe manufactories, an iron-foundry, a distillery, manufactories of carriages, hats, combs, silver ware, steam-engines, pumps, etc. The city has a horse railway. There are numerous ships, barques, brigs, schooners, and steamboats owned here, and some of the finest ships afloat are launched from its ship-yards. Pop. in 1870, 12,595; in 1880, 13,538; in 1885, 13,716.

New Caledo′nia, an island in the South Pacific Ocean belonging to France, lies between lat. 20° and 22° 30′ S., and between lon. 164° and 167° E. It is 220 miles long and 30 miles broad, high, mountainous, and containing several active volcanoes in the interior, but surrounded by sandbanks and coral-reefs along the coasts. The valleys are fertile; bananas, bread-fruits, cocoanuts, and sugar-canes abound, and the vine grows wild. The inhabitants, numbering about 29,000, consist of different tribes, some of which are very savage. The island has two good harbors, Port Balade and Port St. Vincent.

New Canaan, Conn. See APPENDIX.

Newcas′tle, a port of entry, capital of Northumberland co., New Brunswick, on the left bank of the Miramichi, 30 miles from its mouth. The river is to this point navigable for large ships. Its shipbuilding, lumber-trade, and fisheries are important. Salmon, herring, bass, mackerel, oysters, and lobsters are largely exported. The town is well lighted with gas. Pop. of sub-district in 1881, 4209.

New Castle, city, on R. R., former cap. of New Castle co., Del. (see map of Delaware, ref. 2–H, for location of county), on the Delaware River and on the Philadelphia Wilmington and Baltimore R. R., has a court-house, public library, etc. Pop. in 1870, 1916; in 1880, 3700.

Newcastle, R. R. junction, cap. of Henry co., Ind. (see map of Indiana ref. 6–F, for location of county), 83 miles S. E. of Fort Wayne, has several manufactories. Pop. in 1870, 1556; in 1880, 2299.

New Castle, cap. of Henry co., Ky. (see map of Kentucky, ref. 2–G, for location of county), has a large trade in live-stock. Pop. in 1870, 670; in 1880, 500.

New Castle, city and R. R. centre, cap. of Lawrence co., Pa. (see map of Pennsylvania, ref. 4–A, for location of county), has 2 colleges, an opera-house, numerous blast-furnaces, rolling-mills, foundries, sheet and plate mills, nail-factories, a paper-mill, a window-glass factory, grist and planing mills, breweries, etc. The neighboring hills are rich in deposits of coal, iron-ore, limestone, and fire-clay. Pop. in 1870, 6164; in 1880, 8418.

New Castle, cap. of Craig co., Va. (see map of Virginia, ref. 6–E, for location of county). Pop. in 1870, 199; in 1880, 182.

Newcas′tle-under-Lime, town of England, in the county of Stafford, is a queer old place, with large manufactures of hats and some silk and cotton factories. Its vicinity is celebrated for its pottery. Pop. in 1881, 17,506.

Newcastle-upon-Tyne, city of England, in the county of Northumberland, in lat. 54° 58′ N., lon. 1° 35′ W., on the left bank of the Tyne, 8 miles from its mouth in the German Ocean, opposite Gateshead, on the right bank of the river, which, although belonging to another county, virtually forms a part of it. The city is built on three steep hills, and one of its most prominent features is the double bridge across the Tyne built by Robert Stephenson, and containing a carriage-way 90 feet above the water, by which the precipitous streets on both sides of the river are avoided, and a railway viaduct at a height of 118 feet from the water. The old part of the city has a very antiquated appearance, but since the conflagration in 1854 most of the city has been rebuilt in a modern and elegant style. St. Nicholas church, in the Decorated style, is a very fine structure; also the Moot Hall, the dépôt, etc. The various scientific, educational, and benevolent institutions also occupy handsome buildings, and several streets are lined from one end to the other with magnificent mansions. The principal branch of the manufacturing industry is iron. Since the discovery of the Cleveland ironstone, 600,000 tons of iron are annually produced by the furnaces of Newcastle, and 3000 tons of steel. The Elswick iron-works, for the manufacture of guns, shot, shell, iron bridges, and armor for iron-clad ships, cover an area of 11 acres. Lead and copper are also produced. Next to the iron industry ranks the shipbuilding, especially iron vessels; then come the manufactures of earthenware, fire-brick, cement, glass, paper, leather, etc. The principal article of trade is coal. More than 60,000 men are employed in the adjacent collieries, and 22,000,000 tons of coal are annually raised; it is shipped mainly to Hamburg, the Baltic, and the Mediterranean. In the time of the Romans the city formed a stationary camp, *Pons Ælii*, one of the forts along the line of the Wall of Hadrian. After the withdrawal of the Romans the city was for a long time occupied by a colony of monks, and was called *Monkchester*. Robert of Normandy, a son of William the Conqueror, built a castle here, whence the present name of the city. It soon became widely known for its exports of coal and lead. Pop. in 1881, 145,228.

New City, cap. of Rockland co., N. Y. (see map of New York, ref. 8–J, for location of county), on New Jersey and New York R. R., 35 miles N. of New York City. Pop. in 1880, 270.

Newcomb (Harvey), D. D., b. at Thetford, Vt., Sept. 2, 1803; was for eight years teacher at Alfred, N. Y.; edited the *Western Star* at Westfield, N. Y., 1826–28, the Buffalo *Patriot* 1828–30, and the Pittsburg *Christian Herald* 1830–31: was for several years in the employ of the American Sunday-School Union, engaged in preparing or editing works suitable for juvenile readers; was licensed to preach in 1840; became pastor of Congregational churches in Roxbury, Needham, and Grantville; was one of the editors of the Boston *Traveller* 1849, and of the New York *Observer* 1850–51; was for many years a regular contributor to the Boston *Recorder*, the *Youth's Companion*, and other religious papers; wrote 178 volumes, mostly for children, of which the most important was the *Cyclopædia of Missions* (1855). In his later years he preached for a time at the Park street mission church, Brooklyn, N. Y., and at Hancock, Pa. D. at Brooklyn Aug. 30, 1863. (See *Congregational Quarterly*, Oct., 1863.) R. D. Hitchcock.

Newcomb (Simon), LL.D., F. R. A. S., b. at Wallace, N. S., Mar. 12, 1835; came to the U. S. in childhood; taught school in Maryland for several years, and displayed so great a talent for mathematics as to be employed as a computer on the *Nautical Almanac* for 1857. In the following year he first gave special attention to theoretical astronomy; was appointed in 1861 professor of mathematics in the navy, and stationed at the Naval Observatory, for which he supervised the construction and erection of the great telescope; was secretary and chief director of the commission created by Congress in 1871 for the observation of the transit of Venus, Dec. 9, 1874, and organized the numerous expeditions sent to remote quarters of the earth upon that occasion. Prof. Newcomb was chosen in 1872 a foreign associate of the Royal Astronomical Society of England, which in 1874 awarded to him a gold medal for his tables of Uranus and Neptune. He has published a number of astronomical memoirs, written *A Critical Examination of the Financial Policy during the Southern Rebellion* (1865), *Popular Astronomy* (1878), *Principles of Political Economy* (1885), and is prof. of mathematics in Johns Hopkins University, Md.

New'come (William), D. D., b. at Abingdon, Berkshire, Eng., Apr. 10, 1729; was educated at Oxford; was successively bishop of Dromore, Ossory, and Waterford, and became archbishop of Armagh 1795. D. at Dublin Jan. 11, 1800. Among his works were *The Harmony of the Gospels* (1778) and a *New Critical Version of the Twelve Minor Prophets and Ezekiel* (1785–88).

New'comerstown, Tuscarawas co., O. (see map of Ohio, ref. 4–H, for location of county), at the junction of the Pittsburg Cincinnati and St. Louis and the Cleveland and Marietta R. Rs., has a Lutheran college, several large flouring-mills, extensive blast-furnaces, etc. Pop. in 1870, 791; in 1880, 926.

New'digate (Sir Roger), Bart., b. at Arbury, Warwickshire, England, May 30, 1719; educated at Westminster School and University College, Oxford; sat in the House of Commons for Middlesex 1751–80: d. Nov. 25, 1806, leaving liberal bequests to the University of Oxford for founding annual "Newdigate prizes" for the best English verses on subjects connected with sculpture, painting, and architecture.

New Dungeness', cap. of Clallam co., Wash. (see map of Washington Territory, ref. 3–A, for location of county), on the Strait of San Juan de Fuca, at the mouth of the Dungeness River. Pop. not in census.

New Ed'inburgh, post-v. of Carleton co., Ontario, Canada, is an important suburb of Ottawa, from which it is separated by the river Rideau, here crossed by a suspension bridge, over which the street-cars pass. It has a beautiful park, and contains the fine cataract of the Rideau, which affords a great water-power. There are many manufactories. The village contains Rideau Hall, the residence of the governor-general.

Newell (Robert Henry), b. in New York City Dec. 13, 1836; received a liberal education; was for a time engaged in mercantile life; was in 1858–63 literary editor of the New York *Mercury*, to which he contributed a series of sketches signed "Orpheus C. Kerr" (*i. e.* office-seeker), which procured him some note as a humorist, and were republished in 4 vols. He removed to California in 1863; has published several volumes of prose and verse; was one of the editors of the New York *World* 1869–74, and afterward became editor of *Hearth and Home*, a weekly literary journal.

Newell (Samuel), b. at Durham, Me., July 24, 1784; graduated at Harvard in 1807; studied theology at Andover Seminary; was one of the signers of the memorandum (dated June 27, 1810) from students of that institution which led to the formation of the American Board of Commissioners for Foreign Missions; was ordained as a foreign missionary at Salem with four associates Feb. 5, 1812; sailed for Calcutta with Judson; in the same month was ordered to retire by the English authorities of Bengal; went to the Isle of France, thence to Ceylon, and settled at Bombay in 1817, where he wrote, with his companion missionary, Gordon Hall, a work entitled *The Conversion of the World, or the Claims of Six Hundred Millions* (Andover, 1818), which had an extensive circulation, and prepared a memoir of his young wife, Harriet (Atwood) Newell, who d. at the Isle of France Nov. 30, 1812, at the age of nineteen years—a work which had a wide popularity, and was translated into several languages. Mr. Newell d. at Bombay Mar. 30, 1821.

Newell (William A.), M. D., b. in Ohio; graduated at Rutgers College 1836; was in Congress from New Jersey 1847–51 and 1865–67; governor of New Jersey 1857–60.

New England, comprising the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut, was originally called North Virginia, when granted in 1606 by James I. to the Plymouth Company for colonization, but received subsequently its present name from Capt. John Smith, who explored it in 1614, and made a map of the coast.

Newfane, cap. of Windham co., Vt. (see map of Vermont, ref. 9–C, for location of county), on Brattleboro' and Whitehall division of Central Vermont R. R., 13 miles N. W. of Brattleboro'. Pop. of tp. in 1870, 1113; in 1880, 1031.

Newfoundland. The island of Newfoundland, one of the colonial possessions of Great Britain in North America, lies across the entrance of the Gulf of St. Lawrence, to which it affords access at its northern and southern extremities. According to the latest and most accurate surveys, it is situated between the parallels of 46° 36′ 50″ and 51° 39′ N. lat., and between the meridians of 52° 37′ and 59° 24′ 50″ W. lon. Its greatest length from Cape Ray (the south-western extremity of the island) to Cape Norman (the farthest northern land) is 317 miles, and the greatest breadth from Cape Spear (the most easterly point) to Cape Anguille (the most westerly) is 316 miles. The total area is 42,000 square miles. It is thus more than one-sixth larger than Ireland, and ranks as the tenth largest island of the globe. Its triangular-shaped coast is 1000 miles round, measuring from headland to headland; but so deeply indented are its shores with numerous noble bays that if these were circumnavigated the operation would more than double that extent of coast-line. It is that part of the American land which lies nearest to Europe, the distance between the most eastern part of Newfoundland and Valentia, in Ireland, being 1640 miles. By the two great bays of Trinity and Placentia, which are on opposite sides of the island, it is almost severed into two portions, the southern being the large peninsula of Avalon, on which St. Johns, the capital, is situated, and which is united to the northern by a narrow isthmus in one place only 3 miles in width. The Avalon peninsula is further divided by the bays of St. Mary and Conception; and having thus an extensive frontage on the Atlantic and numerous harbors, and being in proximity to the best fishing-grounds, it is the most thickly populated portion of the island. On all sides the great arms of the Atlantic penetrate far into the land, some of the bays being 90 miles in length, thus more than compensating for the want of large navigable rivers, and carrying the finny tribes far inland within reach of the fisherman. Within a degree of the eastern coast is the Great Bank of Newfoundland—the greatest submarine island of the globe, 600 miles in length and 200 in breadth—the chief breeding-ground of the cod. The whole Atlantic coast of Labrador, 1100 miles in extent, with its valuable fisheries, is also attached to Newfoundland and under the jurisdiction of the colony. Thus Nature has marked out the island as one of the great fishing-centres of the world. Around its shores are countless small submarine elevations where at certain seasons the cod and other fish congregate in vast shoals, and have been fished for centuries without any apparent diminution of their numbers.

Climate.—Erroneous ideas regarding the climate have been widely prevalent. It has been currently believed that in summer the island is almost perpetually enveloped in fogs, and that in winter intense cold and snow-storms prevail. In reality, however, the fogs generated on the Banks by the confluence of the Arctic current and the Gulf Stream are felt only on the southern and the south-eastern shores of the island when southerly winds prevail. The fog seldom penetrates far inland, on the western and north-eastern shores is but little felt, and is almost unknown in the interior. Taken as a whole, the climate is more temperate and more favorable to health than that of the neighboring continent. The fierce summer heats of Canada and the U. S. are unknown, and in winter the thermometer seldom sinks more than a few degrees below zero, and that for but a few hours. The summer range of the thermometer is from 70° to 80°, and it is but seldom that 84° is reached. Like all insular climates, that of Newfoundland is variable and subject to sudden changes. The Arctic current, which washes the eastern shores, exerts a chilling influence, especially in spring, but brings with it, by way of compensation, the seal, the cod, the herring, and other fishes which have their *habitat* in cold water. The robust, healthy appearance of the people sufficiently evidences the salubrity of the climate. The average mean temperature is 41–42°. Open fireplaces are sufficient to warm the houses in winter, and free exercise in the open air is attainable throughout. The average rainfall is 58.30 inches. Tornadoes are unknown and thunder-storms very rare. There is nothing in the climate to interfere with agricultural operations.

Bays, Rivers, Lakes.—The largest bay is Placentia, 55 miles wide at the entrance and 90 miles in length. It has numerous islands, which give it a very picturesque appearance. Its fisheries of cod, salmon, and herrings are very valuable. The town of Placentia, on a magnificent harbor, is possessed of historic interest, having been originally founded by the French and held by them for a considerable time. Fortune Bay, 25 miles wide and 70 in length, is the seat of a valuable herring-fishery. At its mouth are the islands of St. Pierre and Miquelon, ceded by treaty to France as a shelter for its fishermen. Bay St. George, on the western coast, is 40 miles wide, with a good harbor at its head. Around its shores are many fertile valleys, forests of valuable timber, and an extensive coal-field. Bay of Islands is the seat of a valuable winter herring-fishery. Notre Dame Bay, on the north-eastern coast, is 50 miles wide at its mouth, and with its numerous arms penetrates more than 80 miles inland. On its shores are the now famous copper-mines. Bonavista Bay presents some of the finest scenery in the island, and has extensive tracts of good land on its shores. Trinity Bay runs 70 miles inland. The harbor on which the town of Trinity stands is one of the finest in the world. On the S. side of the bay is Heart's Content, where the Atlantic cables are landed. Conception Bay is the most populous and commercially important, having 41,000 inhabitants along its shores. Its scenery is greatly admired.

The three largest rivers are the Exploits, the Humber, and the Gander. The Exploits rises in the south-western angle of the island, flows in a north-easterly direction, and falls into the Bay of Exploits after a course of more than 200 miles. It drains an area of nearly 4000 square miles. The Humber drains an area of 2000 square miles and falls into the Bay of Islands. The Gander falls into Gander Bay, and drains an area of 2500 square miles.

One of the most remarkable physical features of the island is the immense number of lakes and ponds, which cover nearly a third of the entire surface. They are nearly all stocked with trout. In many districts they form a very beautiful feature in the landscape. The largest is Grand Lake, 56 miles in length, with an area of 192 square miles and enclosing an island 22 miles long and 5 miles in breadth. Red Indian Lake is 37 miles long, with an area of 64 square miles. Gander Lake is 33 miles in length.

Mountains.—The coasts present, for the most part, a forbidding aspect. Dark cliffs, miles on miles of rocky walls from 200 to 300 feet in height, bold promontories and headlands, greet the voyager at almost all parts of the island. But when the bays are entered, scenes of rare beauty are frequently met with. On passing from the rugged coastline to the outer interior a hilly country presents itself, with eminences of no great elevation. The interior proper, which is yet but imperfectly known, consists of an elevated, undulating plateau traversed here and there by ranges of low hills, the surface being diversified by valleys, woods, and lakes. Much of the interior is a savanna country, the soil being a fine black peat-mould sustaining countless herds of reindeer. All the great hill-ranges take a north-easterly and south-westerly direction. The principal of these is the Long Range, which extends along the western side of the island for nearly its entire length, having peaks more than 2000 feet in height. Parallel to this is the Anguille Range. The Middle Range stretches across the country from Fortune Bay to Notre Dame Bay. Avalon district is traversed by several ranges of hills. In addition, the country is remarkable for a number of isolated and sharply-peaked summits having the local name of "tolts."

Land and Forests.—Until a comparatively recent period the belief was almost universal that the greater part of the island was hopelessly barren, and that the climate presented insurmountable obstacles to agriculture. The geological survey, commenced in 1864 and still continued, has dissipated these false impressions, and has proved that, while there are districts irreclaimably barren, especially near the southern and south-eastern shores, there are extensive fertile belts which if cultivated would sustain a very large population in comfort. The survey has also revealed the existence of very large and valuable forests of pine and other timber. In the region around St. George's Bay there are 730 square miles suitable for settlement. Bay of Islands, including the Deer Lake and Grand Lake country, contains 600 square miles suitable for settlement. The valley of the Gander has 1700 square miles of good land, and the Exploits valley 1620 square miles more or less available for settlement. Thus in these great valleys alone there are 4650 square miles, or 2,976,000 acres, fit for agricultural purposes and capable of sustaining a numerous population. But, in addition, there are less extensive tracts of fertile land in various localities fit for agricultural purposes, and also extensive areas admirably suited for cattle- and sheep-raising, forming an area of 2,000,000 acres. Thus there are known to be close on 5,000,000 acres fit for agricultural and grazing purposes. Of this, only 34,293 acres are under culture, the value of the annual produce being about $612,350. Hitherto the fisheries have absorbed the attention of the population, and the culture of the land has been neglected to a large extent.

In regard to forest wealth and lumbering capabilities, the island holds an important place. The forests are chiefly found in the valleys of the large rivers and along the banks of their tributaries. The principal varieties of the forest-timbers are white pine, white and black spruce, tamarack, fir, yellow and white birch. The geological report estimates the area of pine-forests in the valley of the Gander alone at 850 square miles. In the Exploits valley, the Humber and Gambo valleys, there are also considerable areas of pine-forests.

Minerals.—The first copper-mine—that of Tilt Cove—was opened in 1864, on the shore of Notre Dame Bay. Up to 1879 it yielded 50,000 tons of copper-ore, valued at $1,572,154, and nickel-ore worth $32,740. Another still more productive mine was opened in 1875 at Betts Cove, in the same district, and in 1878 a third, at Little Bay, which has eclipsed both its predecessors. Up to 1879 the total export of copper- and nickel-ore amounted in value to $4,629,889. A rich deposit of lead-ore has been discovered at Port-a-Port, and lead and silver deposits on the shores of Placentia Bay. Gold has been found in small quantities. Gypsum in immense developments is found on the western coast, also marble of various shades of color. There is a coal-field in St. George's Bay 25 miles wide by 10 miles in length. It is still unworked.

Geology.—Mr. Alexander Murray, C. M. G., F. G. S., an experienced geologist, conducted the geological survey from 1864 until a recent date, when ill-health compelled him to resign. Mr. James Howley was for many years his assistant. The various reports of the survey show that all the great ancient rock-systems between the Lower Laurentian and the coal-measures are more or less represented at one part or another of the island. The Laurentian system has an immense spread, constituting the principal mountain-ranges and coming to the surface through the more recent deposits or brought up by great dislocations. Three-fourths of the peninsula of Avalon are Huronian (equivalent to the Cambrian of English geologists). Lower Silurian rocks have a large development, and in these the metallic ores occur. The Carboniferous series occupy a large area in the neighborhood of St. George's Bay and Grand Lake.

Fisheries.—The fisheries constitute the grand staple industry on which the people are mainly dependent. By far the most important of these is the cod-fishery, which is prosecuted around the shores of the island, along the coast of Labrador, and to a limited extent on the Banks. The average annual value of this fishery is about $6,250,000. It is prosecuted from the 1st of June till the middle of October. The bait used are herrings, caplin, and squids, which at stated seasons visit the coast in immense shoals. The codfish when salted and dried are exported to Brazil, the West Indies, Spain, Portugal, Italy, and Britain. The average quantity annually exported is about 1,250,000 quintals of 112 pounds each. The seal-fishery is next in value. It is carried on in powerful steamers and stout sailing-vessels from the 1st of March till the middle of April. The young seals are taken on the icefields brought down by the Arctic current, where they are suckled by the mothers till three or four weeks old, when they are in the best condition. The hunters kill them by a blow on the head and bring away the skins with the fat adhering, leaving the carcases on the ice. The fat is manufactured into oil; the skins are salted for exportation. The number of seals taken varies greatly from year to year, ranging from 300,000 to 550,000. The average annual value for the last three years has been $1,026,896. The chief seats of the herring-fishery are Labrador, Bonne Bay, Bay of Islands, St. George's Bay, and Fortune Bay. Its average value in the last three years was $581,543. The salmon-fishery averages in value $114,505; the lobster-fishery, $104,000. The total average value of the whole fisheries may be reckoned at $8,000,000.

Population.—The seats of population are all situated on the various bays and harbors, there being no settlement at any distance from the seacoast. The earliest record of the resident population is that of 1654, which gives the number as 1750. In 1698 it amounted to 2640; in 1763, to 7000; in 1804, to 20,380; in 1836, to 75,094; in 1845, to 98,703; in 1857, to 124,288; in 1874, when the last census was taken, to 161,374. The new census, commenced at the close of 1884, which is to be completed in 1885, will probably give about 185,000 as the population. Of these about 54,000 are engaged in catching and curing fish, the number of able-bodied fishermen being about 30,000.

Religious Denominations.—The census of 1874 gave the number of the various religious denominations in Newfoundland as follows:

Church of Rome	64,317
Church of England	59,561
Wesleyans	35,702
Presbyterians	1,168
Congregationalists	461
Baptists and others	165

The Protestants are descendants of settlers from England; the Roman Catholics are of Irish extraction.

Government.—Since 1855 the colony has enjoyed the benefits of "responsible government;" so that the people are ruled according to their own wishes as expressed in the selection of their representatives in the legislature. The government consists of a governor, who is appointed by the Crown of England; a legislative council or upper chamber, composed of 15 members nominated by the governor in council and holding office for life; and a house of assembly of 33 members, elected every four years by the votes of the people, each householder having a vote. The executive council consists of 7 members chosen by the party commanding a majority in the legislature. The island is divided into 17 electoral districts.

Revenue.—The revenue is mainly derived from import duties. The prosperity of the colony may be inferred from the fact that the revenue has more than doubled within the last twenty years. In 1883 it amounted to $1,369,909, and now amply covers the expenditure. The *per capita* taxation is $4.94. The public debt is $1,351,000, but this is in course of extinction by a sinking fund; so that in a limited number of years it will be removed. The annual value of the exports is $8,200,000; of the imports, $6,863,708. The registered tonnage of the colony is 1895 vessels, of which 29 are steamers, the tonnage being 89,655 tons.

Education.—Education is conducted on the denominational principle, the annual legislative grant being $93,952, which is divided among the religious bodies in proportion to their respective numbers. There are 416 elementary schools, 4 academies, and 2 grammar schools. In the elementary schools there are 24,292 pupils; in the academies, 674.

Railways, Roads, Docks.—The first railway was commenced in Aug., 1881. It is designed to extend from St. John's to Hall's Bay, with branches to Brigus, Harbor Grace, and Carbonear, the entire distance being 340 miles. In Nov., 1884, it was opened for traffic as far as Harbor Grace, a distance of 86 miles. When completed, it will connect the most populous districts with the capital, open up the fertile lands for settlement, and establish land-communication between the capital and the mining-region. Of postal roads there are 720 miles; of district roads, 1700 miles. The new graving-dock in St. John's Harbor was opened in Dec., 1884. It is 600 feet in length, 132 feet in breadth, and 25 feet in depth. It admits the largest Atlantic steamer afloat. It is of wood, the cost being $550,000.

History.—Newfoundland was discovered in 1497 by John Cabot, a Venetian by birth, then in the service of Henry VII. of England. Five hundred years before, according to Icelandic sagas, it was visited by Lief, son of Eric the Red, one of the Scandinavian sea-rovers who at this early date made their way to the shores of America. Soon after Cabot's discovery the value of its fisheries was made known, and fishermen from Normandy, Brittany, and the Basque provinces were plying their avocations in its encompassing seas. It was not till 1583 that formal possession of the island was taken by Sir Humphrey Gilbert, in the name of Queen Elizabeth. Various unsuccessful attempts at planting a colony were made, the most important effort being by Sir George Calvert, afterward Lord Baltimore, who in 1623 obtained a patent entitling him to the lordship of the whole southern peninsula. He built a house at Ferryland and introduced settlers, but was so harassed by the French that he abandoned the place and settled in Maryland, where he founded the city of Baltimore. Meantime, English fishermen in increasing numbers, chiefly from Devonshire, carried on the valuable cod-fisheries on the Banks and along the shores. The fish taken were dried on shore; and when winter approached, the fishermen embarked for England, taking with them the products of their labors. The shipowners and traders who took part in this lucrative business found that it was to their interest to discourage all attempts at settling the island, in order to retain the harbors and curing-stations for their exclusive use. Their settled policy was to conduct the fisheries from England and prevent a resident population from taking any share in them. They were able to enlist the British government in support of this policy under the plea that the fisheries, thus prosecuted, would be a nursery of seamen for the navy. Laws were enacted prohibiting fishermen from remaining behind at the close of the fishing-season, forbidding settlement, or even the erection of a house without a special license. For more than a century this short-sighted policy was persevered in, greatly retarding the prosperity of the country and inflicting cruelties and hardships on the hardy settlers, who, in spite of all prohibitions, increased in numbers, sturdily resisted the tyranny of the merchant-adventurers, and finally gained the victory. The British government at length awoke to the injustice of their policy. The laws prohibiting settlement and land-grants were repealed, a governor was appointed in 1728, and a new order of things began. Not more than eighty years have elapsed since the last restrictions were removed. Since that date the colony has made satisfactory progress.

The French long disputed with Great Britain for the possession of Newfoundland, but the contest was ended in 1713 by the Treaty of Utrecht, which ceded the island to England, but secured to the French the right of fishing and curing fish on 400 miles of coast from Cape Ray to Cape John. This concession to the French has led to continual disputes and bitter animosities, and, though they have no territorial rights, that portion of the coast on which they have fishing privileges is but scantily settled and is far behind the rest of the island. Repeated attempts have been made to get rid of the French claims, but hitherto in vain.

The condition of the colony during the last twenty years has been one of advancement. Common roads have been extended, the railway system has been introduced, and facilities for the cultivation of land and the settlement of the interior have been promoted. Many native industries, especially in the capital, have been founded and are prospering. More varied employments for the people have thus been established, and their condition is improving. Mining industry is extending and becoming increasingly important. As erroneous ideas in regard to the natural resources of the country are dissipated, the people are led to a hopeful confidence in its future and encouraged to put forth energetic efforts for its improvement.

M. Harvey.

Newfoundland Dog. See Dog.

New'gate Prison, in London, at the W. end of Newgate street, opposite the Old Bailey, is mentioned as a prison in 1207. It was at the new gate of the city. In the fifteenth century Sir Richard Whittington in his will left funds to rebuild it. In 1666 it was again rebuilt after the great fire. In 1780 it was destroyed by the No Popery rioters, and was again rebuilt. In 1808, Mrs. Fry commenced her labors for the improvement of the horrible condition which had for centuries characterized the place. Debtors ceased to be sent there in 1815; since that time the institution has gradually become, in many respects, a model one of its kind.

New Glas'gow, post-v. of Pictou co., N. S., on the Nova Scotia Railway, 9 miles S. E. of Pictou, on East River, has shipyards, foundries, tanneries, and other manufactories, and several important coal-mines. It has 1 weekly paper. Pop. of town in 1881, 2595.

New Granada. See COLOMBIA, UNITED STATES OF.

New Guinea. See PAPUA.

Newhall (FALES HENRY), D. D., b. at Saugus, Mass., June 19, 1827; graduated in 1846 at Wesleyan University; entered the Methodist Episcopal ministry (after teaching 1846–53); was professor of rhetoric and English literature in Wesleyan University 1863–71; studied in Europe 1867–68; became president of Ohio Wesleyan University in 1873.

New Ham'burg, a German village of Wilmot tp., Waterloo co., Ont., Canada, on the Grand Trunk Railway, 75 miles W. of Toronto. It has a large foundry and other manufactories. Pop. of village in 1881, 1240.

New Hamp'shire, one of the New England or Eastern States, and one of the original thirteen (see map of N. H. and Vt., in article VERMONT), lying between 42° 42′ 30″ and 45° 18′ N. lat., and 70° 43′ 40″ and 72° 33′ W. lon.; on the S. its breadth is a little more than 90 miles, at the extreme N. it is 3 or 4 miles; average breadth, about 45 miles: extreme length, 178 miles. It is bounded on the N. and N. N. W. by the province of Quebec, Dominion of Canada, on the E. by Maine and the Atlantic, on the S. S. E. and S. by Massachusetts, and on the W. by Vermont; area, 9305 square miles, or 5,955,200 acres.

Seal of New Hampshire.

New Hampshire, by census of 1880, ranked 31 among the States in population, 32 in value of agricultural products, and 18 in value of manufactures.

Face of the Country.—New Hampshire has but 18 miles of seacoast, and Portsmouth is the only good harbor for large vessels. The Isles of Shoals, a group of eight rocky islands, lie about 8 or 9 miles from the shore; three of them belong to New Hampshire. The seacoast is low and level, and a portion of it marshy for quite a number of miles inland; but, with this exception, the surface of the State is broken and mountainous. The Appalachian range of mountains enters the State from Maine, and forms a plateau varying in elevation from 800 to 1500 feet through nearly the entire length of the State, from which rise at irregular intervals numerous summits. That portion of this plateau occupying the S. part of Coos and the N. portion of Grafton and Carroll counties has a great number of lofty peaks, and is known by the general name of the White Mountains, though it is locally divided into the White and Franconia ranges. Mount Washington, the highest of these peaks, and the loftiest summit of the North or Northeastern States, is 6285.4 feet in height, and there is now a R. R. running from the base to its summit. The Ammonoosuc River flows through the valley immediately N. of Mount Washington. Other peaks are scattered over the State, which from their isolated positions seem higher than they really are. Between these mountain-summits are many beautiful valleys, some of them containing lakes, others watered by the numerous streams of the State, and most of them fertile and yielding abundantly such crops as the somewhat severe climate will permit. There is a moderate slope from N. to S., and most of the streams have considerable falls in their course.

Rivers and Lakes.—The Connecticut River is the longest river in the State, rising in its extreme N. limit, and forming, after its union with Hall's Stream, the W. boundary throughout the entire length of the State; only the affluents of the E. bank belong to New Hampshire, except near its source; these are Perry's Stream, Indian Stream, Hall's Stream, Mohawk River, Sim's Stream, the Upper Ammonoosuc River, Lower Ammonoosuc or Mink River, Mascomy River, Sugar River (the outlet of Sunapee Lake), and Ashuelot River. The Merrimack River drains the S. half of the State; it receives from the W. the Contoocook, Piscataquoi, and Sowhegan rivers; from the E. the Suncook River. The Piscataqua River, which forms a part of the S. E. boundary of the State, rises in East Pond. It receives the Salmon Falls and Cocheco rivers. The Saco and Androscoggin rivers have their sources and receive several affluents in New Hampshire. None of these rivers except the Piscataqua are navigable in the State. The State is noted for the number and beauty of its lakes. Of these, Winnipiseogee Lake (*i. e.* "the smile of the Great Spirit") is the largest. Squam Lake, Lakes Ossipee and Sunapee, Umbagog, Connecticut, and many other lakes and ponds, give variety and beauty to the scenery.

Geology and Mineralogy.—Iron is found in the form of magnetic and specular ores in Grafton and Carroll cos., and in bog-iron ore all over the State. There are iron-furnaces at Franconia, near one of the largest mines, but the ore is less rich than in some of the deposits in other States. Silver, copper, lead, zinc, graphite, and tin are also found; the graphite is largely in demand for crucibles. Mica or isinglass of great purity and in sheets of considerable size is obtained at Alstead and Grafton. There are quarries of steatite or soapstone at Francestown and Oxford, and a large deposit of the mineral usually known as Bath brick not far from Manchester. Building granite of excellent quality abounds. The other minerals are gneiss, crystallized quartz, ochres, different kinds of spar, talc, terra sienna, tourmalines, beryls, garnets, jasper, amethysts, asbestos, manganese, sulphur, and magnesia.

Vegetation.—The N. portion of the State and the mountainous regions are covered with heavy forests of oak, pine, beech, sugar-maple, birch, etc. The S. portion has less timber, having been longer under cultivation: but along the streams there are heavy growths of deciduous trees, more especially of the chestnut, elm, poplar, locust, hornbeam, hickory, willow, sugar-maple, butternut, alder, etc. The flora is to a large extent alpine and sub-alpine.

Climate.—The climate is cold and the winters are long and severe, but the warm season is pleasant and genial. Owing to the general elevation of the State, it is somewhat colder than Maine in the same lat. It is, however, very healthful. The prevalent winds of New Hampshire are, in the order of their frequency, N. W., W., S. W., N., S. E., and S. The mean temperature of the State averages 43.4°, ranging from 38° in the White Mountain region to 47° in the S. portion of the State. The highest temperature in seven years was 98°; the lowest, —30°; and the range, 128°. The average rainfall over the entire State is 47.16 inches. The heaviest rainfall occurs in the autumn, and usually in October; the lightest in the summer, generally in July.

Zoology.—In the N. and the mountainous portions of the State the bear, panther, lynx, wildcat, wolf, and fox, as well as the mink, marten, raccoon, and skunk, are found in considerable numbers; deer, and rarely the elk and moose, as well as smaller game, are also found in that section, as well as around the lakes; and game and aquatic birds are plentiful, as are birds of prey and the various song-birds common to New England. The rattlesnake is the only venomous snake. The lakes and rivers abound in choice fish.

Agricultural Products.—The sterility of the soil is such that but very small crops are grown, except of corn, oats, and potatoes. Of Indian corn, 1,350,248 bushels were raised in 1879: oats, 1,017,620 bushels: wheat, 169,316 bushels; buckwheat, 94,090 bushels; barley, 77,877 bushels. The clip of wool in 1880 yielded 1,060,589 pounds; 170,843 pounds of tobacco were raised.

Farm Animals.[*]—In 1880 there were in New Hampshire 46,773 horses, 232,405 cattle, 211,825 sheep, and 53,437 swine.

Manufactures.—New Hampshire is a heavy manufacturing State, the splendid water-power of her rivers, running through so hilly and diversified a country, being turned to the utmost advantage. Cotton-, woollen-, and paper-mills abound: there were, in 1880, 25,487 cotton-looms, with 1,008,521 spindles, employing 16,657 persons, and consuming 172,746 bales of cotton. In this industry New Hampshire ranks as second among the States in the product, and third (or next after Rhode Island) in the number of spindles. The iron and steel manufacture was of the value of $807,340 in 1880.

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[*] On farms only.

Railroads.—In Jan., 1882, there were in operation in New Hampshire 1026 miles of R. R., costing $25,370,787, with net earnings of $1,287,133, and paying in interest and dividends $1,189,657. The Boston Concord and Montreal and the Portland and Ogdensburg are the most important lines.

Finances.—The assessed valuation of property in New Hampshire in 1881 was: real estate, $123,511,284; personal, $77,366,732; total, $200,878,016. Rate of State tax, 20 cents on $100, producing $398,692; aggregate taxation, State, county, and town, $2,697,640; State debt, 1881, $3,411,248; aggregate State and local indebtedness, $10,724,170.

Commerce.—New Hampshire has one port of entry, Portsmouth, where imports to the amount of $20,031 and exports of $2761 were entered in 1881. The interior trade of the State is extensive, but no statistics of it exist. The fisheries of New Hampshire yielded only $176,684 in 1880. The registered shipping of New Hampshire in 1881 exhibited a total of 74 vessels—69 sailing and 5 steam—with tonnage of 9688.

Banks.—In Oct., 1881, New Hampshire had in operation 47 national banks, with capital of $5,830,000; circulation, $5,158,159; U. S. bonds to secure circulation, $5,777,000; aggregate deposits, $4,542,590. There were, besides, 67 savings-banks, with deposits of $32,092,232; one State bank, with $50,000 capital and $25,658 deposits; and 4 private bankers, with $45,234 deposits. The insurance companies (all foreign except one) wrote risks to the amount of $40,000,000 in 1880, receiving in premiums $483,621, and paying for losses $413,600.

Education, etc.—In 1880 the number of children of school-age (five to twenty-one years) was estimated at 71,132, of whom 64,670 were enrolled in public schools, with average daily attendance of 48,943. Total expenditure for public schools, 1880, $568,103, of which salaries of teachers required $415,777. New Hampshire has one university, Dartmouth College, at Hanover, having 15 professors and 247 students in 1880, with receipts from tuition of $16,000. There are many normal schools, female seminaries, and academies of high class, of which Phillips Academy, at Exeter, is notable for its excellence and antiquity. There were published in New Hampshire, in 1882, 89 newspapers and periodicals, 9 of them daily.

Churches.—The Congregationalists take the lead, with 187 churches, 196 ministers, and 20,547 members; Methodist Episcopal, 112 churches, 138 ministers, 12,659 members; Baptists, 86 churches, 110 ministers, 9127 members; Free Will Baptists, 108 churches, 8849 members; Second Adventists, 48 churches, 5750 members; Protestant Episcopal, 27 churches, 1967 members; Roman Catholics, 27 churches and 27 priests; and a dozen other denominations, with from 1700 to 35 members each.

Population.—In 1860, 326,073; 1870, 318,300; 1880, 346,991 (white 346,229, colored 762, including 63 Indians and 14 Chinese).

Principal Cities and Towns, Pop. 1880.—Manchester, 32,630; Concord (cap.), 13,843; Nashua, 13,397; Dover, 11,687; Portsmouth, 9690; Keene, 6784; Rochester, 4683; Suncook, 3487; Franklin Falls, 1957; Lebanon, 1954; Littleton, 1651; Exeter, 1526; Laconia, 1445; Lancaster, 1409; Hinsdale, 1351; Newport, 1342; Hanover, 1134; Plymouth, 941.

COUNTIES.	* Ref.	Pop. 1870.	Pop. 1880.	COUNTY TOWNS.	Pop. 1880.
Belknap	8–F	17,681	17,948	Laconia	1,445
Carroll	6–G	17,332	18,224	Ossipee	160
Cheshire	10–D	27,265	28,734	Keene	6,784
Coos	3–F	14,932	18,580	Colebrook Lancaster	635 1,409
Grafton	6–E	39,103	38,788	Haverhill Plymouth	517 941
Hillsborough	10–E	64,238	75,634	Amherst Manchester Nashua	434 32,630 13,397
Merrimack	8–F	42,151	46,300	Concord	13,843
Rockingham	10–G	47,297	49,064	Exeter Portsmouth	1,526 9,690
Strafford	8–G	30,243	35,558	Dover Rochester	11,687 4,683
Sullivan	8–D	18,058	18,161	Newport	1,342
Total		318.300	346,991		

History.—The Piscataqua River and the coast of New Hampshire were visited by the famous Capt. John Smith in 1614. In 1622 all the territory between the Merrimack and the Kennebec rivers and the seacoast, 60 miles inland, was granted by the council for New England to Sir Ferdinando Gorges and Capt. John Mason, both churchmen and royalists, and designed to be called the Province of Maine. In the spring of 1623 the first English settlement in this province W. of Piscataqua River was made at Little Harbor (now Rye). Some time after, Gorges and Mason divided their great province, Mason taking all W. of the Piscataqua River. In 1629 the council granted Mason his share, lying between the middle of the Merrimack River and the Piscataqua River, and reaching inland 60 miles from the seacoast, with all islands within 5 leagues thereof. Mason called it New Hampshire, and sent over substantial colonists with cattle, mills, etc., needed for a great plantation. Little Harbor, Strawberry Bank (now Portsmouth), and Dover soon became considerable settlements. The first settlers were churchmen. Mason's untimely death, in 1635, retarded the progress of the settlements. The rigor and the intrigues of the Bay Colony soon introduced among the settlements an active Puritan element, which got control of affairs, and annexed all the settlements to Massachusetts in 1641. The latter claimed nearly all New Hampshire to be within the charter limits. This action overthrew Mason's proprietary interest, but the claims of his heirs in England issued, forty years later, in the emancipation of New Hampshire. In 1677 a royal order restrained Massachusetts to within 3 miles N. of the Merrimack River, and in 1679 a royal commission established a government over the province of New Hampshire. The king appointed the president and council, and the people elected an assembly. In 1692 a royal commission established a new government, which continued till overthrown by the Revolution. The king appointed the government and council, and the people chose a legislature. From 1675 to 1750 the inhabitants suffered terribly from the Indians. The limits of the province, much the same as now, were fixed by royal determination—the S. and E. in 1740, and the W. in 1764. New Hampshire took an active part in the Revolution, and one of the first assaults on royal authority in the country was the capture by her patriots of the fort at New Castle, Dec., 1774. A State constitution was adopted in 1784. The Federal Constitution was adopted by a small majority June 21, 1788. While provincial authority continued Portsmouth was the seat of government; the provisional government during the Revolution was at Exeter. Since 1805, Concord has been the capital of the State.

Governors.

Josiah Bartlett	1792–94	Samuel Dinsmoor	1849–52
John Taylor Gilman	1794–1805	Noah Martin	1852–54
John Langdon	1805–09	Nathaniel B. Baker	1854–55
Jeremiah Smith	1809–10	Ralph Metcalf.	1855–57
John Langdon	1810–12	William Haile	1857–59
William Plumer	1812–13	Ichabod Goodwin	1859–61
John Taylor Gilman	1813–16	Nathaniel S. Berry	1861–63
William Plumer	1816–19	Joseph A. Gilmore	1863–65
Samuel Bell	1819–23	Frederic Smyth	1865–67
Levi Woodbury	1823–24	Walter Harriman	1867–69
David L. Morrill	1824–27	Onslow Stearns	1869–71
Benjamin Pierce	1827–29	James A. Weston	1871–72
John Bell	1829–30	Ezekiel Straw	1872–74
Matthew Harvey	1830–31	James A. Weston	1874–75
Jos. M. Harper (act'g)	1831	Person C. Cheney	1875–77
Samuel Dinsmoor	1831–34	Benj. F. Prescott	1877–79
William Badger	1834–36	Natt Head	1879–81
Isaac Hill	1836–39	Charles H. Bell	1881–83
John Page	1839–42	Samuel W. Hale	1883–85
Henry Hubbard	1842–44	Moody Currier	1885–87
John H. Steele	1844–46		
Anthony Colby	1846–47		
Jared W. Williams	1847–49		

REVISED BY A. R. SPOFFORD.

New Hamp'ton, cap. of Chickasaw co., Ia. (see map of Iowa, ref. 2–I, for location of county), on the Chicago Milwaukee and St. Paul R. R. Principal industry, farming. Pop. in 1870, 455; in 1880, 1105.

New Harmony, Posey co., Ind. (see map of Indiana, ref. 11–A, for location of county), on the Wabash River, is noted for the settlement made there in 1815 by the "Harmonists" under George Rapp, transferred to Robert Owen in 1824 for an experiment in socialism, and subsequently the seat of a "school of industry" founded by William Maclure. Pop. in 1870, 836; in 1880, 1095.

New Hartford, Conn. See APPENDIX.

New Haven, city and important R. R. and commercial centre, cap. of New Haven co., Conn. (see map of Connecticut, ref. 6–D, for location of county), on a sandy plain at the head of a shallow harbor, between West and Mill rivers, including also the neck between Mill River and the Quinnipiack, where the part of the town called Fair Haven is situated. Formerly city and town had distinct limits; now they have nearly the same by the extension of the city organization over a larger area. The government of the *town*, according to a general law which points back to the organization of the early settlements in the colonies of New England, is in the hands of selectmen, not more than seven in number, with whom are elected grand jurors, constables, assessors, a board of relief, a town-clerk, a register of births, etc., a treasurer, a collector of taxes, etc. The *city* has a special charter, which has often been changed in its details. New Haven is now divided into 12 wards, each of which sends two aldermen and three councilmen to the boards of aldermen and the common council. A mayor, chosen, like these boards, biennially, and having in his hands the nomination of some of the principal administrative boards, presides at the meetings of these boards and of the board of aldermen.

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* Reference for location of counties. See map of New Hampshire and Vermont, in article VERMONT.

Education.—New Haven is well supplied with common schools under an elected board having control over teachers, studies, and expenses. Many of the school-houses, of which in all there are 28, are commodious and handsome buildings. A number of private schools, the Hopkins Grammar School, the public high school, with the various departments of YALE COLLEGE (which see), complete the system of education.

In 1884 the police cost $104,913, and the fire department $80,988. The receipts into the city treasury in all, in 1884, were $838,025, and the disbursements $809,314. The city debt, in Jan., 1885, was $595,000, of which $405,000 is for a very important system of sewerage. New Haven is well supplied with railroads. There are the roads to New York; to Hartford and Springfield, now consolidated into one; the canal road to Northampton; the New London; the air-line to Willimantic *viâ* Middletown; and the Derby. New Haven is a port of entry, and has a considerable trade both with other parts of the U. S. and with foreign parts. A new park of large dimensions has been laid out, and the harbor is undergoing very important improvements.

Manufactures.—The census of 1880 reported 587 manufactories; capital, $9,703,737; average number of hands employed, 15,156; wages paid during the year, $5,761,374; value of products, $24,040,225. Its manufactures are its principal source of prosperity, the most important being the making of carriages, of rifles, and other works in iron.

Churches.—There are in the town about 40 churches—viz. 13 Congregational, 9 Episcopalian, 1 Lutheran, 7 Roman Catholic, 7 Methodist, 4 Baptist, 1 Universalist, besides several where German is the language of the service, and several consisting of colored members.

History.—New Haven was the principal settlement in the colony, originally independent, which was founded by Theophilus Eaton, Rev. John Davenport, and their associates, men of more than the ordinary wealth of colonists, in 1638. Other settlements were made on land purchased from the Indians, as was the case at Quinnipiack, at Guilford, Milford, Stamford, and Branford, which with Yennicock or Southhold, on Long Island, joined the principal settlement under a constitution made by the inhabitants without royal charter. The independence of this colony continued, until the charter of Connecticut, procured from the king, Charles II., in 1662, included the New Haven colonists under the same jurisdiction. Some of the settlements were ready enough to come under the new charter, but several years passed before it was accepted with content by the others. Under this charter Hartford and New Haven were made joint capitals, the legislature meeting alternately at each place, until in 1873, by an amendment of the constitution, Hartford was made the sole seat of government. Pop. in 1870, 50,040; in 1885 about 75,000. T. D. WOOLSEY.

New Heb'rides, a group of more than twenty islands in the Pacific Ocean, situated between lat. 14° and 20° S., and between lon. 168° and 170° E. They lie about 1000 miles N. of New Zealand, 400 miles W. of Fiji, and 1400 miles N. E. of Sydney, extending about 300 miles from N. E. to S. W. The islands are volcanic and fertile. The trees are magnificent. The banana, bread-fruit, sago-palm, yam, and other like tropical productions abound. The climate is malarial. The islands were discovered by Quiros and Torres in 1606. The population is estimated at from 70,000 to 100,000. The people are mostly of the Papuan race, speaking some twenty different languages, and much disintegrated politically. Till recently they were cannibals. Christianity is now making decided progress in the islands, Presbyterian missionaries having gone there in 1848. R. D. HITCHCOCK.

New Holland. See AUSTRALIA.

New Ibe'ria, cap. of Iberia parish, La. (see map of Louisiana, ref. 10–D, for location of parish), on Morgan's Louisiana and Texas R. R. and the Bayou Teche, 55 miles W. S. W. of Baton Rouge, surrounded by extensive sugar and cotton plantations, has a considerable trade. Pop. in 1870, 1472; in 1880, 2709.

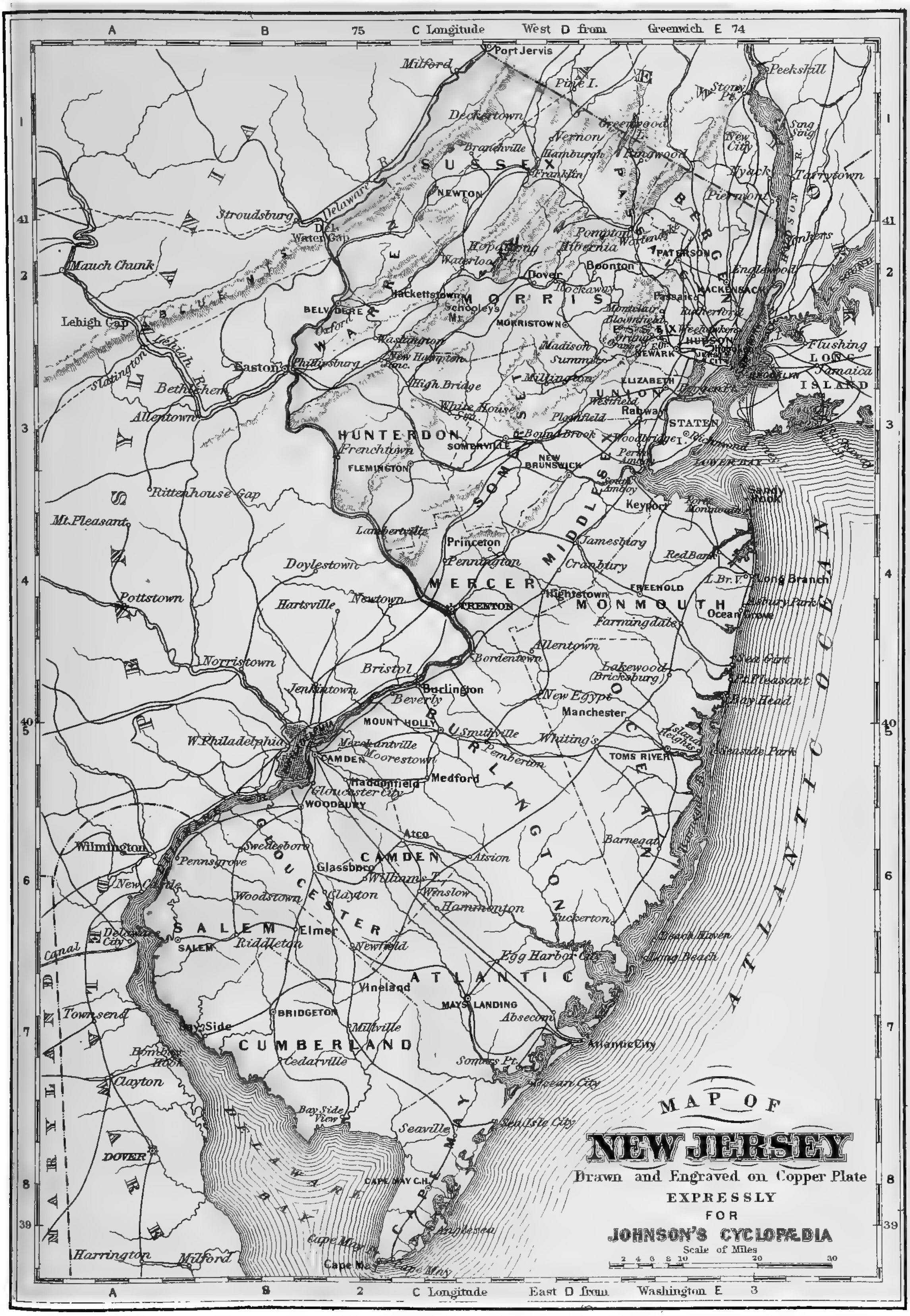
New Jersey, one of the Middle Atlantic States, and one of the original thirteen, situated between Delaware River and Bay and the Atlantic Ocean and Hudson River, and between 38° 55′ 50.42″ and 41° 21′ 19″ N. lat., and 73° 53′ 51.25″ and 75° 33′ 2.74″ W. lon.; bounded on the N. by New York, on the E. by Hudson River, Staten Island Sound, Raritan Bay, and the Atlantic, S. by Delaware Bay, and W. by the Delaware River, which separates it from Delaware and Pennsylvania; extreme length, 167⅜ miles; greatest breadth, 59 miles; least breadth, 32 miles; area, 7815 square miles, or 5,001,600 acres.

THE GREAT SEAL OF THE STATE OF NEW JERSEY
MDCCLXXVI

Seal of New Jersey.

New Jersey, by census of 1880, ranked 19 among the States in population, 25 in value of agricultural products, and 6 in value of manufactures.

Face of the Country.—The N. half of the State is traversed by three distinct ranges of mountains; two of them—the Kittatinny or Blue Mountain, called Shawangunk in New York, and the Highland range—belong to the Appalachian chain, while the third and lower range lies between the Highlands and the ocean, and is a part of the low mountain-range which descends from Massachusetts through New York and enters New Jersey below the Palisades. The interval between the second and third ranges of mountains is throughout most of its extent largely charged with trap-rock, which at times, as at the Palisades, completely obscures its matrix and appears as an independent line of basalt. The Blue or Kittatinny range is somewhat the highest, rising to a height of not far from 1800 feet at High Point, near the New York line. It forms an almost unbroken ridge from the New York State line to the Delaware Water Gap. Its E. slope is steep. The top of this ridge is flat and generally covered with a heavy forest-growth. The Highland range is composed of a great number of mountain-ridges. It has really no unbroken ridges except the Green Pond Mountain range. The highest point is Rutherford's Hill on Hamburg Mountain, 1488 feet above the sea, though Wawayanda Mountain, near the New York line, is 1450 feet. Schooley's Mountain and the Musconetcong Mountain—both favorite summer resorts—are two of the many ridges of this range. Most of these ridges slope gently to the general level on their N. E. faces, while the S. W. terminate abruptly and sometimes precipitously. The trap-ridges are irregularly distributed. The longest and most widely known of these is that generally called Palisade Mountain, which, commencing between 8 and 9 miles W. of the Hudson River, in Rockland co., N. Y., reaches the river by a bold curve, and thence follows the W. bank down in the almost perpendicular and frowning Palisades. Nearly parallel with this ridge, and from 10 to 18 miles W. of it, are the First, Second, and the less continuous Third Mountains, which, though broader and somewhat higher than the Palisades, are not so long. They include the Orange Mountain, Fairmount, etc. S. W. of these are other less extensive but prominent trap-ridges known as Rocky Hill, Ten-mile Run Mountain, Long Hill, Sourland Mountain, Goat Hill, and, farther N., Round Mountain, and a large horseshoe-shaped mass of trap rising 767 feet above the sea, and known as Pickle Mountain. These trap ridges all have their E. front abrupt and almost perpendicular, while on the W. side they slope gradually toward the plain. The S. half of New Jersey has no elevations deserving the name of mountains. The Highlands of Navesink, S. of Sandy Hook, are about 400 feet high. All of Southern New Jersey is a gently-undulating plain in the centre, 150 to 190 feet above the sea, and sloping gradually to the ocean on one side and the Delaware River on the other. The valley of the Delaware River, from the New York State line to the Delaware Water Gap—a distance of 40 miles—varies in breadth from half a mile to 3 miles, and possesses great beauty and a rich and productive soil. At the Water Gap the Kittatinny or Blue Mountain crosses the river, and from that point the



MAP OF

NEW JERSEY

Drawn and Engraved on Copper Plate

EXPRESSLY

FOR

JOHNSON'S CYCLOPÆDIA

valley is broader. Below this the valley stretches out in wide plains of sandy loam, broken only by occasional trap-dikes, as far as Trenton, when clay deposits take the place of sand as far S. as Elsinborough, when the sand again resumes its sway. The Kittatinny valley lies between the Kittatinny Mountain and the Highland range, and is everywhere noted for its rural beauty and agricultural wealth.

Rivers, Bays, Lakes.—The Hudson River bounds the State for 28 or 30 miles. It receives from this State only the Wallkill River, with three small affluents of that stream. Newark Bay receives the Passaic and the Hackensack rivers, with their affluents. Raritan Bay receives the Raritan River, with its N. and S. branches, and three other tributaries and three affluents of these. The Atlantic Ocean receives the Rahway River, Navesink and Shrewsbury rivers, Shark River, Manasquan River, Metedeconk and Tom's rivers, and Cedar Creek, Little Egg Harbor or Mullica's River, and Great Egg Harbor River. Delaware Bay receives the Delaware River, with its fifteen tributaries and four affluents of these: and in the extreme S. of the State Cohansey Creek and Maurice River, as well as a number of smaller streams. The numerous bays along the coast, besides Delaware Bay and Newark, Raritan, and Sandy Hook bays, are sometimes called bays, sometimes harbors or sounds. They form a line of internal water-communication along the Atlantic coast from Metedeconk River to Cape May for vessels of light draught. The principal are Barnegat Bay, Little Egg Harbor, Great Bay, Absecom Bay, and Great Egg Harbor. There are numerous lakes and ponds in the State, but few of them are of considerable size. Greenwood Lake, partly in New York, is from a third to a half mile wide and 7 or 8 miles long. Lake Hopatcong in Morris co. is 5½ miles long and from a third to 1¾ miles wide. Budd's Lake is nearly 2 miles long and three-fourths to 1 mile wide. Green Pond, also in Morris co., between Green Pond and Copperas Mountains, 1044 feet above the sea, is 3 miles long and from a quarter to a half mile in width.

Mineralogy and Economic Geology.—The clay marls, pure marls, and shell marls of the State are used to the amount of more than 200,000 tons per annum, lime also, for fertilizing purposes, marsh-mud, peat both as a fertilizer and fuel, not to speak of the great variety of marine products, partially mineral, used for fertilization; building-materials, including a very fine gneiss, white and blue limestones, Potsdam sandstone and the variety of New Jersey free or sand stones; roofing and writing slates throughout the Kittatinny valley, and flag and paving stones of large size and excellent durable material, are abundant along and near the Hudson. Hydraulic lime and clay suitable for brick-making are plentiful and largely used. New Jersey has vast beds of the best iron-ores. There are in Somerset co. and elsewhere in the State veins of copper-ore which have been worked in the past, but they would not now prove profitable, yielding only 9 or 10 per cent. of pure copper. Zinc-ores have been found only in two localities, but they are of excellent quality, and supply seven-tenths of the zinc oxide and more than one-fifth of the metallic zinc produced in the U. S. The quality of both is said to be much superior to that of the imported. Lead-ore (galena) occurs at several localities, but is not sufficiently abundant to pay for working. Nickel has also been found in small quantities. Porcelain and potter's clays of excellent quality are dug annually to the extent of nearly 300,000 tons. Kaolin is also found in extensive deposits, but not of the best quality, and infusorial earth, in demand for polishing purposes and for the preparation of dynamite or giant-powder, in Morris co. A pure white sand equal to any known for glass-making purposes abounds in Southern New Jersey. Moulding-sand of good quality, and sand for making the brick for reverberatory furnaces, are found in Burlington and Morris cos. Graphite or plumbago occurs in several parts of Morris and Passaic cos.; it has been mined with profit. Sulphate of baryta, manganese, molybdenum, iron pyrites, used largely for producing sulphuric acid, and greensand for chemical purposes and glass-making, are among the other mineral products of the State.

Soil and Vegetation.—Though much of the soil is a light sandy loam, it is easily tilled; and, by the addition of rich marls, lime, and marsh-mud of the tide-washed portions of the State, it has a high value. Taking all parts, the forest-area may be calculated as comprising about one-third of the State, though portions of this are scrub. The prevalent timber of the S. part is pine, with some cedar in the swamps; the N. portion, and especially the forests on the hills, are composed mostly of oak, hickory, chestnut, hornbeam, tulip-tree, basswood, dogwood, sassafras, with wild-cherry and some ash and elm. The *Magnolia glauca* is found in the swamps. Wild grapes, cranberries, whortleberries, blackberries, and raspberries are abundant, and the bitter-sweet, wax-berry, button-bush, shad-bush, and box-elder are plentiful. The flora of the State is very large, and many of the flowers are of great beauty.

Zoology.—There are in New Jersey bats, moles, shrews, the wild-cat (now very rare), red and gray foxes, the fisher, weasel or stoat, mink, otter, and skunk; the black bear, raccoon, opossum, squirrels; woodchuck or ground-hog, muskrat, the common rabbit, a few deer, the black whale, and porpoise. The birds are very numerous, comprising the turkey-buzzard and black vulture, the eagle, falcon, hawk and fish-hawk, owl, cuckoo, woodpecker, humming-bird, swift or chimney-swallow. whippoorwill and night-hawk, kingfisher, fly-catcher, thrush, robin, and several species of wren; wood-warbler, swallow, waxwing, shrike, creeper, titmouse, shore-lark, finch, sparrow, oriole, crow, bluejay, turtle-dove, and wild pigeon; ruffed grouse and quail, heron, ibis, plover, oyster-catcher, avoset, snipe, curlew, woodcock, rail, swan, wild goose, duck, brant, teal, etc.; petrel, gull, tern, pelican and gannet, cormorant, loon and diver, auk and guillemot. Of reptiles there are turtles, terrapins, tortoises, and lizards, the rattlesnake, copperhead, and large milk-adder, with harmless snakes, including the black-snake and water-snake; salamander, frog, tree-toad, and toad. The number of fishes is enormous, comprising the perch, sunfish, darter, tautog or blackfish, cunner or conner, sheepshead, and porgy; weakfish, angel-fish, surgeon, pilot, ribbon-fish, the little barracuda; the mackerel family, including the common and Spanish mackerel, bonito, tunny, spinous dory; bluefish, swordfish, gar- or bill-fish, flying-fish, pipe-fish, stickleback, mullet, silver-side, sandlarice, red sea-perch, bull-head, sculpin, gurnard, toad-fish, goby, blenny, angler, mouse-fish, lump-fish; the cod family, flounder, including the halibut; killie-fish, salmon, brook-trout, smelt, soury; the shad and herring family, including several species of herring, the common shad, alewife, moss bunker, and anchovy; pike and gar, chub, minnow, dace, shiner, sucker, eel, catfish, file-fish, trunk-fish, head-fish, globe-fish, balloon-fish, puffer, sea-horse, sturgeon, shark, ray, devil-fish, and lamprey.

Climate.—The climate of the State is in general healthy, differing in the character of its winds on the seacoast from that in the interior, milder and with somewhat less range in the S. than in the N. counties. Mean temperature of year: Newark (lat. 40° 44′ 30″ N., lon. 74° 10′ W., elevation 35 feet), 51.25°; New Brunswick (lat. 40° 29′ N., lon. 74° 16′ 40″ W., elevation 75.8 feet), 51.1°; Sandy Hook (lat. 40° 28′ N., lon. 74° 1′ W., elevation 23 feet), 49.9°. Annual rainfall: Newark, 54.73 inches; New Brunswick, 49.32 inches; Sandy Hook, 52.99 inches.

Agricultural Products.—According to the census of 1880 the leading crops of New Jersey were: Indian corn, 11,150,705 bushels; oats, 3,710,573 bushels; wheat, 1.901,739 bushels: rye, 949,064 bushels; buckwheat, 466,414 bushels; barley, 4091 bushels. The wool-clip of 1880 produced 441,110 pounds. The yield of tobacco was 172,315 pounds.

Farm Animals.[*]—The census of 1880 showed 86,940 horses, 223,886 cattle, 117,020 sheep, and 219,069 swine.

Manufactures.—New Jersey is heavily engaged in manufactures of almost all descriptions, its vicinity to the great marts of New York and Philadelphia giving it great facilities both for marketing its products and for importing raw materials at a minimum of cost. Cotton and woollen factories abound, and the various products of iron and steel (as machinery, hardware, steam-engines, locomotives, railway cars, etc.) are produced by the New Jersey shops in great number, and exported even to foreign countries. The aggregate product of the iron and steel manufactures in 1880 was $10,341,896. There were then 3344 cotton-looms, running 232,305 spindles, employing 4658 persons, and using 20,569 bales of cotton.

Railroads.—In Jan., 1882, there were in operation in New Jersey 1753 miles of railway, costing $167,618,355, with net earnings of $11,509,911, and paying in interest and dividends $9,847,202. The State is a network of railways, of which the Central of New Jersey, the New Jersey Southern, the Pennsylvania, and the Reading are among the chief.

Finances.—The assessed value of property in New Jersey in 1880 was: real estate, $442,632,638; personal, $129,885,723; total, $572,518,361; rate of State tax, 2½ mills on $1, producing $895,250; aggregate raised by taxation, State, county, and municipal, $8,958,065; amount of State debt, less sinking fund, $813,675; total State and local indebtedness, net, $49,547,102.

Commerce.—The direct foreign commerce of New Jersey from its three ports of entry was, in 1881, imports, $166,219; exports, $88,595. The interior commerce is enormous, but no statistics of it exist. The aggregate shipping of New Jersey in 1880 exhibited 1303 registered vessels, with a tonnage of 103,962.

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[*] On farms only.

Banks.—In Oct., 1881, there were 67 national banks, with capital of $12,960,000; circulation, $10,386,784; U. S. bonds to secure circulation, $11,671,350; aggregate deposits, $28,469,730. There were also 33 savings banks, with deposits of $20,388,409; 10 State banks and trust companies, with $1,167,683 capital and $3,487,561 deposits; and 5 private bankers, with $26,231 capital and $1560 deposits. There were 21 insurance companies belonging to the State, which paid losses in 1881 of $1,218,820; premiums received in 1880, $1,678,886.

Education, etc.—In 1880 the number of children of school-age (five to eighteen years) was 330,685, of whom 205,240 were enrolled in public schools, with average attendance of 116,860; aggregate expenditure for public schools in 1880, $2,039,938, of which teachers' salaries required $1,391,550. New Jersey has 4 universities and colleges, with 71 instructors and 688 students, paying tuition fees of $21,136 in 1880. The College of New Jersey, at Princeton, is one of the oldest institutions of learning in America. Normal schools, female seminaries, and academies are numerous and excellent. In 1882 there were published in New Jersey 209 newspapers and periodicals, of which 24 were daily.

Churches.—The Methodist Episcopal denomination comes first, with 492 churches, 338 ministers, and 74,926 members; Presbyterian, 268 churches, 365 ministers, 46,070 members; Baptist, 172 churches, 32,367 members; Roman Catholic, 142 churches, 184 priests, and about 175,000 population; Reformed Church, 114 churches, 18,683 members; Protestant Episcopal, 136 churches, 14,926 members; Lutheran, 74 churches, 8360 members; and 20 other denominations, with from 3400 to 100 members each.

Population.—In 1860, 672,035; 1870, 906,096; 1880, 1,131,116 (white 1,092,017, colored 39,099, including 170 Chinese, 74 Indians, and 2 Japanese); in 1885, 1,277,135.

Principal Cities and Towns, Pop. 1885.—Jersey City, 153,503; Newark, 152,988; Paterson, 63,280; Camden, 52,884; Hoboken, 37,721; Trenton (cap.), 34,386; Elizabeth, 32,149; New Brunswick, 18,258; Orange, 15,231; Bayonne, 13,080; Bridgeton, 10,065; Plainfield, 8913; Millville, 8824; Morristown, 8760; Passaic, 8329; Phillipsburg, 8058; Atlantic City, 7942; Rahway, 6861; Burlington, 6653; Salem, 5515; Long Branch, 5140; Hackensack, 4983; Princeton, 3546.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1885.	COUNTY TOWNS.	Pop. 1885.
Atlantic.........	7–C	18,704	22,356	May's Landing..	744
Bergen...........	2–E	36,786	39,880	Hackensack......	4,983
Burlington.....	5–D	55,402	57,558	Mount Holly.	
Camden..........	6–C	62,942	76,662	Camden............	52,884
Cape May......	8–C	9,765	10,748	Cape May C.-H..	570
Cumberland...	7–B	37,687	41,982	Bridgeton.........	10,065
Essex	2–D	189,929	213,764	Newark............	152,988
Gloucester......	6–B	25,886	27,603	Woodbury.........	3,278
Hudson..........	2–E	187,944	240,332	Jersey City.	153,503
Hunterdon.....	3–C	38,570	37,420	Flemington.......	1,751
Mercer...........	4–C	58,061	65,825	Trenton............	34,386
Middlesex......	3–D	52,286	56,180	New Brunswick	18,258
Monmouth.....	4–E	55,538	62,314	Freehold	2,432
Morris...........	2–D	50,861	50,735	Morristown	8,760
Ocean	5–D	14,455	15,590	Tom's River.	
Passaic	2–D	68,860	83,387	Paterson..........	63,280
Salem.............	6–B	24,579	25,372	Salem................	5,515
Somerset........	3–C	27,162	27,425	Somerville........	3,316
Sussex	1–C	23,539	22,401	Newton.............	2,648
Union............	3–D	55,571	61,829	Elizabeth..........	32,149
Warren..........	3–C	36,589	37,772	Belvidere..........	1,773
Total..........		1,131,116	1,277,135		

History.—It is probable that somewhere between 1614 and 1620 a few Dutch traders established themselves in Bergen. The whole region was claimed by the New Netherlands colonists, and in 1623 a fort was established 4 miles below Philadelphia, on the Delaware. The region along the Delaware was granted in 1634 to Sir Edmund Ployden, who called it New Albion. About 1638 the Delaware River was visited by a party of Swedes and Finns, who purchased land from the Indians and planted a colony, calling it New Sweden. In 1655 a Dutch force, headed by Petrus Stuyvesant, governor of the New Netherlands, conquered the Swedish colony. In 1664 the Dutch were conquered by an English force sent by Charles II., who had granted the entire region between the Delaware and Connecticut rivers to his brother, the duke of York. Some New England colonists the same year settled at Elizabethtown. In this or the following year the duke of York conveyed the present territory of New Jersey to Lord Berkeley and Sir George Carteret, and it was called New Jersey in compliment to Sir George Carteret, who had held the Isle of Jersey as royalist governor for Charles II. Sir George sent out his brother, Philip Carteret, in 1665 to be governor, but his administration proved unpopular. In 1670 he was obliged to leave the colony, and a natural son of Sir George was for a short time governor. In 1674, Lord Berkeley sold his half to two members of the Society of Friends, Fenwick and Byllinge, who in 1682 sold it to William Penn. The colony was now divided into East and West Jersey by a line drawn from Little Egg Harbor to a point on the Delaware in lat. 41° 40′ N. In 1682 or 1683, Penn purchased all Carteret's rights in East Jersey, and the colony became a refuge for the persecuted Friends. The colony had no Indian troubles, and its growth was rapid until the Revolution, in which a majority of its inhabitants took an eager part. Active preparations were made for the coming conflict by the New Jersey patriots; they were represented in the Continental Congress, and on the 2d of July, 1776—two days before the Declaration of Independence—their provincial congress reported and adopted a constitution for an independent State, which was ratified on the 18th of July following, and under which the State was governed until 1844, when its present constitution was adopted. During the war New Jersey suffered severely from the incursions of British troops and Tories, and the important battles of Trenton, Princeton, Millstone, Red Bank, and Monmouth were fought within the State. The Federal Constitution was adopted by a unanimous vote Dec. 18, 1787. It is worthy of notice that the State constitution of 1776 allowed universal suffrage, both male and female, white and colored. Women continued to vote when they chose till 1807. The constitution of 1844 restricts suffrage to white males over 21 years, and this provision was modified subsequently to accord with the U. S. constitutional amendments.

Governors.

William Livingston......	1789–94	Daniel Haines....	1848–51
William Patterson.......	1794	George F. Fort............	1851–54
Richard Howell	1794–1801	Rodman M. Price.........	1854–57
Joseph Bloomfield........	1801–12	William A. Newell.......	1857–60
Aaron Ogden	1812–13	Charles S. Olden	1860–63
William S. Pennington.	1813–15	Joel Parker...................	1863–66
Mahlon Dickerson	1815–17	Marcus L. Ward...........	1866–69
Isaac H. Williamson.....	1817–29	Theodore F. Randolph.	1869–72
Peter D. Vroom...........	1829–32	Joel Parker	1872–75
Samuel L. Southard......	1832–33	Joseph D. Bedle............	1875–78
Elias P. Seeley............	1833	George B. McClellan.....	1878–81
Peter D. Vroom............	1833–36	George C. Ludlow.........	1881–84
Philemon Dickerson....	1836–37	Leon Abbett................	1884–87
William Pennington ...	1837–43		
Daniel Haines.............	1843–44		
Charles C. Stratton	1844–48		

REVISED BY A. R. SPOFFORD.

New Jersey, College of, founded under the auspices of the Presbyterian synod of New York, which then included New Jersey. Chartered by New Jersey in 1746, it was opened in Elizabethtown in May, 1747, received a more liberal charter in 1748, was removed to Newark, and finally to Princeton in 1757, where a large college was erected named Nassau Hall, in memory of William III. of the house of Nassau. It was occupied as a barracks and a hospital both by the American and the British troops in the Revolution. Gen. Washington drove the British from its walls Jan. 3, 1777. The Continental Congress met in it in 1783. The Congress and Gen. Washington attended the commencement in that year. Gen. Washington presented fifty guineas to the trustees to repair the damages of war, which were appropriated for a portrait of Washington by the elder Peale. Dr. Witherspoon and two of the alumni, Richard Stockton and Benjamin Rush, were signers of the Declaration of Independence. Rev. Jonathan Dickinson was the first president from May to Oct., 1747. Rev. Dr. James McCosh was elected president in 1868. Active and energetic, his reputation has greatly advanced the interests of the college. The faculty has been enlarged, the number of students increased, new studies introduced, nine large buildings erected, and the funds greatly augmented. Among its benefactors have been Messrs. James Lenox, John J. Blair, and N. Norris Halstead, the last gentleman having erected the observatory, and the former two having endowed professorships; Messrs. John C. Green, Henry G. Marquand, Robert Bonner, R. L. and A. Stuart, George W. Musgrave, George M. Gier, and others. Mr. Green gave $750,000 to found a school of science, erect a library, Dickinson Hall, and for other objects. The trustees of his estate have erected Witherspoon Hall and Edwards Hall, enlarged the school of science, and endowed a number of professorships. These donations have amounted to $1,000,000. In 1882, Mr. Marquand erected a handsome chapel, costing $125,000, and other friends placed in the observatory one of the largest telescopes ever constructed. Mr. William Libbey,

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* Reference for location of counties. See map of New Jersey.

Sr., who founded the museum of geology and archæology at a cost of $100,000, has recently presented to the college the University Hotel, which cost more than $250,000.

The college year is divided into three terms; some of the studies are elective in the junior and senior years. There are many prizes and fellowships, the recipients of the latter being required to pursue a prescribed course of study for one year after graduation. The John C. Green School of Science is now in operation. Besides the president, there are 29 professors and 12 tutors and assistants. There are (1883) 561 students, viz.: fellows, 9; graduate students, 58; academic students, 417; scientific students, 82; total (excluding 5 names repeated), 561. The college and society libraries contain 75,000 vols. The number of graduates is about 5000, among whom have been some of the most distinguished men in Church and State, the most eminent being James Madison, fourth President of the U. S. Within the last fifteen years $3,000,000 have been contributed by friends to the college. The buildings are mostly of stone, and occupy the campus, which runs parallel with the main street of the town. The grounds are shaded with fine trees. Nassau Hall, East and West colleges, the American, Whig, and Cliosophic halls form a fine quadrangle, within which are planted two Revolutionary cannon. The other buildings lie chiefly to the E. and W. of this quadrangle. The geological and archæological museum in Nassau Hall and the museum of natural history in the School of Science are rapidly growing in importance. A school of philosophy has just been established, for the foundation of which Mrs. R. L. Stuart has given $150,000.

HENRY C. CAMERON.

New Jersey Tea. See CEANOTHUS.

New Jeru′salem Church. This is the name given by Emanuel Swedenborg (see SWEDENBORG, EMANUEL) to the Church which he declared it to be his mission to found. In his writings he says no word, and to those who accepted his doctrines during his life he gave no advice, looking to a separate and distinct organization of the New Church at that time. A few years after his death some of those who had received his doctrines associated in London and took the name of "The New Church signified by the New Jerusalem in the Revelation." This organization has continued in England with changes from time to time, and now embraces many societies, which meet in a "General Conference" annually in different parts of the kingdom. In this country there is a "General Convention of the New Jerusalem in the U. S. of America," which holds annual meetings at different places. It is incorporated by the State of Illinois, and is composed of associations, other collective bodies of the Church, and isolated receivers. Its constitution provides for its membership, its organization, and its ministry. In many other countries there are societies or individual receivers. The New Church does not regard itself as a sect, or as one more added to the churches of Christendom. It believes itself to rest upon a wide system of religious doctrine, which accepts all the truth in existing beliefs, and provides the means of discerning and refuting their errors, and is therefore gradually to become the prevailing system of faith in the Christian world. The essentials of this Church, as stated by Swedenborg himself, are—I. The divinity of our Lord and Saviour Jesus Christ; II. the holiness of the Word; III. a life of charity. Whoever holds these in faith and in life is thereby a member of the New Church, whatever may be his or her theological name or place. They who hold and profess these doctrines, and desire to separate from other churches, unite together to help each other in learning the truth now revealed, and living and loving it. Thus united, they take the name of the New Church, but not in a sectarian, exclusive, or self-commendatory spirit.

All that Swedenborg teaches in his voluminous theological writings may be considered in reference to the three essentials above stated.

I. *The Divinity of the Lord.*—Swedenborg utterly rejects the doctrine of three persons in one God, and the connected doctrines of election, predestination, and salvation by faith alone. He holds that this doctrine of a personal Trinity has no distinct and apprehensible meaning, or else it teaches three Gods. At the same time he asserts a trinity of essence, but not of person, in God. It may assist us to comprehend this Trinity if we look at the corresponding trinity in man, who is made in the image and likeness of God. The soul is by itself inconceivable and without shape or force. But the soul forms and fills a body—a material body while we live on earth, and a spiritual body afterwards. (See SWEDENBORG.) The soul is manifested in and by the body, and acts through it as its instrument. Here we have soul, body, and action, and these three make up the living man. Jehovah, the Father, is in himself as utterly inaccessible to thought as he is to sight or touch. He is for ever in the Divine Humanity, and through this Divine Humanity is known and becomes an object of thought and faith and love. Through this Divine Humanity he acts, and this action or operation is of the Holy Spirit. God is a divine and infinite man. Before his incarnation his Divine Humanity made itself known, as far as was then possible, by various revelations, and he was worshipped under the idea of a divine man, which idea took various forms in different ages and nations. Since that event he, as our Lord and Saviour Jesus Christ, is the only proper object of love and worship for all who know him. The doctrine of our Lord runs through Swedenborg's writings, receiving illustration everywhere. Jehovah, the Father, assumed a human nature, and was born of the Virgin Mary. This human nature was full of germs of evil which she had inherited. Jesus Christ was tempted through them, but overcame them all; and as each evil was overcome and put away, the opposite good took its place, until the indwelling divinity filled the assumed humanity, and made it divine and one with the Father. While these temptations were going on, our Lord, in the moments of conflict and suffering, spoke of himself as distinct from the Father, and in the intervals of rest and peace spoke of himself and the Father as one. These temptations were all caused by evil spirits exciting the proclivities to evil he inherited from his mother. By victory in these temptations these evil spirits were overcome and completely subjugated, and man was redeemed from bondage to evil, and his spiritual freedom for ever secured. The glorification of the assumed humanity is a perfect type of the regeneration of man—with the difference that in our Lord all evils were excited and all overcome, because through the Father within he had infinite power, while in every man, whose power is necessarily finite, evil spirits are permitted to excite only those of his inherited evils, which he can overcome in his own freedom. All good springs from the love of the Lord and of the neighbor; all evil springs from the love of self and the love of the world for the sake of self. The character of every man consists of all the good and all the evil which he has done in freedom and from the love of it; and it abides for ever. If when he dies his ruling love is for good, he goes to heaven among his like; if his ruling love is for evil, he goes to hell among his like.

Swedenborg's doctrine of "Proprium" (this Latin word being retained in the English translations) is important, and near the centre of his system. The word may be translated "Ownhood;" and the doctrine, briefly stated, is this: Life flowing into man from the Lord, constantly and incessantly, is given to him to be his own, that he may be in actual freedom. He is in no sense and no measure independent of God, for every thought and every feeling or affection comes to him from God. It is given to him to be his own; and by this gift of the ownhood of his life man is himself and free, and not a mere channel through whom divine action flows. Hence, what a man loves and does from love he, in Swedenborg's language, appropriates; that is (*approprio* being from *ad* and *proprium*), adds to his ownhood, or to the life that is his own. By this doctrine of man's ownhood of life Swedenborg explains the origin of evil. Man, being actually free, may turn to evil or to good, and may pervert the life he receives by influx. He did and does turn himself to evil; he did and does pervert this influent divine life; and thus evil originated and continues. Nevertheless, the Lord gave and gives him freedom, for he desires to give him the greatest possible happiness a created being can enjoy; and this comes from the free and voluntary choice of good rather than evil. Children inherit the qualities of their parents and ancestors. By this inheritance man's natural "proprium" is full of proclivities to evil; and the whole effort of Divine Providence in relation to every man is to cleanse and vivify this ownhood.

The Lord alone is life, and has life in himself. All life is derived from him; and whatever exists, exists because he imparts to it his life and being. In everything which is, this life becomes what it is determined to be by the inmost form or nature of the thing itself; which form or nature is given to it by the Lord, that it may be what it is. He gives his life to man to become man's own life, that man may be himself and free. And because entire moral freedom is given to man, this influent divine life becomes in him whatever he chooses to make it, the Lord ever doing all that can be done without impairing his freedom to lead and guide him to goodness. But this freedom he never takes away. Hence, it results that the Lord cannot give any truth or any goodness to man which he does not receive willingly, for there must be voluntary reaction on the part of man, in his freedom, to meet the divine action. In the degree in which man, thus in his freedom, permits this influent divine life to be in him pure and unperverted, he is good; if he perverts it, he is evil.

If in this way he is good, he finds his place in heaven, where angels are blessed in the consciousness that all their life and affections and thoughts are from God in them, and are in them their own by his gift. If he becomes evil, he goes among those who believe that they live of and from themselves, and who are ruled compulsively by infinite mercy for their own sakes. All angels and evil spirits began life on this or some other earth.

There are three heavens. The life of the highest or heavenly heaven is love to the Lord; of the middle or spiritual heaven, it is charity or love to the neighbor; of the lowest or natural heaven, it is simple obedience. Each heaven consists of innumerable societies, every angel living in that which is in accordance with his character. Opposite to each heaven is a hell. Few persons go to heaven or to hell immediately upon their resurrection from the dead material body. (For an account of the spiritual body, and the substance of which it is formed, see article on SWEDENBORG.) They remain for a while, but not more than thirty years, in the "world of spirits," where their ruling love is liberated from conflicting or disguising elements of character; and when this is accomplished each one goes to his or her place in heaven or hell. But no one goes to hell who has not voluntarily rejected the good influences which would have saved him, and thereby confirmed himself in evil. Only those who reach adult age have power to do this, and therefore they who die before maturity are saved.

II. *The Holiness of the Word.*—The Bible is the word of God, uttered by him through writers who were fully inspired, and whose minds he used as his instruments. It was so written that it might be the expression of infinite and divine wisdom. This word, or wisdom, is in the heavens, a perpetual source of light for all angels. Upon earth it is expressed in human language, that it may give the light of life to all who live on earth. Within the literal sense is the spiritual sense, in which the Word is read by those in heaven; and this internal sense is adequately expressed by the literal sense, because this literal sense corresponds perfectly to the spiritual sense. This can be understood only so far as we understand the relation between natural things and spiritual things. The natural world is a world of effects, of which the causes are in the spiritual world; and the effects correspond to the causes. Hence, everything in nature corresponds to something in spirit, and when used in Scripture represents and signifies what it corresponds to. The whole end of Divine Providence in all its working is to bring men into a condition in which they may be happy for ever. In this work the Word is the chief instrument of the Lord. By means of correspondence it is in the literal sense brought down to all possible conditions of human character, so that it may reach every man wherever he stands and help him to ascend from his low estate. The fear of God is the beginning of wisdom; and if this lead to obedience, the first upward step is taken; and if it be followed, the fear of the Lord is at length converted into the love of him. This doctrine of correspondence is a vast subject in itself, and but little can be said of it here. Many correspondences are obvious, and constantly occur in common language. Heat corresponds to love or affection, light to truth or wisdom. And as all things in the spirit of man refer either to his will and affections, or else to his thoughts and understanding, so all things in nature refer and correspond to affections of some kind or character, or else to thoughts of some kind or character. Most of Swedenborg's theological writings are devoted to an exposition of the spiritual sense of Scripture, by applying thereto the doctrine of correspondence, and in all his works this subject is frequently referred to. Of our common Bible, the books of Ruth, Chronicles, Ezra, Nehemiah, Esther, Job, Proverbs, Ecclesiastes, and the Song of Solomon in the Old Testament, and the Acts and Epistles in the New, have no continuous spiritual sense, and were not written under the same full inspiration as the books which contain this sense. The first chapters of Genesis have only spiritual truth, the historical truth beginning with the account of Terah; and some statements in the Word—as, for example, that the sun and moon stood still—are true only in their spiritual sense.

III. *A Life of Charity.*—This word does not mean with Swedenborg eleemosynary gifts or acts. These are good, and should be done when and as they are called for. But charity is the love of the neighbor; and this is heavenly and leads to heaven when it is founded upon love to the Lord. Its highest and truest work is the faithful discharge of our daily duty in all the things required of us by the place or position which Providence has assigned to us. So it is we may do the most good to others, and manifest our love to Him who has given us this way of being useful, and therefore happy; for all happiness is founded upon usefulness.

Another doctrine of the New Church should be noticed—that of conjugial love. Of the two Latin words *conjugalis* and *conjugialis*, Swedenborg preferred the latter, and the common English translations retain this term. He strongly inculcates the sanctity of marriage, deducing this from its foundation in the perfect union of love and wisdom in the Divine Being, whence comes a union of corresponding nature, but infinitely diversified in form, throughout creation. Everywhere we find an image or resemblance of marriage. In the animal kingdom it is obvious; in the vegetable, less obvious, but as certain; and throughout creation we find a conjunction of two, diverse but adapted to each other, causing production. A man is in all particulars of body or mind a man, and a woman is a woman. Each is imperfect without the other. United, they form a one, and the marriage relation, which exists naturally in the natural world and spiritually in the spiritual world, is the instrument by which Infinite Love gives the highest and purest happiness created beings can receive; while unchastity and impurity of every kind, and most of all adultery, destroy all good in the will and all wisdom in the understanding of those who give themselves up to these infernal lusts.

The number of those who, professing the doctrines of the New Jerusalem, have separated from the former Church, is not large. But that of those who in all the churches have more or less knowledge of and respect for these doctrines is believed to be very large. THEOPHILUS PARSONS.

New Kent Court-house, cap. of New Kent co., Va. (see map of Virginia, ref. 6–I, for location of county). Pop. not in census.

New Leb'anon, post-v. and tp., Columbia co., N. Y. (see map of New York, ref. 6–J, for location of county), on Lebanon Springs R. R. The township includes Lebanon Springs, in the E. part of the town, celebrated for its thermal springs, Tilden's, New Lebanon Centre, West Lebanon, and New Britain. It has good schools, numerous churches, a female seminary, a glass manufactory, a vinegar factory, a grist and several saw mills, machine shops, etc. Pop. of tp. in 1870, 2124; in 1880, 2245.

New Le'on, a state of the Mexican Confederation, is bounded by San Luis Potosí, Tamaulipas, and Cohahuila, and comprises an area of 23,635 square miles, with 203,284 inhabitants, most of whom are whites and mestizoes. The surface is elevated, hilly, or mountainous, the climate hot but healthy, and the soil very fertile and well adapted for agriculture. The state has suffered very much, however, from military disturbances, and its natural riches are developed only on a very small scale. Cap. Monterey.

New Lexington, R. R. centre, cap. of Perry co., O. (see map of Ohio, ref. 6–G, for location of county), has mills, foundry, planing-mill, tanneries, etc. Pop. in 1870, 953; in 1880, 1357.

New Lisbon, on R. R., cap. of Columbiana co., O. (see map of Ohio, ref. 4–J, for location of county), has fine waterworks and several large manufacturing establishments. Pop, in 1870, 1569; in 1880, 2028.

New Lisbon, R. R. centre, Juneau co., Wis. (see map of Wisconsin, ref. 6–D, for location of county), on the Chicago Milwaukee and St. Paul R. R., 134 miles W. of Milwaukee, possesses fine water-power, good schools, flouring and lumbering mills, sash, door, and blind factory, brewery, farm-implement manufactory, etc. Pop. in 1870, 1221; in 1880, 1024.

New London, city, R. R. centre, and port of entry, one of the capitals of New London co., Conn. (see map of Connecticut, ref. 6–F, for location of county), on Thames River, 3 miles from its entrance into Long Island Sound, has water and gas, several fine schools, extensive iron-foundries, a woollen-mill, a cotton-gin factory, fruit-canning establishment, tannery, a silk and a shirt factory, and a cracker bakery consuming 100 barrels of flour daily. It has daily communication with New York City by steamboat, and with both New York and Boston daily by rail. New London is much frequented in summer by tourists, and its harbor is one of the finest on the Atlantic coast. Fort Trumbull is located here. Pop. in 1870, 9576; in 1880, 10,537.

New London, on R. R., cap. of Ralls co., Mo. (see map of Missouri, ref. 3–H, for location of county), 10 miles S. of Hannibal, has a graded school, a flouring-mill, etc. Pop. in 1870, 410; in 1880, 502.

New London, city and R. R. junction, Waupacca and Outagamie cos., Wis. (see map of Wisconsin, ref. 5–E, for location of counties), situated on Wolf River, just below the mouth of the Embarras, 40 miles S. W. of Green Bay and 48 miles N. W. of Fond du Lac, has several manufactories. Pop. in 1870, 1015; in 1880, 1808.

New Madrid, cap. of New Madrid co., Mo. (see map of Missouri, ref. 7–K, for location of county), on R. R. and the Mississippi River, 40 miles S. W. of Cairo, Ill., and 280 miles S. E. of Jefferson City, has an extensive river-trade, chiefly in shipping corn, lumber, and cattle to Southern markets. New Madrid is one of the oldest towns of the upper Mississippi, having been settled under the Spanish government of Louisiana in 1780, and has suffered from earthquakes, especially those of 1811, for which reason the houses are built of wood. Pop. in 1870, 634; in 1880, 712.

Newman (Edward), F. L. S., b. at Hampstead, England, May 13, 1801; began in childhood to study natural history, especially entomology; established and edited the *Entomological Magazine* 1833, the *Entomologist* 1840, the *Zoologist* 1843, and the *Phytologist* 1844; became in 1840 a publisher, and issued, besides many popular works by other writers, his own *History of British Ferns* (1840), *Dictionary of British Birds* (1866), *Illustrated Natural History of British Moths* (1869), *Illustrated Natural History of British Butterflies* (1871), and several minor treatises. He gave almost exclusive attention for several years to insects injurious to vegetation, and made discoveries important to the agriculturist and fruit-grower. D. June 12, 1876.

Newman (Francis), one of the early settlers in New Hampshire (1638), and subsequently at New Haven; was secretary under Gov. Eaton: was in 1653 a commissioner to the Dutch government at Manhattan to complain of encroachments upon the rights of the colony; was chosen assistant governor 1653, commissioner of the united colonies 1654 and 1658, and was governor of New Haven from 1658 to his death, Nov. 18, 1660.

Newman (Francis William), LL.D., b. in London June 27, 1805; studied in a private school at Ealing; graduated with double first-class honors at Worcester College, Oxford, 1826; was fellow of Baliol 1826–30, when he resigned on account of theological objections to subscribing the Thirty-nine Articles; proceeded with Mr. Graves and others on a kind of mission to the Mohammedans; resided a considerable time at Bagdad and travelled extensively in the Levant, acquiring a familiar knowledge of Arabic and of Oriental literature, but gradually becoming widely alienated from Anglican theology; was classical tutor in Bristol College from 1834–40, professor of classics at Manchester New College, London, 1840–46, and professor of the Latin language and literature at University College, London, 1846–63, since which time he has devoted himself exclusively to literature. Similar in mental characteristics to his celebrated brother, Mr. Newman has diverged from the Church of England in precisely the opposite direction, though the title of his first book betrays the same longing for ecclesiastical unity which led Dr. J. H. Newman to the Church of Rome. Author of *Catholic Union: Essays toward a Church of the Future and the Organization of Philanthropy* (1844), a scholarly *History of the Hebrew Monarchy* (1847), *The Soul, its Sorrows and Aspirations* (1849), a remarkable autobiography entitled *Phases of Faith, or Passages from the History of my Creed* (1850), *Lectures on Political Economy* (1851), *Regal Rome* (1852), *The Odes of Horace translated into unrhymed English Metres* (1853), *The Iliad of Homer translated into unrhymed English Metres* (1856), *Theism, Doctrinal and Practical* (1858), *Textbook of Modern Arabic* (1866), *A Grammar of the Berber Language*, *Europe of the Near Future* (1871), and an English-Arabic *Dictionary* in Roman type, besides treatises on many other subjects, including mathematics, social science, politics, elocution, philology, and general literature, which exhibit great scholarship and wonderful versatility.

Porter C. Bliss.

Newman (John Henry), D. D., brother of F. W. Newman, b. in London Feb. 21, 1801; was educated at Ealing and at Trinity College, Oxford; graduated B. A. 1820; was chosen a fellow of Oriel; took Anglican orders 1824; was vice-principal of St. Alban's Hall 1825–26; tutor of Oriel 1826; opposed Catholic emancipation 1829; was one of the university preachers 1830; joined with Hurrell Froude in forming a conservative Anglo-Catholic party within the Church of England; visited Rome and Sicily 1832–33; took part with Keble and Pusey in originating the "Oxford Movement;" was a leader in the propaganda of "High Church" doctrines by means of the celebrated *Tracts for the Times;* rapidly developed his tendencies toward Roman Catholicism; was in 1828–43 incumbent of St. Mary's, Oxford, and chaplain of Littlemore, and acquired great fame as a preacher and writer; founded at Littlemore in 1842 a community of ascetics. In 1845 he joined the Roman Catholic priesthood, and became head of the Oratorian establishment at Birmingham; was rector of the Roman Catholic University, Dublin, 1854–58, and then became head of the Roman Catholic school at Edgbaston. Author of *Tract No. 90, Parochial Sermons, Essay on Development of Christian Doctrine, Arians of the Fourth Century* (1833), *Theory of Religious Belief* (1844), *Callista, a Sketch of the Third Century, Loss and Gain* (1848), *Apologia pro Vita Sua* (1864), *An Essay in Aid of a Grammar of Assent* (1870), *A History of Arianism* (1875), many sermons, lectures, essays, and other works, including a reply to Gladstone's pamphlet on the *Vatican Decrees* (1875) and *A Letter addressed to His Grace the Duke of Norfolk.* He was appointed cardinal May 12, 1879.

Newman (John P.), D. D., b. in New York City Sept. 1, 1826; educated at Cazenovia Seminary; became a minister of the Methodist Episcopal Church; was for several years pastor of the Metropolitan M. E. church, Washington, D. C., and chaplain of the U. S. Senate 1869–74; is a member of the Society of Biblical Archæology, and author of *From Dan to Beersheba* and *The Thrones and Palaces of Babylon and Nineveh* (1875), works of Oriental travel presenting observations made on an official tour of inspection of the U. S. consulates in Asia; was pastor Madison Ave. Cong. church, New York, 1882–84.

Newman (Samuel), b. at Banbury, Oxfordshire, England, in 1602; graduated at Oxford 1620; took orders in the Church of England; came to Massachusetts 1636; preached nearly two years at Dorchester; was pastor of the church at Weymouth 1638–43, and removed in 1644, with a portion of his church, to Seconet, where they founded the town of Rehoboth, then embracing Seekonk and Pawtucket, R. I. D. at Rehoboth July 5, 1663. Author of a *Concordance for the Bible* (Lond., 1643; Camb., 1683; 5th ed., Lond., 1720), known as the *Cambridge Concordance*, and formerly supposed to be the first work of the kind.

Newman (Samuel Phillips), son of Mark H. Newman, the publisher, b. at Andover, Mass., in 1796; graduated at Bowdoin Coll. 1816; was prof. of rhetoric in that institution 1824–39, and principal of the Massachusetts State Normal School 1839–42. D. at Barre, Mass., Feb. 10, 1842. Author of *Elements of Political Economy, The Southern Eclectic Readers* (3 parts), and *A Practical System of Rhetoric*, of which more than 60 eds. were issued in the U. S. and in England.

Newmar'ket, town of England, partly in the county of Cambridge, partly in that of Suffolk, is the seat of the most famous race-course in England, and in 1881 had 5093 inhabitants, most of whom are jockeys, grooms, trainers, and stablemen.

New'market, post-v. of York co., Ontario, Canada, on the Northern Railway, 34 miles N. of Toronto, has 2 weekly newspapers, important manufactures, and trade. Pop. of sub-district in 1881, 2006.

New Market, N. H. See Appendix.

New Market, Shenandoah co., Va. (see map of Virginia, ref. 4–G, for location of county), 50 miles S. of Winchester, has a polytechnic institute and a female seminary. Pop. in 1870, 600; in 1880, 662.

New Mar'tinsville, cap. of Wetzel co., West Va. (see map of West Virginia, ref. 3–D, for location of county), 40 m. S. of Wheeling, on the Ohio River, has a woollen-factory and several mills. Pop. in 1870, 260; in 1880, 778.

New Mex'ico, a south-western Territory of the U. S. (see map of Ari., Cal., New Mexico, Ut., and Nev., in article California), between 31° 20' and 37° N. lat. and 103° 2' and 109° 2' W. lon.; bounded on the N. by Colorado, on the E. by Indian Territory and Texas, on the S. by Texas and Mexico, on the W. by Arizona: length from N. to S., 345 miles on the E. side, 380 miles on the W. side; breadth from E. to W., 330 miles on the N. line, 352 miles on the S.; area, 122,580 square miles, or 78,451,200 acres.

Face of the Country.—New Mexico forms a part of the lofty table-land which is the foundation of the Rocky Mountain ranges, as well as those of the Sierra Madre. This table-land gradually slopes southward to the Llano Estacado or Staked Plain and to El Paso. The Llano Estacado is a broad, almost level, treeless, and waterless plain, extending over 3 or 4 degrees of lon. and nearly as many of lat., which is apparently barren, but is capable, if by any means it can be irrigated, of yielding large crops. From the elevated table-land there rise hundreds of summits of the Rocky Mountains, and W. of the Rio Grande the peaks of the Sierra Madre lift themselves from 3000 to 10,000 feet above the *mesa* or plateau. The mountain-chains E. of the Rio Grande valley are known locally as the Guadalupe, Sacramento, and Organ Mountains, and still farther E. the Sierras Blanca, Hueca, Capitana, etc., which form the W. boundary of the valley of the Rio Pecos. W. of the Rio Grande the Sierra Madre is divided into numerous chains and some isolated peaks. The principal of these mountain-chains are the Sierra San Mateo, the Zuñi Mountains, the Sierra del Datil, and the Sierra Mimbres. Still farther W. the San Juan Mountains enter the Territory from Colorado, and the heavy masses of the Mogollon

Mountains and the Pinaleno, Peloncito, and Chiricahua Mountains from Arizona. The principal river of New Mexico is the Rio Grande, which has a general direction from N. to S., but is not navigable in any part of its course through New Mexico. It receives from the W. two tributaries, the Rio Chama and the Rio Puerco, and from the E. several smaller streams. The Rio Pecos, a large affluent of the Rio Grande, drains the S. E. and E. portion of the Territory, and the Canadian River and two or three of its branches the N. E. The W. portion is drained by the large tributaries of the Colorado River and their affluents, and particularly by the San Juan, Little Colorado, and Gila, each of which has three or four considerable tributaries.

Minerals.—Gold and silver are both abundant in this Territory. The oldest mining-districts are the Old and New Placers, Pinos Altos, Cimarron, Arroya, Hondo, Manzano, and Moreno, and tracts in the Organ Mountains, the Sierras Blanca, Carriza, Jicarrilla, and the Mogollon and Magdalena Mountains. Copper is found in very rich ores in several parts of the Territory, the Santa Rita mine, in Grant co., producing 3000 pounds of copper per week. Galena mines in the Organ Mountains yield 80 per cent. of pure lead, besides about $50 worth of silver to the ton. Iron and salt are abundant. Anthracite coal is found in the Placiere Mountains, on the E. border of the Rio Grande valley, 30 or 40 miles S. S. W. of Santa Fé, and bituminous at various points in cañons in the Cretaceous plains, where by erosion the strata have been cut through to the coal-measures, and the lignites in the Tertiary beds of the N. part of the Territory. There are numerous mineral springs in New Mexico, and the Hot Springs, about 5 miles from Las Vegas, have a very high reputation. The temperature varies from 80° to 140° F.

Soil and Vegetation.—The mountain-ranges are partially covered (where they are not basaltic) with pine, cedar, spruce, and other evergreens. The foot-hills have extensive tracts of piñon or nut-pine and a smaller cedar, and in the river-bottoms are belts of cottonwood, sycamore, and other deciduous trees. In the S. part of the Territory there are numerous groves of oak and walnut; in the Llano Estacado the mesquite grows to a varying height of from 5 to 20 feet. In the S. and S. W. portions of the Territory the tree-cactus is a marked feature in the landscape. There are many indigenous grasses in the Territory, the most widely spread and valuable of them all being the nutritious mesquite or gama-grass, which grows during the rainy season of July and August, ripens in the autumn, and dries on its stalk, furnishing to cattle, in its stalks and rich seeds, a valuable natural hay of which they are exceedingly fond, The arable soils, under the influence of irrigation, yield fair crops, but the soil is not remarkable for fertility.

Zoology.—The deer, elk, big-horn, wild-hog, antelope, cougar or panther, ocelot, lynx, the grizzly, Mexican or brown, and the black bear, the coyote, wolf, marmot or gopher, beaver, skunk, weasel, rabbit, hare, and squirrel are the principal quadrupeds, while vultures, hawks, turkeys, geese, swans, brant, ducks, and teal are the most common birds, and scorpions, lizards, and horned frogs are the most abundant reptiles. Centipedes are not uncommon.

Climate.—The climate of New Mexico, though varied, is dry. In the N. the range of the thermometer is between 10° and 75° F. In the S. the temperature is very mild, the thermometer rarely indicating as low a temperature as 32°. The rainy season in the S. part of the Territory is in July and August. The amount of annual rainfall is 15.80 inches. The prevalent winds are E. S. E., S. W., W., and N. The climate has justly a high reputation for healthfulness.

Agricultural Products.—The sterility of soil and paucity of population do not permit large production of cereal crops. By the census of 1880 there were raised 706,641 bushels of wheat, 633,786 bushels of Indian corn, 156,527 bushels of oats, 50,053 bushels of barley, and 240 bushels of rye. The wool-clip of 1880 yielded 4,019,188 pounds; 890 pounds of tobacco were raised.

*Farm Animals.**—By the census of 1880, New Mexico had 14,547 horses, 166,701 cattle, 2,088,831 sheep, and 7857 swine.

Manufactures.—These are insignificant, the Territory being dependent on importation for nearly all products, except a few of the ruder and more common manufactures.

Railroads.—There were in operation, Jan., 1882, within the Territory, 975 miles of railway, costing $28,369,300, with net earnings of $211,756, paying in interest and dividends $106,780. The Southern Pacific and Atchison Topeka and Santa Fé are the longest lines.

Finances.—The assessed valuation of property in 1881 was $19,523,624; rate of tax, 50 cents on $100 for Territorial purposes; total taxation, $126,942; aggregate debt, Territorial, local, etc., $84,872.

Banking Institutions.—In Oct., 1881, there were 4 national banks in New Mexico, with capital of $400,000: circulation, $352,437; U. S. bonds to secure circulation, $400,000; deposits, $1,125,640. There were also 8 private bankers, with capital of $13,333 and $459,518 deposits.

Education, etc.—The number of children of school-age (seven to eighteen years), as last reported, was 29,312, of whom only 4755 were enrolled in public schools in 1880. Total expenditure for public schools in 1880, $28,973, of which $28,002 was for teachers' salaries. In 1882 there were 21 newspapers published in New Mex., none daily.

Churches.—The Roman Catholic religion is greatly in the ascendency, owing to the Spanish origin of so many of the inhabitants. It claims 121,000 Catholic pop., 38 churches, and 94 priests: the Presbyterians have 7 churches, 162 members; the Baptists, 1 church, 20 members.

Population.—In 1860, 93,516; 1870, 91,874; 1880, 119,565 (white 108,721, colored 10,844, including 57 Chinese and 9772 Indians); in 1885, 133,530, not including Indians on reservations.

Principal Cities and Towns, Pop. 1880.—Santa Fé (cap.), 6635; Albuquerque, 2315; Silver City, 1880; Las Vegas, pop. not given; Socorro, 1272; Bernalillo, 1223.

COUNTIES.	†Ref.	Pop. 1880.	Pop. 1885.	COUNTY TOWNS.	Pop. 1880.
Bernalillo	6–J	17,225	20,061	Albuquerque	2,315
Colfax	5–K	3,398	5,668	Springer	34
Dona Ana	7–J	7,612	7,921	Las Cruces.	
Grant	7–I	4,539	7,397	Silver City	1,800
Lincoln	7–K	2,513	4,777	Lincoln	638
Mora	5–K	9,751	10,015	Mora	915
Rio Arriba	5–I	11,023	11,764	Tierra Amarilla.	
San Miguel	6–K	20,638	21,435	Las Vegas.	
Santa Fé	5–J	10,867	10,455	Santa Fé	6,635
Sierra ‡	7–J	......	2,438	Hillsborough.	
Socorro	7–I	7,875	12,315	Socorro	1,272
Taos	5–I	11,029	9,775	Fernandez de Taos.	
Valencia	6–J	13,095	9,509	Los Lunas.	876
Total		119,565	133,530		

History.—At the time of the discovery of the American continent New Mexico had a large and industrious population, either Aztec or Toltec, who had their walled towns, their stone dwellings, several stories in height, their manufactures of cotton and wool, their rude but effective weapons of war, and who cultivated and irrigated the soil and gathered therefrom large crops. They were idolaters. The Spanish adventurers Alvar Nuñez, Marco de Niza, and Coronado penetrated to this region in 1537, 1539, and 1540. In 1581 the country was explored by Capt. Francisco de Bonillo and his comrades, all Spanish adventurers, from whose account it was named New Mexico. Between 1595 and 1599, Juan de Oñate was sent thither by the viceroy of Mexico to establish forts, colonies, and missions, and to take possession of the whole country in the name of his master, the king of Spain. Oñate was successful, but at length the Indians rose, and drove the Spaniards out of the country in 1680. In 1698 the Spaniards regained a portion of their former power. In 1822 the inhabitants of New Mexico united with the other inhabitants of Mexico in throwing off the yoke of Spain, and thenceforward, until 1846, they were governed in the same way with the other states of Mexico. In 1846, Gen. Stephen Kearny with a small U. S. force captured Santa Fé, and soon after conquered the whole Territory and raised the American flag there. In 1848 it was ceded to the U. S. by the treaty of Guadalupe Hidalgo. The present Territorial government was organized Sept. 9, 1850. By the treaty of Dec. 30, 1853, what was known as the Gadsden Purchase was added to it. It then comprised the whole of Arizona and a portion of what is now Colorado. Arizona was set off from it in 1863, and the portion of Colorado in 1865. During the early part of the late civil war New Mexico was the scene of a protracted and bloody strife. In 1859 the Territorial legislature passed a law recognizing the existence of slavery in the Territory, but this was repealed in 1861, and with it was abolished the system of peonage—a modified slavery which had existed for two and a half centuries.

Governors.

James S. Calhoun	1851–52	William A. Pile	1869–71
William C. Lane	1852–53	Marsh Giddings	1871–76
Solon Borland	1853	Samuel B. Axtell	1876–78
David Merriwether	1853–57	Lewis Wallace	1878–81
Abraham Rencher	1857–61	Lionel A. Sheldon	1881–85
Henry Conolly	1861–65	Edmund G. Ross	1885–
Robert B. Mitchell	1865–67		
W. F. M. Arny (acting)	1867–69		

REVISED BY A. R. SPOFFORD.

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* On farms only.

† Reference for location of counties. See map of New Mexico, in article CALIFORNIA.

‡ Formed since census of 1880.

New Mil′ford, Litchfield co., Conn. (see map of Connecticut, ref. 4–C, for location of county), 36 miles N. of Bridgeport, on the Housatonic River and R. R., contains the Adelphic Institute, navy-button factories, an efficient fire-department, a park association, and is one of the largest tobacco-packing towns in New England. Pop. of tp. in 1870, 3586; in 1880, 3907.

New′nan, city and R. R. junction, cap. of Coweta co., Ga. (see map of Georgia, ref. 3–F, for location of county), is a manufacturing town. Pop. in 1870, 1917; in 1880, 2006.

New Neth′erlands, the old name of the country situated between Delaware and Connecticut rivers. The exclusive right to trade here was granted, Oct. 11, 1614, by the states-general to the explorers. In 1623, New Netherlands was made a province or county of Holland, and the states-general granted it the armorial distinction of a count. In Sept., 1664, the colony of New Netherlands, which Charles II. had granted to his brother, the duke of York, was conquered by the capitulation of New Amsterdam.

New Orleans, State of Louisiana (see map of Louisiana, ref. 10–F, for location), chief city, commercial metropolis, and port of entry of Gulf States, and tenth city of the U. S. in population, situated upon both sides of Mississippi River, but chiefly on the left or northern bank, 107 miles above its mouth, embraces the whole of Orleans parish, reaching on the N. and E. to Lakes Pontchartrain and Borgne, covering a statutory area of 187 sq. m., though the settled area within the drainage districts comprises only 40 sq. m. The greatest length from W. to N. E. is 22 miles, and greatest breadth across the N. E. peninsula 10 miles. The lines of lat. 30° N. and lon. 90° W. of Greenwich intersect in its lower suburbs, 1 mile from the river. The general course of the river is from W. to E. past the city, which, however, occupies a curve or bend in the shape of an S 10 miles in length along the N. side of the river, giving it the appropriate name of "the Crescent City." The boundary, about 4 miles below the centre of the city, is the parish of St. Bernard, and that above it, is the upper line of Carrollton, 6½ miles above, running back 5 miles to Lake Pontchartrain. The suburb of Algiers occupies the S. side of the river. The city lies 960 miles below the mouth of Ohio River, and is 1103 miles by railway from Washington. It is built entirely on the alluvial bank, and is wholly below high-water level of the river. It is protected from yearly floods by a levee raised in front along the river-bank and extending back to the lake above the city, and also along the lake-front as a precaution against the back-water caused by storm-winds on the lake and Gulf. A system of drainage-canals with powerful machinery drives out into the lake the rainfall, sewage, and seapage of the city. The elevation of the flood-water of the river in front of the city is 15 feet above the level of the lake and Gulf. The climate is not extreme, frosts being rare, and the temperature averaging about 69° F. The vicinity of marshes and shoal-water lakes produces a high degree of water-saturation, and consequently an annual mean rainfall of 57 inches. The mean annual height of the barometer is 30.075 inches, with a range of 1.31 inches. Temperature, 1881, 69.72°; 1882, 70.79°; 1883, 71.17°; 1884, 70.25°; mean, 70.27°; average minimum, 48.62°; average maximum, 90.31°.

The city is reached by both river and railway, with a constant arrival and departure of steamboats and trains. The river abounds in boats of all dimensions, plying for trade and travel both up and down, and the packet lines running to the nearer river-cities are of a magnificence and elegance unequalled on any other waters. There are steamship lines to New York, Boston, Philadelphia, Baltimore, Havana, Key West, and Florida ports, Vera Cruz and other Mexican, Central, and South American ports, Texas ports, Liverpool, Havre, and Bremen, and also an indefinite number of small vessels, both sail and steam, engaged in the trade and travel of Lake Pontchartrain. Six important railroads enter the city—namely, the Louisville and Nashville, formerly known as the New Orleans and Mobile; the Chicago St. Louis and New Orleans, or Southern Division of the Illinois Central; Morgan's Louisiana and Texas, or Southern Pacific; the Texas Pacific; Cincinnati New Orleans and Texas Pacific, or New Orleans and North-eastern; and the Louisville New Orleans and Texas, or "Mississippi Valley" route. In addition to these trunk lines, the New Orleans Lake Borgne and Terre aux Bœuf Railroad extends from New Orleans to Shell Beach, formerly Proctorsville, 22 miles.

The original plat of New Orleans was laid out in 1718 under Gov. de Bienville and was less than 1 mile square, the streets crossing at right angles, with the cathedral at the front centre, facing the river. As the city extended in the bend of the river it became necessary to conform the streets to its peculiar shape; hence, in the upper and lower additions they meet and diverge in a very irregular and abrupt manner. The streets in the original or French part of the city are very narrow, chiefly 40 feet wide. Canal street, the dividing-line between the old French and what is now called the American part of the city, is a boulevard of great beauty, 210 feet in width; so also are Claiborne, Rampart, Esplanade, St. Charles, and other avenues. There are 17 public parks and squares in the city, 3 canals for commercial purposes, 10 or 12 for draining, and 16 markets. The public buildings of greatest interest are the U. S. custom-house, the cathedral, and court-halls, facing Jackson Square, the city hall, fronting La Fayette Square, the university buildings, on Common street, the charity hospital, the marine hospital, the Hôtel Dieu, the St. Charles Hotel and the St. Louis Hotel (once the State-house), and the cotton and sugar exchanges. There are several churches of considerable architectural elegance, as well as several well-built banking-houses. The street railroads render intercourse between all parts of the city and its suburbs easy and cheap. The extent of track is about 158 miles, under the operation of 8 companies. Two sets of gasworks supply the city with gas. The waterworks amply supply the middle and lower parts of the city, but the upper districts are without their benefit. The water is pumped into the reservoir from the river at 1000 feet distance, and is partly settled before passing into the pipes. This water is used freely for drinking purposes, but cisterns to collect the rain-water are used in all portions of the city for drinking, especially in the upper districts. The river-water is considered equally healthy, but is less palatable. The public wharves are divided into 15 sections; the landings are 49 in number. Steamers, sail-vessels, and all crafts are duly assigned their places. The ferries along the river-front are 12 in number, of which 9 are steam-ferries and 3 skiffs.

The commercial position and trade of New Orleans are of the highest interest. Situated near the mouth of a river that gives secure harbor for vessels of all draughts known to navigation, the city concentrates the ocean and coast-bound commerce of 100 navigable rivers and more than 20,000 miles of navigable channel. The area of the Valley of the Mississippi is 1,238,642 sq. m., with a population, largely agricultural, of 21,821,854 souls. New Orleans has long been the chief cotton-mart of the world, and one of the chief sugar-marts. Its greatest commerce, as indicated by these two staples, was reached in 1861, when there were received 2,255,448 bales of cotton and 460,000 hogsheads of sugar. The following statistics will illustrate the present magnitude of the trade of New Orleans: In the years 1883–84 there were received from the interior 1,709,481 bales of cotton from a total crop of 5,713,206 bales: sugar, 106,916 hogsheads and 291,230 barrels; 269,943 barrels of molasses; rice, 248,703 barrels; tobacco, 7068 hogsheads; flour, 711,390 barrels; wheat, 1,211,702 bushels; hay, 173,410 tons; pork, 50,726 barrels; bacon, 15,682 boxes; lard, 25,904 tierces; corn, 5,677,128 bushels. The total foreign imports of 1883–84 were $10,612,592; duties collected, $2,057,861. Chief articles of import: Coffee, $2,885,724; sugar, $1,336,761; fruit, $1,311,787; tin, $414,879. Exports to foreign countries, $81,004,455, cotton, tobacco, wheat, and staves constituting the principal articles exported. Entrances: Foreign, tonnage 681,441; coastwise, tonnage 317,340; total, 998,781. Clearances: Foreign, tonnage 706,959; coastwise, tonnage 350,212; total, 1,057,171. Vessels entered the port, 1116; cleared, 1147.

Manufactures.—In the absence of good water-power and of available skilled labor, the manufactures of New Orleans are neither extensive nor valuable. There were 915 establishments in 1880, with a capital of $8,565,303, employing 9504 hands and turning out $18,806,096 of products.

City Government.—The administration of the city affairs is committed to a mayor, four administrative or executive officers—treasurer, comptroller, and commissioners of public works and police and of public buildings—and a board of aldermen, consisting of 31 members, elected by the several wards and districts. All the officials serve for four years. They are aided by a board of health with a president, 5 directors, and 5 sanitary commissioners; a surveyor, city attorney, superintendent of fire-alarm telegraph, coroner, superintendent of house of refuge, warden of the work-house, a librarian, a superintendent of the public schools, and a board of 20 directors. Most of these have their offices in the city hall, which is an elegant white marble building of Ionic façade, fronting on La Fayette Square. It contains the public library of the common schools, with 7000 volumes, which suffered during the war and has not grown since.

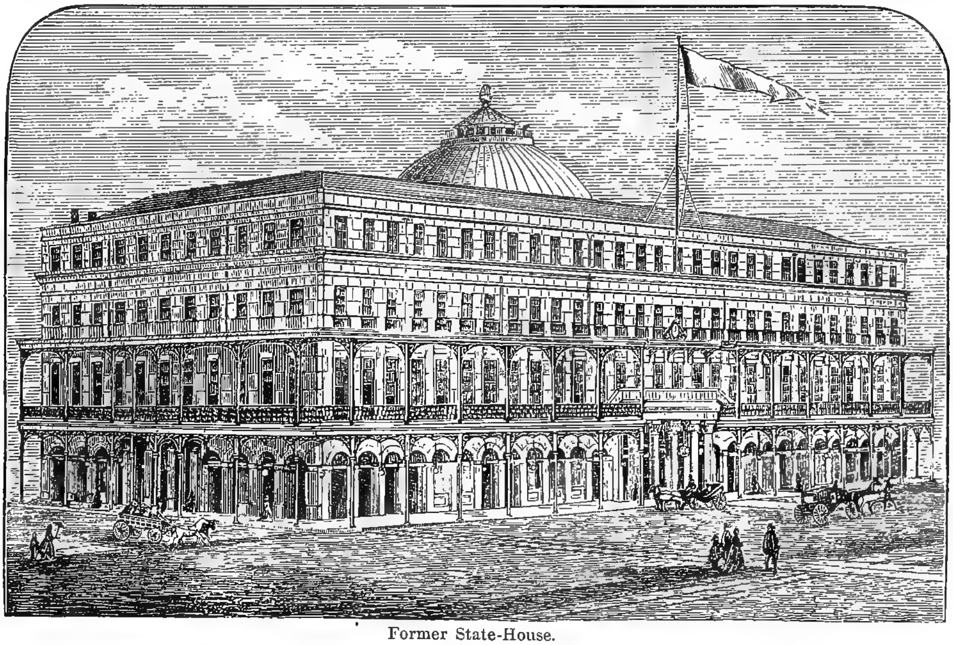
Metropolitan Police.—The police of the city is under the control of the mayor and council, with a superintendent or chief of police and about 200 privates. The city is divided into 8 precincts and 2 suburban precincts. A fire-alarm telegraph is under the direction of the police. It has 9 stations or boxes, reaching within two squares of any portion of the city. The Firemen's Charitable Association has entire charge of the fire department; the police give the alarm. The city and underwriters contribute to the expense of supporting the organization, but no pay is received by the members. There are 4 chief engineers and 4 assistant engineers of the several departments for the city proper and the fifth, sixth, and seventh districts. There are 40 companies in the 7 districts, Carrollton included.

The *judicial department* of Louisiana consists of 5 supreme judges. The lower or district court for New Orleans has two divisions—one criminal with two sections, the other civil with five sections—each presided over by a judge. These city courts are served by one criminal and one civil sheriff. Recorders' courts and courts for the execution of the city ordinances are also established. The city prison, known as the "Calaboose," is 123 by 129 feet, and cost $200,000. It is very secure and very healthful, having been several times exempt from yellow fever when the disease was epidemic.

City Assessment.—1860, $121,038,650; 1861, $124,174.403; 1863, $100,869,098; 1865, $98,788,335; 1870, $139,844,204; 1875, $118,637,715; 1884, $114,628,814. *Debt.*—1865, $7,492,250; 1875, $22,002,030; 1884, $18,427,185. *Items of Expenditure.*—Firemen's Charitable Association, $199,900; lighting the city, $119,625; police, $186,000; city debt interest, $1,125,288. The city debt amounts to 16 per cent. of the assessment, whereas prior to the war it was only 4 per cent.

Religious Sects.—The French, Italian, Spanish, and Irish population of New Orleans is largely Roman Catholic, while most of the American and German residents are Protestants. The various sects in New Orleans have lived without fanatical rancor or bigotry, and in business or friendly relations there appear to be no discriminations on account of creed. The churches (171 in number) are in the main elegant buildings. Those of the Roman Catholics and Episcopalians may be ranked first in architectural elegance. The value of the Roman Catholic churches and school buildings far exceeds that of all the other church property in New Orleans. There are 33 Roman Catholic churches; 52 Baptist, of which 30 are colored; 12 Episcopal; 7 Evangelical Protestant; 1 Greek; 8 Lutheran; 23 Methodist Episcopal, of which 13 are colored; 11 Methodist, of which 1 is colored; 12 Presbyterian, 1 Unitarian, and 5 Hebrew.

Among the institutions of learning is the Tulare University of Louisiana, with three divisions, law, medicine, and academic, and 25 professors. The Jesuit College is a flourishing institution. There are several schools and convents under the patronage of the Roman Catholic Church. The Ursuline convent, just below the city, was the first educational establishment in the Mississippi Valley, being founded in 1727. The Peabody Seminary or high school, with 70 pupils, and the normal, with 60 pupils, are in very successful operation. The seminary has already trained 250 well-qualified teachers for the State public schools for white youth, and the Peabody normal school, of more recent origin, has done a similar work, through 40 such teachers, for the colored schools. There are three institutions of collegiate grade for the education of colored students, including the university supported by the State. The public schools of New Orleans have justly been a source of pride to the people. They were established about the year 1840, and were in complete operation in 1844. Since emancipation, schools for blacks have been put on the same footing as those for whites, and they have been extensively attended. The number of public schools is 53; teachers, 390; pupils, 21,641. The cost of supporting them, which is an *ad-valorem* tax upon all property in the city, amounts to $290,000 yearly. The schools are under the direction of a superintendent and 20 directors.



Former State-House.

There are 26 newspapers—7 daily (1 in the French language, 1 in German) and 19 weeklies.

Asylums and Hospitals.—The asylums of the city comprise 62, of very various character and management. Among the most noted of these are several large orphan asylums, Roman Catholic and Protestant, the Widows' Home, and the Asylum for the Old and Infirm. These various benevolent institutions are partly supported at the city's expense. The number of inmates for which the city makes provision is 2836. The Widows' Home was founded, supported, and is now endowed exclusively by the late Dr. William Newton Mercer of New Orleans. The hospitals of the city are 4 in number, and are variously supported; but the charity hospital is of general jurisdiction, at once a beneficence and an honor to the city. There are 2 others of specific character, and 4 infirmaries.

Hotels and Clubs.—The St. Charles Hotel has long been ranked as one of the first in the U. S. It was destroyed by fire in 1850, but rebuilt in 1852 with greater elegance, being noted for its spacious balcony, portico, and rotunda ornamented with Corinthian pillars. Vonderbank's and the City hotels are spacious and comfortable. The St. Louis, formerly a rival of the St. Charles, was used as a State-house until the restoration of Baton Rouge as capital of the State. The restaurant was reputed the best in America, especially those which preserve the "famous Creole *cuisine* of ante-war times." There are 20 clubs, literary, dramatic, or social, among which the most notable are the Pickwick, Boston, Jockey, and Shakespeare.

Cemeteries.—Of these there are 34. The oldest are situated in the lower part of the city, and belong to the Roman Catholic population. Of late years higher grounds have been selected for the purpose on the ridge-lands of Metairie Bayou on the outskirts of the city. New Orleans is peculiar in the disposition of its dead. The lowness of the ground, being below the flood-level of the Mississippi, renders it impracticable to bury in the earth; hence nearly all interments have to be in sepulchres of some sort. The devices of these are as various as the means and taste of the builders suggest, from the tomb of simple brick masonry to the costly sculptured marble. The general form of the most expensive class is that of a miniature temple, the opening like a door in the front, upon which is placed the inscription. These grounds are laid out in right angles, and the tombs ranged upon the intersecting avenues as streets, realizing more perfectly than anywhere else the idea of "cities of the dead." These avenues are lined with trees of the evergreen class, and wherever practicable are ornamented with cultivated flowers, and around many of the tombs there are little flower-gardens of exquisite beauty. It is obvious that such tenements as these need care and protection against the ravages of time. Consequently, the festival of All Saints' Day (Nov. 1) has a twofold value—to keep in tender recollection those passed from sight, and to keep in repair their resting-places. For a week or two previously, all needful repairs are made, all clearing up, cleaning, and resetting of plants, etc., and on the grand festival-day the whole city unites in its floral decorations. It is a truly beautiful and impressive sight.

The Masons have a grand lodge and 35 subordinate lodges; the Independent Order of Odd Fellows has a grand lodge and 17 subordinate lodges and an encampment; the Heptasophs have 1 grand lodge and 2 subordinate lodges: the temperance organizations have 5 divisions and 29 temples of honor, and there are 3 encampments of Knights Templar, 1 Independent Order of Temperance, 1 division of United Brethren, a grand grove of United Druids and 6 subordinate groves, with a "Norma" or supreme Irish chapter, 15 lodges of Knights of Pythias, 5 of United Order of Red Men, and the Hibernian Aid with 6 branches. To these we add 47 independent benevolent associations, and among them the Howards and the Firemen's Charitable Association. Many of these associations have burying-places and mausoleums of their own, and are active in their attention to all strangers and other needy persons coming within their orders.

Defences.—The two principal defences of New Orleans are Forts Jackson and St. Philip on opposite banks of the Mississippi, 83 miles below the city, surrendered to Gen. Butler in Apr., 1862. Fort Pike is situated on the marsh at the Pontchartrain end, and Fort Macomb at the Lake Borgne end, of the Rigolets Pass; Fort Wood is on the W. border of Bayou Chef Menteur; and Fort Macomb, 6 miles S. E. of Fort Pike, is surrounded by unhealthy marshes and has been virtually abandoned. There are 13 admirably disciplined and accoutred military companies.

Of the public monuments of the city, the first in interest is that in honor of the victory of 1815, erected on the old battle-ground, just below the lower boundary of the city. It is a plain granite shaft 100 feet high, but in very rickety and neglected condition. An equestrian statue of Gen. Andrew Jackson, cast from the cannon captured by him at the battle of New Orleans, is erected on a granite pedestal in the centre of Jackson Square, formerly the Place d'Armes, opposite the old cathedral. A colossal bronze statue of Henry Clay stands in the attitude of oratory at the intersection of St. Charles and Canal streets. One of Benjamin Franklin, in La Fayette Square, fronting the city hall, is of Powers's finest workmanship. A marble shaft in honor of Gov. Allen of Louisiana stands in Washington Cemetery, and a monument of white marble to the "Confederate dead" in Cypress Grove Cemetery. There also now stands a bronze colossal statue of Gen. R. E. Lee, on Lee (formerly Tivoli) Circle. It is mounted on a marble shaft 100 feet high.

The U. S. custom-house, a solid building of Quincy granite, covering an entire square, is, next to the U. S. Capitol and treasury, the largest public edifice in the U. S. It contains the offices for the customs, the post-office, the U. S. courts, the internal revenue, the surveyor-general's office, and the receiver and register of the land-office.

Mardi Gras.—The festival preceding the first day of Lent, or Ash Wednesday, is one of special interest in New Orleans, and the city is distinguished for the splendor she gives to her favorite holiday, the "Mardi Gras" or "Fat Tuesday." Most of the distinctive ceremonies now annually performed were originally introduced by the French population as early as 1827, and for many years their celebration was confined chiefly to them. One of the leading features has been the procession of the "Bœuf Gras," the ox gorgeously dressed and attended through the streets with much pomp by large numbers of gayly and grotesquely masked butchers. Everything pertaining to these festivities now comes within the control of an elaborate organization. The day, Mardi Gras, is a legal holiday, and the whole city is for the time ostensibly placed under the control of the King of Carnival, the mysterious and mighty "Rex." There are two principal pageants. The first, in the daytime, is the escort of the "beloved Rex" through his favorite city. He is seated on a magnificent car, high above the heads of the people, his approach heralded as only royalty used to be, attended by his own special guard and foreign soldiery, as well as by the U. S. military and marines. The illusion of a powerful monarch visiting his dominions is most curiously sustained to the minutest detail. The night pageant has generally been known as the "Mystick Krewe of Comus." This has a character altogether unique. The first display was in 1857. The proceedings are kept entirely secret; nothing is known but that the Krewe will again make their appearance, but whence they come, of whom composed, and what is to be the character of the entertainment is kept in profound mystery till they suddenly reveal themselves to the curious and always delighted spectators. It is a series of tableaux, drawn upon immense floats brilliantly illuminated, illustrative of great classic poems or striking events in the world's history, ancient and modern—as "Paradise Lost," "the Iliad," the "Historic Characters of America," "Audubon and his Birds," and "Scenes from the Ancient Scriptures." These displays evince a rare combination of classic erudition, taste, and ingenuity, presented with a completeness and gorgeousness as bewildering as it is beautiful. The day's pageants close with combination tableaux at the theatre, with a ball, and with the grand court-ball of "Rex," at which he chooses a queen, who shares his greatness for the evening.

Health of New Orleans.—Although the liability to yellow fever and to malarial diseases has given New Orleans a reputation for unhealthfulness, the tables of mortality show the city's health to be very good. Since the year 1797 there have been 28 epidemics, chiefly of yellow fever, in New Orleans, and since the year 1842 there have been but 10—in the last 28 years only 3; and the great decrease of frequency gives strong hopes that the disinfectants successfully used may enable the city to entirely escape their recurrence.

Vital Statistics and Yellow Fever of New Orleans in Epidemic Years.

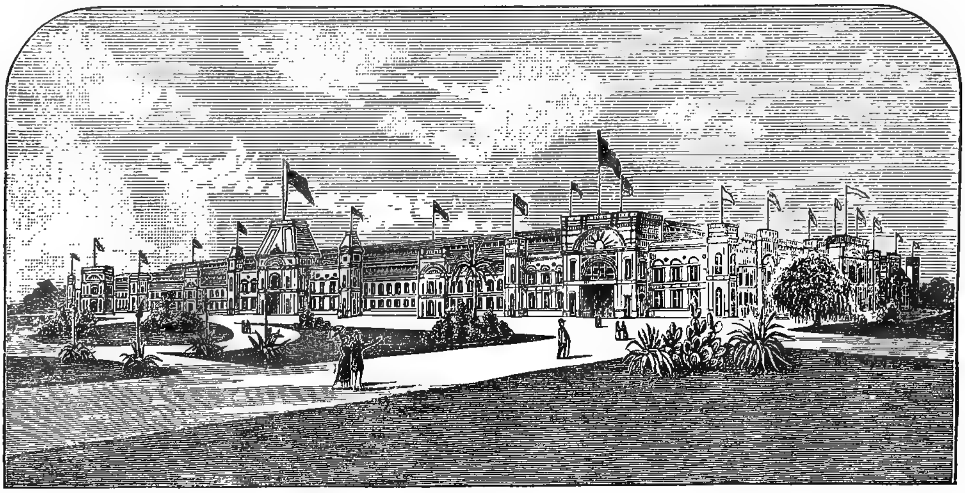
Year.	Population.	Total deaths.	Deaths by yellow fever.	Death-rate.	Death-rate by yellow fever.
1847	120,000 est.	9,336	2804	0.08	0.023
1848	123,500 "	8,191	872	0.06	0.006
1849	127,000 "	10,661	752	0.08	0.006
1853	140,000 "	15,683	7849	0.11	0.056
1854	146,600 "	10,800	2425	0.075	0.016
1855	148,400 "	9,000	2670	0.06	0.018
1858	160,000 "	11,721	4855	0.07	0.030
1867	182,000 "	10,096	3107	0.055	0.020
1873	205,000 "	7,995	226	0.040	0.002
1878	211,371 "	10,717	4056	0.0507	0.019

Since 1878 the health of New Orleans has been phenomenally good, the mortality being only 24.69 per 1000 population.

The history of New Orleans dates from 1718, when De Bienville, the newly-appointed governor, ordered the engineer De la Tour to lay it out and to build a levee to protect it from the floods. He built a levee and rampart around the front and on Canal, Esplanade, and Rampart streets—a mile in front and three-fourths of a mile in depth. With various vicissitudes, but always growing slowly, the city contained in 1785 about 4780 inhabitants. In 1804, Louisiana was transferred to the U. S. The city was made a port of entry. It contained 10,000 persons, one-half of whom were colored. After the introduction of the steamboat in 1812–20, and the battle of New Orleans in 1815, a stimulus was given to the growth of the city, and its progress to commercial supremacy was very rapid. The ease with which it could now stem the tide of the Mississippi River enabled it to import goods and distribute them to the Mississippi Valley. The telegraph only remained necessary to complete its capacity to take rank among the foremost in commercial position, and that was opened to New York in 1847.

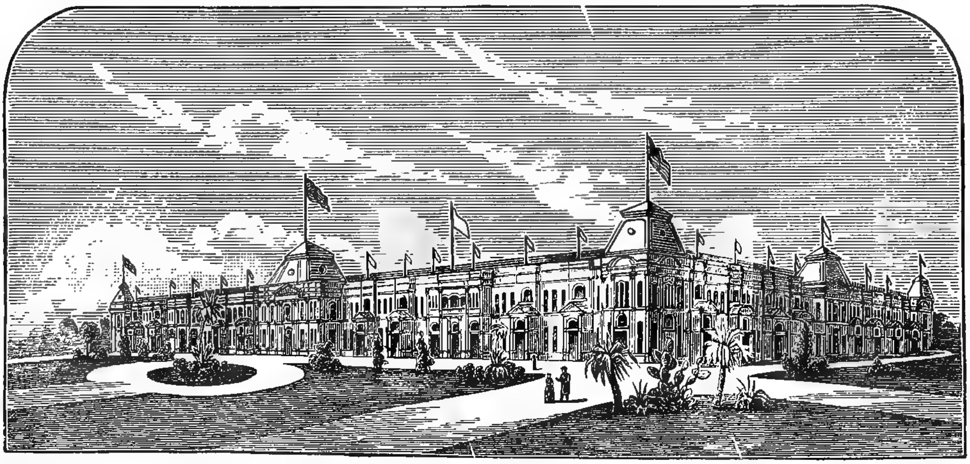
The height of prosperity was reached by New Orleans in 1860, when its trade was greater than ever before or since. During the war New Orleans suffered greatly, its commerce being completely destroyed, but in 1866 it began to revive again. In 1874 the U. S. government assigned to Capt. J. B. Eads the task of deepening the mouth of the river. This he accomplished by means of two stone jetties, which he located in South Pass, and the effect of which was to scour out the bottom of the river and deepen the pass from 7 to 31 feet, making New Orleans the deepest port on the Gulf. This work was completed in 1879, and had a material effect on the commerce of New Orleans, bringing to it a considerable portion of the grain of the Mississippi Valley and inducing three leading railroad companies to extend their lines to it, in order to have a deep-water terminus.

In 1883, New Orleans was chosen by the Cotton Planters' Association as the location for the world's industrial and cotton centennial exposition, which had been organized under an act of Congress. The Upper City Park was selected for the site of the exposition, and on Feb. 12, 1884, the work of constructing the necessary buildings was begun. They were completed by December, and on Dec. 16 the exposition was thrown open to the world.

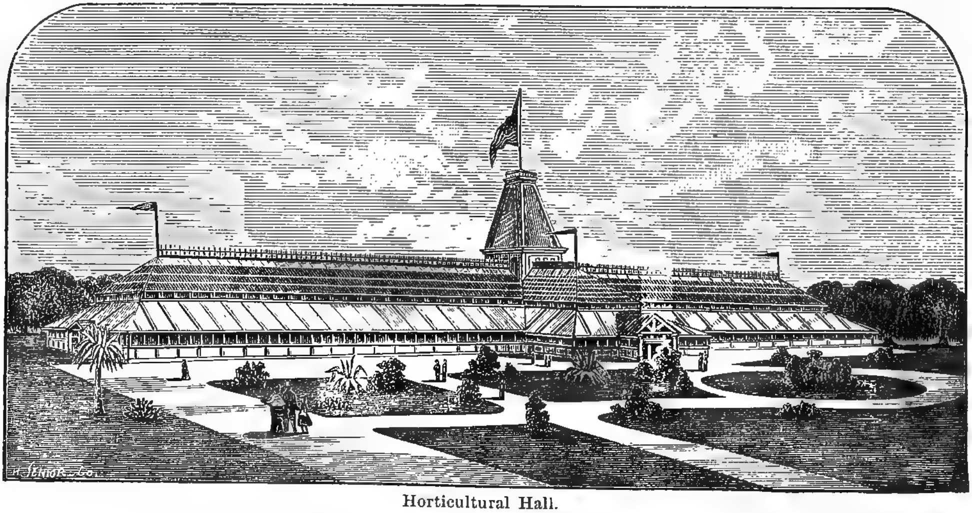


Main Building.

The park, which is 249 acres in extent, contained 29 principal buildings. Of these the most important were the Main Building, 1378 by 905 feet, covering 33 acres, and being the largest building in the world; the Government Building, 885 by 565 feet devoted to the exhibit of the U. S. government, the several States, and the Women's, Colored, and Educational departments; the Horticultural Hall, 600 by 194 feet, the largest conservatory in the world; Machinery Annex, Saw-mill building, Art Gallery, Mexican building, etc. There were 23,000 exhibitors at the exposition.

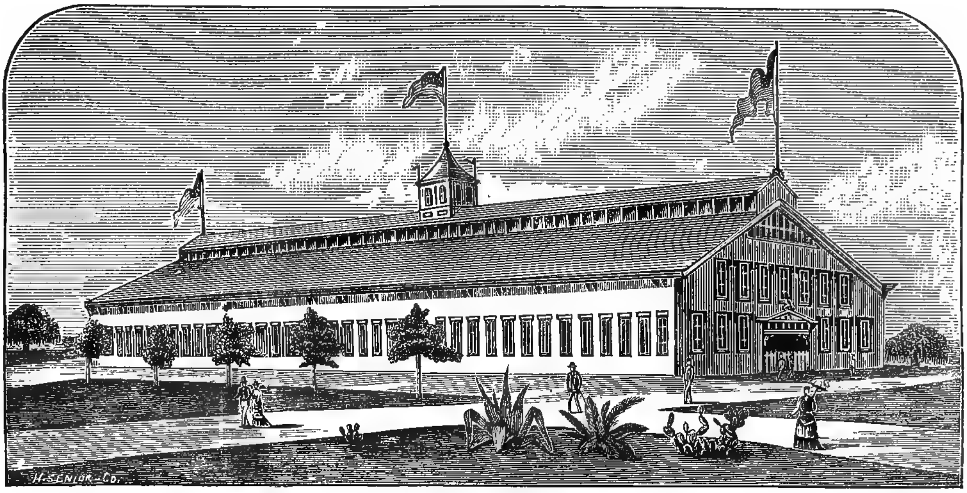


United States and State Exhibits.

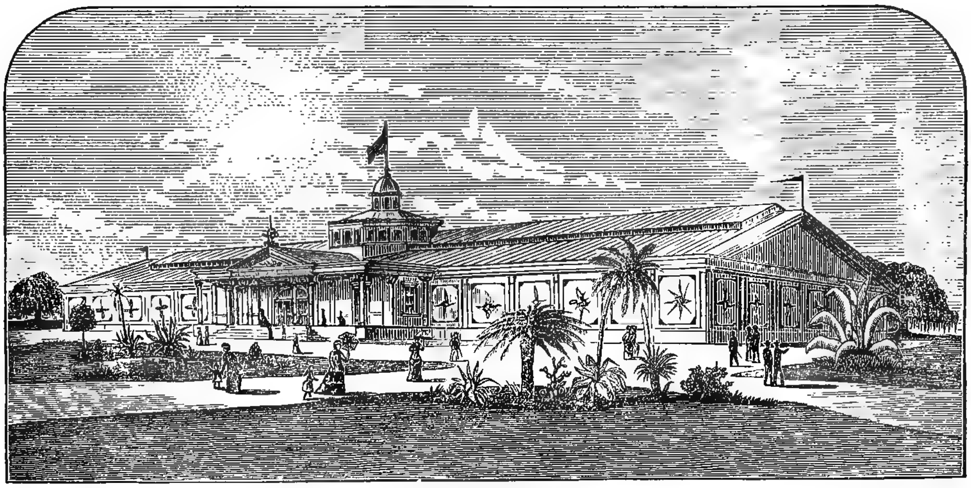


Horticultural Hall.

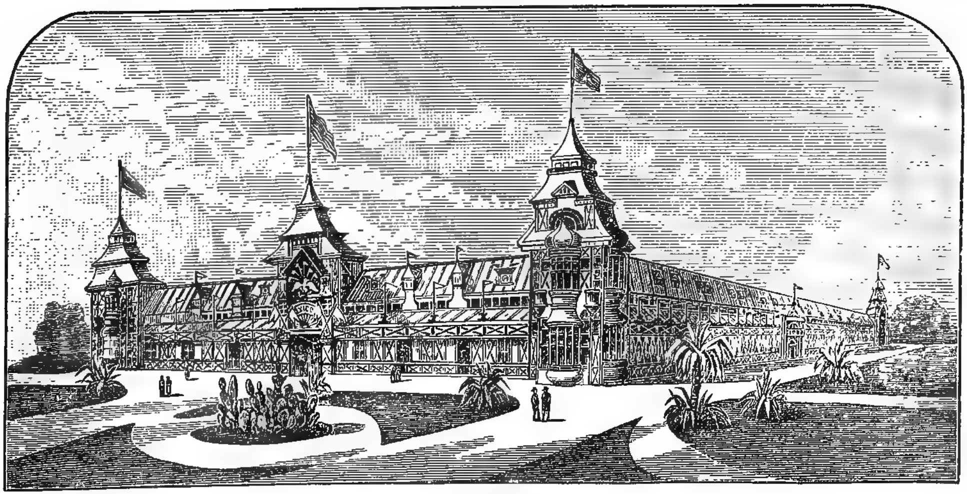
In consequence of a deficiency in railroad connections the attendance has not been as large as at other world's expositions, amounting to 1,950,000 from Dec. 16, 1884, to May 31, 1885. The U. S. granted an appropriation of $1,365,000 toward the exposition, besides $300,000, for the purpose of making an exhibit there; the State of Louisiana, $80,000; the city of New Orleans, $100,000, toward the erection of a permanent Horticultural Hall; Mexico, $250,000 for



Factories and Mills.



The Art Gallery.



Mexican National Head-quarters.

an exhibit, while various other countries and states made liberal appropriations in order to be well represented. The Exposition was reopened in Nov., 1885, as the North, Central, and South American Exposition.

Table of Population.

Year.	Black.	White.	Total.
1830	21,280	25,530	49,826
1860	25,428	149,063	174,491
1870	50,490	142,293	191,413
1880	57,617	158,367	216,090
1885	62,000	172,500	234,500

The population of New Orleans is very variable, falling some 30,000 in summer, and increasing as much in winter beyond these figures. The population is very cosmopolitan. About one-fourth are negroes of pure and mixed descent; of the whites, a fourth are creoles, descendants of the original French and Spanish settlers. The American element constitutes one-third of the white population; the remainder are of foreign—mainly German, Irish, Italian, and Spanish—birth or descent.

ALEXANDER WALKER.

New Orleans, Battles of (1814–15). After the battle at Villeré's plantation (Dec. 23, 1814), Lieut.-Gen. Edward Pakenham immediately prepared to effect the capture of New Orleans. But Gen. Andrew Jackson defended the city against the British. Jackson's victory, Jan. 8, 1815, gave him great renown, while the British forces were utterly defeated, Pakenham himself being killed.—In 1862, New Orleans, as a centre of military operations, was closely blockaded by a Federal fleet, but on Apr. 24, Farragut forced the defences near the mouth of the river, and the city was compelled to surrender.

New Philadel'phia, R. R. centre, cap. of Tuscarawas co., O. (see map of Ohio, ref. 4–H, for location of county), in the heart of the Tuscarawas coal and iron ore region, has agricultural tool manufactory, foundries, woollen and flouring mills, boiler and machine works, a salt manufactory, planing-mills, a match-factory, carriage-shops, and a paper-mill. Pop. in 1870, 3143; in 1880, 3070.

New Philippines. See Caroline Islands.

Newport, town in the Isle of Wight, England, on the Medina, which is navigable here. Pop. in 1881, 1357.

Newport, town of England, in the county of Monmouth, on the Usk, has a very large export-trade in coal and iron, extensive shipbuilding docks, iron-foundries, and manufactures of nails, anchors, etc. Pop. in 1881, 38,427.

Newport, Ark. See Appendix.

Newport, on R. R., cap. of Vermilion co., Ind. (see map of Indiana, ref. 6–B, for location of county), 1 mile W. of the Wabash River, has a seminary, a town-hall, and a Masonic temple. Pop. in 1870, 398; in 1880, 591.

Newport, city, on R. R., Campbell co., Ky. (see map of Kentucky, ref. 1–I, for location of county), on the S. bank of the Ohio River, opposite Cincinnati, and separated from Covington by the Licking River on the W., was first settled in 1791, and was by the census of 1880 the third city in the State in population. The various courts are held alternately in Newport and Alexandria. Newport has 16 churches and a large number of schools and benevolent societies.

Manufactures.—The census of 1880 reported 94 manufactories; capital, $1,700,715; average number of hands employed, 1748; wages paid during the year, $711,019; value of products, $3,996,995. The principal manufactories are—iron and steel works, recently enlarged for the manufacture of "chrome steel;" the Anchor and the Harper iron and steel works; iron and pipe factory and blast furnace; stove manufactory; steam saw-mill; Dueber watch-case manufactory, employing over 1000 hands, etc. The Louisville and Nashville R. R. passes through the city. A suspension bridge connects this place with Covington, and a railroad bridge supplied with roadways and footways unites it with Cincinnati; steam ferryboats ply between here and Cincinnati. A street railroad passes through Newport over the Licking River suspension bridge to Covington, and thence over the suspension bridge to Cincinnati, another crosses from Newport to Cincinnati over the R. R. bridge, and another runs from Newport to Dayton. There are a paid fire department, steam fire-engines, and fire-alarm telegraph. Pop. in 1870, 15,087; in 1880, 20,433.

Ed. "State Journal."

Newport, cap. of Sullivan co., N. H. (see map of New Hampshire, ref. 8–D, for location of county), on the Sugar River and on the Concord and Claremont R. R., has high schools and manufacturing interests. Pop. of tp. in 1870, 2163; in 1880, 2612.

Newport, Perry co., Pa. (see map of Pennsylvania, ref. 5–F, for location of county), 28 miles W. of Harrisburg, on the Pennsylvania R. R., has planing- and saw-mills, tanneries, furnace, grist-mill, etc. Pop. in 1870, 945; in 1880, 1399.

Newport, city, cap. of Newport co. (see map of Rhode Island, ref. 5–H, for location of county), and one of the capitals of Rhode Island, situated near the head of Narragansett Bay, 30 miles S. of Providence. The city has one endowed high and several public and private schools, 2 libraries, 6 national, 2 State, and 3 savings banks, 14 churches, 2 societies of Friends, Jewish synagogue, repair-shops of Old Colony Steamboat Company, 1 daily and 2 weekly newspapers, and paid fire department with 4 steam and 3 hand engines. Newport is connected with Boston by the Old Colony R. R., with New York by the Old Colony steamboats and Shore Line R. R., and with Providence by the American line of steamers. The U. S. torpedo station is on an island in Newport harbor. Fort Adams, one of the largest fortifications in America, is on a point 1½ miles S. W. of the city. The U. S. Naval War College is located here, on Coaster's Harbor Island. Newport has many antiquities: she claims the oldest newspaper extant in the U. S., the *Mercury*, started in 1758 by James Franklin, nephew of Benjamin; the first Methodist Episcopal church building with a steeple and a bell. The first Baptist church in America was organized here, though that is disputed by Providence; the Redwood Library (1750), the Statehouse (1742), city hall (1763), besides Revolutionary relics. Hundreds of families spend the summer here, including the most wealthy and aristocratic classes in the country. The summer pop. is from 7000 to 10,000. Newport villas are the finest in America. The Society of Friends have had their annual meetings here for nearly 250 years. Pop. in 1870, 12,521; in 1880, 15,693; in 1885, 30,339. A fine bronze statue of Commodore O. H. Perry was unveiled here Sept. 10, 1885. L. D. Davis, Ed. "News."

Newport, on R. R., cap. of Cocke co., Tenn. (see map of Tennessee, ref. 6–J, for location of county). Pop. in 1870, 281; in 1880, 347.

Newport, R. R. junction, Orleans co., Vt. (see map of Vermont, ref. 2–D, for location of county), at the head of Lake Memphremagog and on the Passumpsic and the South-eastern R. Rs. Pop. of tp. in 1870, 2050; in 1880, 2426, including 920 in village.

Newport (Capt. Christopher), b. in England about 1565; was selected for the command of the squadron which conducted the first permanent English colony to Jamestown, Va., May 13; returned to England in June, and brought over in the following year additional emigrants and fresh supplies; accompanied Capt. John Smith on visits to Powhatan; returned to England; made another voyage to Virginia in 1608, and came again in the fleet bringing the new charter and Lord Delaware as governor in 1610; returned to England about 1612, and wrote *Discoveries in America*, republished in the *Archæologia Americana*. The subsequent career of Newport is unknown.

Newport News, Warwick co., Va. (see map of Virginia, ref. 7–I, for location of county), a terminus of the Chesapeake and Ohio R. R., has an immense grain-elevator with all modern improvements and a capacity of 1,600,000 bushels. The harbor is especially fine, and always free from ice. The largest sea-going vessels can come directly alongside the elevator.

New Rich'mond, Clermont co., O. (see map of Ohio, ref. 7–C, for location of county), 20 miles N. of Cincinnati, on R. R. and the Ohio River, has a chair-factory, distillery, woollen-, saw-, and grist-mills, tobacco-factory, brewery, a public hall, etc. Pop. in 1870, 2516; in 1880, 2545.

New Richmond, St. Croix co., Wis. (see map of Wisconsin, ref. 4–A, for location of county), on the Chicago St. Paul Minneapolis and Omaha R. R. Pop. in 1880, 729.

New Rochelle', Westchester co., N. Y. (see map of New York, ref. 8–J, for location of county), on L. I. Sound and on N. Y. New Haven and Hartford R. R., 20 miles N. E. of New York. Pop. of tp. in 1870, 3915; in 1880, 5276.

New Ross, town of Ireland, county of Wexford, on the estuary of the Barrow. It is an old town, surrounded with walls built in the thirteenth century; it carries on a lively trade and has a good harbor. Pop. in 1881, 6626.

New'ry, town of Ireland, partly in the county of Armagh and partly in that of Down, on the Newry, has iron-foundries, cotton-mills, tanneries, coach and car manufactories, and a lively trade. It is one of the principal ports of Ulster, and has exports of grain, provisions, cattle, flax, and linen. The imports are principally timber, manufactures, and provisions. Pop. in 1881, 15,085.

New San'dec, town of Austria, in Galicia, on the Dunajec, seat of several civil, military, and ecclesiastical authorities, with good educational institutions. Pop. 7079.

New Sibe'ria, a group of islands in the Arctic Ocean, situated N. of the mouth of the Lena, East Siberia, between lat. 73° and 76° N. They are uninhabited, and covered with snow and ice all the year round, but they are interesting, and even important, on account of the remains of vegetable and animal life which they contain; large quantities of ivory are dug out of the ground every year. Indeed, some of the islands are believed to be nothing but an accumulation of drift-timber and bodies of mammoths and other antediluvian animals frozen together. The principal islands are Kotelnoi, Liakov, and Fadievskoi.

New South Wales, a colony of Great Britain in the south-eastern part of Australia, extending along the South Pacific Ocean from Point Danger, in lat. 28° 8′ S., to Cape Howe, in lat. 37° 31′ S., and stretching inland to the 141st meridian, bounded by the colonies of Queensland, South Australia, and Victoria. Area, 316,320 square miles, of which, however, only a very limited part is regularly settled. Pop. 751,468, most of whom are of English descent, some Germans, and a larger proportion of Chinese and aborigines. The whole district is traversed from N. to S. by a range of mountains running parallel with the coast at a distance of from 100 to 150 miles from the shore. The northern part of this range is called the Liverpool Hills, the middle the Blue Mountains, and the southern, which contains the highest peak, Mount Kosciusko (6500 feet), the Australian Alps. Though these mountains everywhere indicate the presence of immense volcanic powers, they contain no active volcanoes. Towards the coast they present a steep and rugged face, rent with frightful fissures and crags, rising into fantastic peaks, and sending out a multitude of high, wild spurs, from which many short but deep and rapid rivers rush to the ocean; as, for instance, the Richmond, Clarence, Manning, Hunter, and Shoalhaven. Towards the interior, on the contrary, they slope gradually, forming the large basin of the rivers Murray and Darling, whose numerous affluents during the dry season generally form only strings of pools. They are very rich in coal, copper, lead, and tin, and gold is found in many places. The coal-fields around New Castle are considered almost inexhaustible, and the coals are of superior quality. Gold was first discovered in 1851, and the value of that exported increased in the second year from £468,336 to £2,660,946, and in 1871 to £2,347,000, but fell again in 1881 to £550,111 (145,532 ounces). The colony has also valuable copper and tin mines, the former producing 5494 tons of copper in 1882, at a value of £355,062, the latter producing 8200 tons of tin, at the value of £724,300. The soil is everywhere rich. In the northern and hotter part of the colony cotton, sugar, rice, and other tropical products are raised; in the southern and more temperate part wheat, oranges, peaches, grapes, and mulberries are grown. Wine and silk culture has succeeded very well. There are circumstances, however, which have hitherto prevented agriculture from becoming the principal industry of the colony. Severe droughts seem to be periodical, and occur every tenth or twelfth year. Rain often fails to come for long periods, and when it does come it pours in torrents. Hot winds often rise over the deserts of the inland and sweep down on the lower country, raising the thermometer to 120°, and making the grass dry as hay; the leaves turn yellow and the grapes shrivel and fall. The chief industry is sheep-breeding, carried on on the western slopes of the mountains; 93,636,104 pounds of wool were exported in 1882, amounting to £4,905,440. The value of the total exports was in the same year £16,716,961. In 1883 the colony possessed 6,000,000 sheep, 1,859,985 horned cattle, 328,026 horses, and 154,815 pigs. The total area of land under cultivation was 733,582 acres. The colony was founded in 1788 as a penal establishment; transportation ceased, however, in 1840. To the discovery of the gold-mines the colony is indebted for its rapid progress. Chief town, Sydney, with 220,247 inhabitants. The government consists of a governor, a legislative council of 21 members nominated by the crown, and a legislative assembly of 113 members, elected by 72 constituencies. The governor is appointed by the crown.

Newspaper. See Journalism.

Newt, a vernacular name in England employed for the aquatic Gradientia or salamanders—*i. e. Triton cristatus* and *Lissotriton punctatus*—and extended sometimes to related forms.

New Tacoma, Wash. Ter. See Tacoma.

New Testament. See Bible, The.

Newton, cap. of Baker co., Ga. (see map of Georgia, ref. 7–G, for location of county), on Flint River. Pop. in 1870, 145; in 1880, 167.

Newton, R. R. junction, cap. of Jasper co., Ill. (see map of Illinois, ref. 8–G, for location of county), has steam-, water-, saw-, and grist-mills. Pop. in 1880, 1168.

Newton, city and R. R. junction, cap. of Jasper co., Ia. (see map of Iowa, ref. 5–H, for location of county), 35 miles E. of Des Moines, on the Chicago Rock Island and Pacific R. R., has flouring-mills, etc. Pop. in 1870, 1983; in 1880, 2607; in 1885, 2902.

Newton, city and R. R. junction, cap. of Harvey co., Kan. (see map of Kansas, ref. 7–G, for location of county), 135 miles S. W. of Topeka, on the Atchison Topeka and Santa Fé R. R., has a fine school building, railroad machine-shops, brick-kiln, etc. Pop. in 1880, 2601.

Newton, city, Middlesex co., Mass. (see map of Massachusetts, ref. 2–H, for location of county), on the Charles River and on the Boston and Albany and the New York and New England R. Rs., 8 miles W. of Boston, is in a healthy and beautiful region, well supplied with water and gas, has the Newton Theological Institution (which see), Lasalle Female Seminary, 2 academies, a lyceum, a free and 3 other libraries with about 12,000 volumes, 2 asylums, a fire department, a large number of manufactories, and a cemetery in the centre of the city of about 90 acres. Pop. in 1870, 12,825; in 1880, 16,995; in 1885, 19,759.

Newton, on R. R., cap. of Sussex co., N. J. (see map of New Jersey, ref. 1–C, for location of county), 62 miles from New York City, has a collegiate institute, a public library, a shoe and a spoke factory. Pop. in 1870, 2403; in 1880, 2513; in 1885, 2648.

Newton, R. R. junction, cap. of Catawba co., N. C. (see map of North Carolina, ref. 3–D, for location of county), on the Western (N. C.) R. R., 50 miles W. of Salisbury. Pop. in 1870, 323; in 1880, 583.

Newton, cap. of Newton co., Tex. (see map of Texas, ref. 4–K, for location of county), on Caney Creek. Pop. in 1880, 68.

Newton (Charles Thomas), b. at Bredwardine, Herefordshire, in 1816; was educated at Shrewsbury School and Christ Church, Oxford, graduating with honors 1837; was appointed in 1840 assistant curator of antiquities in the British Museum, which post he held until 1852, when he obtained the appointment of vice-consul at Mytilene, Asia Minor; spent several years in exploring the islands and coasts of the Ionian Archipelago; discovered at Boodroom in 1856 the site of the mausoleum erected by Queen Artemisia at Halicarnassus; made extensive excavations at Cnidus and Branchidæ, depositing in the British Museum the fine collection of sculptures, vases, coins, and inscriptions acquired by excavation or purchase. In 1860 he became British consul at Rome, and in 1861 keeper of the Greek and Roman antiquities in the Museum.—His wife, Ann Mary, daughter of the painter Joseph Severn, noted as the friend of Keats, b. in 1832, was an accomplished artist, endowed with great skill in portrait and figure drawing, and made admirable copies of the sculptures discovered by her husband. She d. at London Jan. 2, 1866.

Newton (Gilbert Stuart), b. at Halifax, N. S., Nov. 2, 1794, son of Henry, a loyalist from Boston; became a pupil of his uncle, Gilbert C. Stuart, the distinguished artist, at Boston; studied for a time in Italy; accompanied C. R. Leslie to Paris and London in 1817, and remained in the latter capital, where he became known as a fine colorist; displayed genius, humor, and pathos in his pictures, excelling in *genre* painting, especially scenes from *Gil Blas* and Molière. He was, however, indolent, unambitious, and fond of society, and consequently effected little. In his later years he suffered from a mental disorder. D. at London Aug. 5, 1835. (See the *Memoir* of Washington Irving and the *Autobiography* of C. R. Leslie.)

Newton (Hubert Anson), A. M., LL.D., b. at Sherburne, N. Y., Mar. 19, 1830, and graduated at Yale College, Conn., 1850; became mathematical professor in Yale College in 1855; has written in the *Am. Journal of Science*, and is a member of various scientific bodies.

Newton (Sir Isaac), b. Dec. 25, 1642 (old style), at Woolstrop, Lincolnshire, England; d. Mar. 20, 1727. He was a posthumous and only child, of excellent family, though greatly reduced in means. He was so small at his birth that he "could easily be put in a quart pot," and so feeble that it was thought he would not survive. At three years of age he was consigned to the care of his maternal grandmother, his mother having married again. He was early sent to the village school, and afterwards to the free grammar school at Grantham. His mother's only wish was to give him sufficient education to enable him to fulfil with credit the duties of a country squire. She therefore removed him early from school, and entrusted him with some share in the management of his own estate of Woolstrop. The boy's passion for mechanics and science was so strong that he entirely neglected his less congenial duties. He constructed mechanical toys of great delicacy; one sundial, made in his boyish days, is still in the house at Woolstrop, and another in the Royal Society rooms. His mother, wisely regarding his passion for study, sent him again to school, and in 1660 he was entered at Trinity College, Cambridge. The same year Dr. Barrow was appointed professor of Greek: Newton soon found in him a safe guide and cordial helper, not only in the classics, but also in mathematics. A story is told to the effect that Newton, after having examined the earlier propositions in Euclid, cast it aside as too easy to be worth while studying; but this is probably false. He regretted in his after life not having given to geometry the close attention it merited, but without some knowledge of its fundamental truths and its modes of reasoning he could never have attained the heights which he so early reached. When Newton entered Cambridge the philosophy of Descartes reigned supreme; one of the first books read by the student was undoubtedly Descartes's *Analytical Geometry*. This new application of algebra to geometry had opened up a whole world of new possibility and beauty. Yet, strange to say, Newton scarcely speaks of the Cartesian method, and later, in his *Optics*, fails to do simple justice to Descartes in regard to the theory of the rainbow. Newton had the habit of noting down, as he read, points which admitted of further development. His jottings and the subsequent developments of certain points in Wallis's *Arithmetica Infinitorum* led him to many remarkable discoveries. (See Binomial and Fluxions.) These discoveries with which he enriched mathematical science were made before he had completed his twenty-fourth year. It would seem that he recognized the powerful instrument which lay in his hand for the solution of the many problems in physical science, for he neither published his discoveries nor made them known to his friends. Having secured these treasures, he turned his attention toward natural philosophy. In 1661 he had been made sub-sizar, and in 1664 scholar; in 1665 he took his degree as B. A.; in 1667 became junior fellow and M. A.; in 1668, senior fellow; and in 1669 he succeeded Dr. Barrow as Lucasian professor of mathematics. The plague in 1665 drove him to his country-seat at Woolstrop; while there he turned his attention to the subject of *gravity*. Whether the story of the falling apple be true or not, he certainly began to connect the mysterious force which draws bodies toward the centre of the earth with that which holds the stars and planets in their orbits. Taking the known velocity of falling bodies, he made a calculation upon the force necessary to deflect the moon from a right line and make it revolve in its orbit round the earth. One of the quantities in this problem is the length of the earth's radius, of which he took the then accepted measurement. There was a discrepancy between the results of his calculation and the known facts amounting to about one-sixth, which caused him to reject his theory as incomplete, and the magnificent discovery of *universal gravitation* lay neglected for sixteen years. In 1668, Mercator published his *Logarithmotechnia*. His quadrature of the hyperbola involved some of the first principles of the method long before perfected by Newton. Mercator's discovery was sent by Collins to Barrow, and shown by Barrow to Newton. At once the young mathematician laid before his master his own MSS. Barrow was struck by the riches of the collection, and wrote to Collins of it. The copy made at that time was found among Newton's papers at his death; the MSS. were sent to Collins, and their value at once acknowledged by the first mathematicians of the age; but he still refused to publish. Newton's attention was now directed toward the subject of light. We find that as early as 1666 he was engaged in grinding lenses for refracting telescopes. The whole difficulty was then supposed to be due to spherical aberration. (See Aberration.) By repeated experiment Newton became convinced that light is not homogeneous, but that a ray of white light is the resultant of innumerable rays of light possessing different colors, rates of vibration, and refrangibility. He assumed, without sufficient ground, that all media possess equal refractive and dispersive powers. He therefore believed that if spherical aberration were obviated by the perfecting of the form of the lenses, chromatic aberration (see Aberration) would still render the image dim; he therefore looked upon the perfection of refracting telescopes as hopeless. Newton generally based every theory upon a patient and profound investigation of facts; his one departure in the assumption just mentioned proved a serious stumbling-block in the way of progress in the science of optics, especially in the invention of achromatic telescopes. In 1672 he was elected a member of the Royal Society of London. His first paper was upon some invention in connection with the reflecting telescope. Soon after a communication on light was read before the Royal Society, which stirred up a violent controversy. Newton advocated the material or corpuscular theory; Hooke, the undulatory theory of light. Newton brought forward many remarkable experiments and much mathematical knowledge to his support. Hooke had little more than an hypothesis to offer. The undulatory theory has since been accepted as the true one, though its foundation is far deeper and surer than that laid by its earlier advocates. In 1671, Newton completed a reflecting telescope made with his own hands, which is still in the library of the Royal Society. About this time, in investigating the colors of thin plates, he invented his very ingenious hypothesis of "fits of easy reflection and transmission." In 1682 a new measurement of an arc of the meridian came to his knowledge; this gave him the requisite information to make again his calculation relative to gravity. As he approached its completion his agitation became so great that he was forced to entrust it to a friend to finish. The result justified his intense feeling; observation and calculation corroborated each other; the crowning glory of Newton's life, the magnificent theory of universal gravitation was complete. (See Gravity.) His discovery was given to the world under the title *Philosophiæ Naturalis Principia Mathematica* in 1687. This work treats of unresisted motion, of resisted motion, and from them deduces the order of the physical universe. So new and startling an exposition of truth, and one so at variance with preconceived notions, roused vigorous opposition. It was half a century after the publication of Newton's *Principia* before the French mathematicians fully accepted its teachings. In Great Britain the Newtonian philosophy, in spite of its profundity, was early introduced. St. Andrew's College adopted it in 1690, Cambridge in 1699, and Oxford in 1704. For many years his means had been very limited—so much so at times that it is upon the records of the Royal Society of 1674 that the usual dues were not required of him, on account of his inability to pay them. In 1689 he became M. P. for Cambridge. At the expiration of the year Parliament was dissolved. In 1692 an accident, by which he lost the fruit of twenty years of labor, undermined his health and impaired his intellect for a time. The story of this loss—that it was occasioned by a favorite dog which upset a burning candle among his papers and reduced them to ashes—is credited by Biot and pronounced a fiction by Brewster. In 1695 he was appointed warden of the mint, with a salary of from £500 to £600 per annum, and in 1699 he was promoted to the mastership of the mint, with a salary of from £1200 to £1500 per annum. The duties of this office he fulfilled with great ability. For twenty years before his death his niece, Mrs. Conduitt, took charge of his establishment in London. His health became greatly impaired, and in 1625 he went to Kensington to live, and the duties of his office were performed by Mr. Conduitt. On Feb. 28 he presided for the last time at a meeting of the Royal Society; the fatigue produced an accession of his disorder, and he d. in the following month, and was buried with great pomp in Westminster Abbey. Two controversies which embittered Newton's life have not been mentioned—the one with Leibnitz in 1676 in regard to the authorship of the binomial theorem and the infinitesimal method, where both were independent discoverers; and another with Flamsteed, the first astronomer-royal, in his later years. The following is a list of his works, with the dates of their publication: (1) *Principia* (1687); (2) *Optics* (1704); (3) *Arithmetica Universalis* (1707); (4) *Analysis per Equationes Numero Terminorum Infinitas* (1711); (5) *Methodus Differentialis;* (6) *De Mundi Systemata* (1728); (7) *The Chronology of Ancient Kingdoms Amended* (1728); (8) *Table of Assays;* (9) *Optical Lectures* (1728); (10) *Observations on the Prophecies of Daniel and the Apocalypse of St. John* (1733); (11) *A Method of Fluxions and Analysis of Infinite Series* (1736); (12) *A Historical Account of Two Notable Corruptions of Scripture* (1754). The principal works of Newton have been collected and reprinted by Dr. Horsley under the title of *Newton opera quæ extant omnia* (1779–85, 5 vols.). His various communications to the Royal Society are to be found in vols. vii.–xi. of its *Transactions*. S. B. Herrick.

Newton (Isaac), b. at Schodack, N. Y., Jan. 10, 1794; became a distinguished naval architect, and constructed over 90 vessels, including the fine Hudson River steamers Hendrick Hudson and New World. D. Nov. 22, 1858.

Newton (Isaac). See Appendix.

Newton (John), b. at London, England, July 24, 1725; was the son of a sea-captain, with whom he made several voyages to the Mediterranean; was pressed into the navy as a seaman in 1744; became a midshipman; exchanged into a vessel engaged in the slave-trade at Madeira; resided some time near Sierra Leone in the employ of a slave-dealer; returned to England 1747, and for four years thenceforward commanded a Liverpool slave-ship, feeling, as he subsequently said, no scruples as to the nature of his occupation; obtained the surveyorship of the port of Liverpool (then a small place) in 1755; taught himself Latin, Greek, and Hebrew; was deeply affected by the religious movement directed by Wesley and Whitefield; took orders in the Church of England 1764; became soon afterwards curate of Olney, Buckinghamshire, where he formed a close intimacy with the poet Cowper; published a *Narrative* of his early life and remarkable religious experience, and with Cowper wrote the *Olney Hymns*, many of which have passed into popular use in public worship; became in 1779 rector of St. Mary Woolnoth, London; was a leader of the Calvinistic or evangelical party in the Church of England, and author of numerous religious treatises, which at the time enjoyed great popularity, and were collected as his *Works* (6 vols., 1816). D. in London Dec. 31, 1807. (See his *Life*, by Rev. Richard Cecil, London, 1808.)

Newton (John), b. in Virginia in 1823; graduated at West Point, and was appointed second lieutenant of engineers July, 1842; with the exception of some three years at West Point as professor of engineering and while chief engineer of the Utah expedition of 1858, he was engaged in the construction of fortifications on the Atlantic and

Gulf coasts until the outbreak of civil war in 1861, when, after serving as chief engineer of the department of Pennsylvania and of the Shenandoah, he was, in Aug., 1861, appointed a brigadier-general of volunteers, and commanded a brigade in the defences of Washington, at the same time performing the duties of an engineer in the construction of those works, until the spring of 1862. With the Army of the Potomac he led his command in the expedition to West Point, at Gaines's Mill, and at Glendale, Va., at South Mountain and Antietam, Md., and at Fredericksburg, Dec., 1862, where he commanded a division; promoted to be major-general Mar., 1863, he commanded the 3d division of the 6th corps in the storming of Marye Heights May 3, 1863; at Gettysburg he succeeded to the command of the 1st corps July 2, 1863, which he retained until the reorganization of the army Mar., 1864, when he was transferred to the West, where he led a division of the 4th corps in the campaign which resulted in the capture of Atlanta., Sept., 1864; commanded various districts in Florida from Oct., 1864, to Jan., 1866, when he resumed duty with his corps, in which he had risen to be lieutenant-colonel, and since that date has been charged with important engineering duties—in removing the obstructions at Hell Gate and other points on the East River, the proposed enlargement of the Harlem River, the improvement of the Hudson from Troy to New York, and of the channel between New Jersey and Staten Island, and of harbors on Lake Champlain. Promoted to be colonel June 30, 1879, and appointed chief of engineers, with the rank of brigadier-general, Mar. 6, 1884.

Newton (Robert), b. at Roxby, Yorkshire, Sept. 8, 1780; received a limited education; became a Methodist preacher 1798; was a celebrated pulpit-orator and evangelist, and for fifty years was constantly engaged in laboring from place to place in Great Britain, chiefly in the service of the British and Foreign Bible Society and the missionary associations. He was four times president of the British Methodist Conference; visited the U. S. in 1839, and attracted great attention by his eloquence. D. in England Apr. 30, 1854.

Newton (Robert Safford). See Appendix.

Newton (Thomas), D. D., b. at Lichfield, England, Jan. 1, 1704; graduated at Trinity College, Cambridge, where he obtained a fellowship; took orders in the Church of England 1729; became curate of St. George's, Hanover Square, London, afterwards of Grosvenor chapel; was made rector of St. Mary-le-Bow 1744, lecturer at St. George's 1747, prebendary of Westminster 1757, bishop of Bristol 1761, and dean of St. Paul's 1768. He edited Milton's *Poetical Works* (1749–52), with critical and variorum notes, and published *Dissertations on the Prophecies* (3 vols., 1754–58), once considered extremely valuable, but now superseded. D. in London Feb. 14, 1782. His autobiography was printed the same year, and his *Works* appeared in 3 vols., 1783.

Newton Centre, Middlesex co., Mass., on the Woonsocket division of the New York and New England R. R., contains the Newton Theological Institution (which see), and is a part of city of Newton.

Newton-in-Mack'erfield, town of England, in Lancashire, has iron-foundries, glassworks, corn-mills, and manufactures of bricks, tiles, and pottery. Pop. in 1881, 10,580.

Newton's Rings. See Thin Plates, Colors of.

Newton Theological Institution, Baptist, located in Newton Centre, Mass., was commenced Nov. 28, 1825; the act of incorporation was passed Feb. 22, 1826. The first professorship established was that of biblical theology, and the first professor was the Rev. Irah Chase. Revs. Henry J. Ripley, James D. Knowles, Barnas Sears, Horatio B. Hackett, Robert E. Pattison, Alvah Hovey, Albert N. Arnold, Arthur S. Train, Geo. D. B. Pepper, Galusha Anderson, Oakman S. Stearns, Heman Lincoln, and Ezra P. Gould have been professors in the institution. This seminary is pleasantly located, 7 miles from Boston, has four public buildings and two dwelling-houses; the library, 12,000 vols., is well selected and constantly increasing; and the funds of the institution amount to over $300,000. It was the first Baptist theological seminary in America.

Newtonville, Middlesex co., Mass., on the Boston and Albany R. R., is part of city of Newton.

Newtown, Pa. See Appendix.

New'town-Ardes, town of Ireland, county of Down, has several spinning and weaving factories, and considerable trade. Pop. 9437.

New Troy, cap. of La Fayette co., Fla. (see map of Florida, ref. 2–E, for location of county). Pop. not in census.

New Ulm, city, cap. of Brown co., Minn. (see map of Minnesota, ref. 10–D, for location of county), on Minnesota River and Winona and St. Peter R. R., has a nunnery, flouring-mills, a foundry, breweries, etc. Pop. in 1870, 1310; in 1880, 2471; in 1885, 3335.

Newville, Pa. See Appendix.

New Year's Day. The custom of keeping the first day of the year as a day of festivity is a widely prevalent one, but the day on which the year commences varies much in different countries. In the Roman Catholic Church, since the establishment of the Gregorian year (or new style), it falls upon the festival of the Circumcision, a holiday of obligation, which also is the feast-day of several saints, of whom St. Sylvester is the most widely honored. In the other churches it has no specially religious character. It is a widespread custom to make calls upon one's acquaintances on this day.

New York, "the Empire State," one of the Middle States of the Atlantic slope, and one of the original thirteen, between 40° 29′ 40″ and 45° 0′ 42″ N. lat., and 71° 51′ and 79° 45′ 54.4″ W. lon.; bounded on the N. and N. W. by the Dominion of Canada, from which it is partly separated by St. Lawrence River, Lake Ontario, Niagara River, and Lake Erie; also on the N. by Long Island Sound, which washes the N. shore of Long Island, and the Atlantic; E. by Vermont, Massachusetts, and Connecticut, the lower New York Bay, and the Atlantic; S. by the Atlantic, the lower bay, and the States of New Jersey and Pennsylvania; and W. and N. W. by Pennsylvania, Lakes Erie and Ontario, and Niagara River, which divide it from the Dominion of Canada; greatest length, N. to S., 311⅝ miles; greatest breadth, E. to W., including Long Island, 412 miles; area, 49,170 square miles, or 31,468,800 acres.

THE GREAT SEAL OF THE STATE OF NEW YORK
EXCELSIOR

Seal of New York.

New York, by census of 1880, ranked first among the States in population and value of manufactures, and second in value of agricultural products.

Face of the Country.—The surface of New York is divided into three sections of unequal size. These sections are E. of the Hudson, N. and S. of the Mohawk and Erie Canal, and are designated E., N., and S. sections. E. of the Hudson there is a continuation of the Green and Hoosac ranges southward, reaching the Hudson in Putnam co., reappearing on the W. side of the river as the Kittatinny Mountains. The N. section has six distinct ranges of mountains, besides two ridges of lower altitude. These ranges all trend from N. E. to S. W. They are, beginning at the S. E.: (1) The Palmertown range, from the vicinity of Whitehall S. W. to the lower part of Saratoga co. (2) The Kayaderosseras or Luzerne Mountains, beginning at Ticonderoga, passing along the W. side of Lake George through Warren and Saratoga cos. to Montgomery co. (3) The Clinton or Adirondack range proper, beginning at Point Trembleau, on Lake Champlain, passing through Essex, Warren, Saratoga, Hamilton, Fulton, and a part of Montgomery co. to Mohawk River. This range contains the highest summits in the State—Mount Marcy or Tahawas, whose height is variously stated at from 5379 to 5467 feet; Dix Peak, 5200 feet, etc. It forms the watershed between the tributaries of the St. Lawrence and those of the Hudson and Mohawk. (4) The Au Sable or Peru range, beginning still higher on Lake Champlain, near the mouth of Au Sable River, and trending S. W. through Essex, Hamilton, and Fulton cos. into Montgomery. (5) The Chateaugay range, which commences near the N. extremity of Lake Champlain in Canada, passes through Clinton, Franklin, and Hamilton cos. to Herkimer co. and the Mohawk River. (6) The St. Lawrence range, parallel with the last and about 10 or 12 miles N. of it, follows the course of the S. shore of the St. Lawrence. The broad plateau known as the Highlands of Black River is about 60 miles in length. Between these

Highlands and the Mohawk is a ridge about 20 miles long, known as Hasenclever Ridge. The section S. and S. W. of the Mohawk and the Hudson may be divided into two sub-sections, the E., which includes three distinct ranges of mountains—viz. (1) the Highlands of Orange and Rockland cos., having a general N. E. direction and coming to the W. shore of the Hudson; (2) back of these, the Shawangunk Mountains, skirting the valley of the Rondout; (3) and most considerable, the Kaatsberg or Catskills, called the Helderberg Mountains, near the Mohawk. In Sullivan and Delaware cos. the Blue Mountains, or Delaware Mountains, take their rise. The W. sub-section of this S. section is a series of terraced plateaus rising from the shore of Lake Ontario, first, to the Ridge Road; this terrace extends from the Genesee to the Niagara above the Falls; second, from the Ridge Road to the falls of the Genesee at Nunda and Portageville; from this point there is a gradual ascent to the summit-level in Chautauqua, Cattaraugus, Allegany, and Steuben cos.

Rivers, Lakes, Bays, etc.—The Hudson River is the principal river. It is navigable to Troy, nearly 160 miles. It has many tributaries, of which the Mohawk is the most important. St. Lawrence River washes the N. boundary of the State for nearly 100 miles, and has several important affluents from the State Oswego River—which is navigable for canal-boats and steamers for 120 miles—Black River, and the Genesee all flow into Lake Ontario; Niagara River, connecting Lakes Erie and Ontario: the Alleghany, one of the constituents of the Ohio, has a course of 50 miles in the State; the Susquehanna, with its tributaries, the Tioga and Chenango; and the Delaware, with its E. and W. branches and its affluents,—are the most important of the other rivers which drain the State. *Lakes.*—The E. end of Lake Erie, half of Lake Ontario, and half of Lake Champlain belong to New York. In the N. E., Lake George, Schroon Lake, and about 200 smaller lakes, in Warren, Essex, and Hamilton cos., add great beauty to the landscape. In Central New York there are three groups of lakes; farther W. commences a chain consisting of Oneida, Onondaga, Otisco, Cross, Skaneateles, Cayuga, Seneca, Crooked or Keuka, and Canandaigua lakes; still farther W. is another chain of five lakes—Owasco, Honeoye, Canadice, Conesus, and Silver Lake; in the S. W. corner of the State is Chautauqua Lake. A remarkable feature of the natural scenery of New York is its waterfalls. The Falls of Niagara (see NIAGARA FALLS) and those of Trenton, the Watkins Glen, the Taghkanic, and the numerous falls near Ithaca are noteworthy. The falls of the Geneseo at Rochester, the High Falls in the same river at Portage, the falls at Ticonderoga, and those in the Adirondacs are worthy of mention. *Islands.*—The most important islands are Manhattan, Long Island, and Staten Island; numerous smaller islands surround these, as Randall's, Ward's, Blackwell's, Governor's, Bedloe's, and David's, around New York; Coney Island, Fire Island, Shelter Island, and a great number of islands in Long Island Sound. There are many small islands in the Hudson River, about 1500 in the St. Lawrence, of which half belong to New York; many in Lakes Erie, Ontario, and Champlain, and about 230 in Lake George. *Bays, Sounds, etc.*—The upper and lower New York bays form one of the finest approaches in the world to a great harbor. Staten Island Sound is rather a strait than a sound, as is also the East River; but Long Island Sound, beyond it, is almost an inland sea. The Hudson River forms a broad expanse near Haverstraw known as the Tappan Zee. There are several small bays and harbors on the New York coast of Lake Ontario, and Buffalo and Black Rock harbors on Lake Erie.

Minerals.—The most important mineral of the State of New York is iron, of which there are magnetic, red and brown hæmatite, specular, and bog-iron ores, and in Duchess co. carbonate of iron is found. Galena or lead-ore is found in St. Lawrence and other counties in large quantities. Zinc, copper, arsenic, manganese, barytes, strontian, and alum occur in various parts of the State, but do not possess much economic value. Salt springs, from which a vast amount of salt is made, occur along the line of the Onondaga salt group, especially in Onondaga co. Gypsum and water-lime accompany them. The State abounds in building material; its granite, white and colored marbles, Potsdam and Medina sandstones, and gray and blue limestones, as well as its excellent clay and sand for brick, furnish a sufficiency of material for its dwellings; but, while it exports some of these, it imports more from other States and countries. Its quarries furnish also large quantities of slate, flagging-stones, and trap-rock for paving purposes. Serpentine (soapstone), talc, asbestos, amianthus, magnesia, in several forms, are among the minerals of merely scientific value. The State has numerous mineral springs of high repute—the chalybeate and saline at Saratoga; sulphur in Madison and Monroe cos.; acid in Genesee, Erie, and Orleans; those evolving nitrogen gas, as in Columbia, Rensselaer, and Seneca cos.; and those possessing magnetic or electrical qualities, as in Tompkins co. In Chautauqua, Duchess, Oneida, and Monroe cos. are illuminating gas springs. Fredonia, in Chautauqua co., has utilized this gas for lighting its streets and dwellings, and the lighthouse at Barcelona, in the same county, is illuminated by it.

Soil and Vegetation.—The greater part of the soil of New York is arable, and some of it very fertile. Most of the mountainous districts are fine grazing-lands, and yield the best milk, butter, and cheese. The plains and valleys are adapted to the culture of cereals, and the N. and N. W. counties to root-crops. Oneida, Madison, Otsego, and a part of Chenango are engaged in hop-culture. Tobacco is cultivated in several counties, grapes on the islands of the Hudson and on the shores of the Central New York lakes, and Indian corn in almost every part of the State. Market-gardening is extensively practised in the vicinity of the large cities, and great quantities of fruit are grown in the central counties. The forest-trees of the State present a great variety, and a few years ago nearly half the area of the State was covered with forests. The State has 12 species of the pine family, including the hemlock, balsam fir, black and white spruce, and tamarack, and the allied species of red and white cedar (arbor-vitæ) and Canada yew. There are 15 species of oak, of which the white oak is the most valuable and the most abundant; 3 species of elm, 3 of ash, 5 of maple, the sugar-maple being the most plentiful; the black walnut and butternut, and 4 species of hickory; the beech, chestnut, 3 species of birch, the sycamore, several species of poplar, numerous willows, the robinia or locust, the tulip tree or whitewood, the linden or basswood, the ironwood or hop hornbeam, and the sumachs; the *Magnolia glauca*, the cornel or dogwood, and various alders, elders, the button-bush, the shad-bush, and spicewood, are other forest-growths.

Zoology.—Among the mammals there are the opossum, bat, mole, shrew, black bear, raccoon, wolverene, skunk, fisher, Pennant's marten, pine marten, weasel, ermine-weasel or stoat, mink, otter, wolf, gray and black panther, Canada lynx, wildcat or bay lynx, seal, hooded seal, and walrus. There are also the gray fox, the red or common fox, the squirrel, the woodchuck, Labrador rat, beaver, musk-rat, porcupine, Norway or brown rat, 2 species of black rat, the gray rabbit, and the prairie hare. Of hoofed animals, besides the domestic animals, there are the fallow deer, elk, moose; there are the whale, porpoise, and the grampus. Six orders of birds are found in the State—birds of prey, birds of passage, the cock tribe, waders, lobe-footed birds, and swimmers. There are 3 orders of reptiles—the turtle, lizard, and serpent tribes. There are 17 species of turtles, tortoises, and terrapins, 2 of lizards, and 2 venomous and 17 or 18 harmless serpents. Of the Amphibia or batrachians there are 4 families—the frog tribe, the salamander tribe, the triton tribe, and the proteus tribe. The number of fishes is very large. The bony and cartilaginous fishes are both represented, the first by 6 orders and the second by 3. The crustaceans include 10 orders and about 60 species. Of mollusks there are 6 orders and a large number of species, many of them edible.

Climate.—The mean temperature of the State is 46.49°; the mean annual maximum of heat, 92°; the mean annual minimum, – 12°; the annual range of the thermometer, 104°. The climate is generally healthy; the death-rate, even in the large cities, is below the average of the country. Bilious affections prevail in the W. counties, diseases of the throat and lungs in the E. Annual rainfall: New York City (lat. 40° 42′ 43″, lon. 74° 00′ 03″, elevation 165.60 feet), 42.63 inches; Buffalo (lat. 42° 53′, lon. 78° 55′, elevation 662 feet), 39.37 inches.

Agricultural Productions.—By the census of 1880 there were produced of Indian corn, 25,690,156 bushels; oats, 37,575,506 bushels; wheat, 11,587,766 bushels; barley, 7,792,062 bushels; buckwheat, 4,461,200 bushels; rye, 2,634,690 bushels. The wool clip of 1880 yielded 8,827,195 pounds; of tobacco the yield in the census year was 6,481,431 pounds.

*Farm Animals.**—There were reported, in 1880, 610,358 horses, 2,339,721 cattle, 1,715,180 sheep, and 751,907 swine.

Fisheries.—The amount of fish taken in the marine and inland waters of New York is not very large; the yield in 1880 was $154,870 in net value of marketable fish, besides amateur fishing. Total product of all fisheries for 1880, $4,380,565.

Manufactures.—New York is one of the most productive States in the Union in all classes of manufactured articles,

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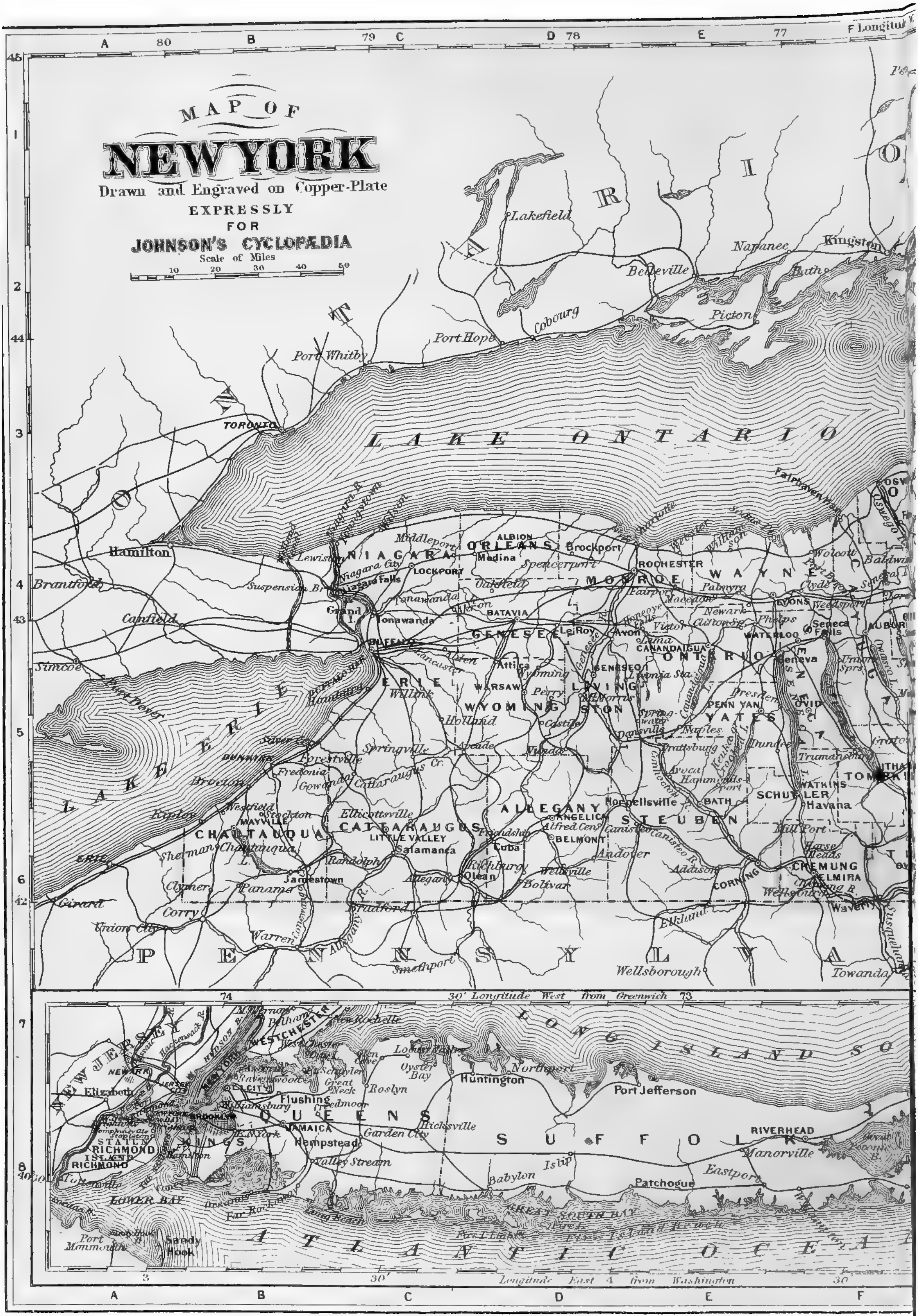
* On farms only.



MAP OF

NEW YORK

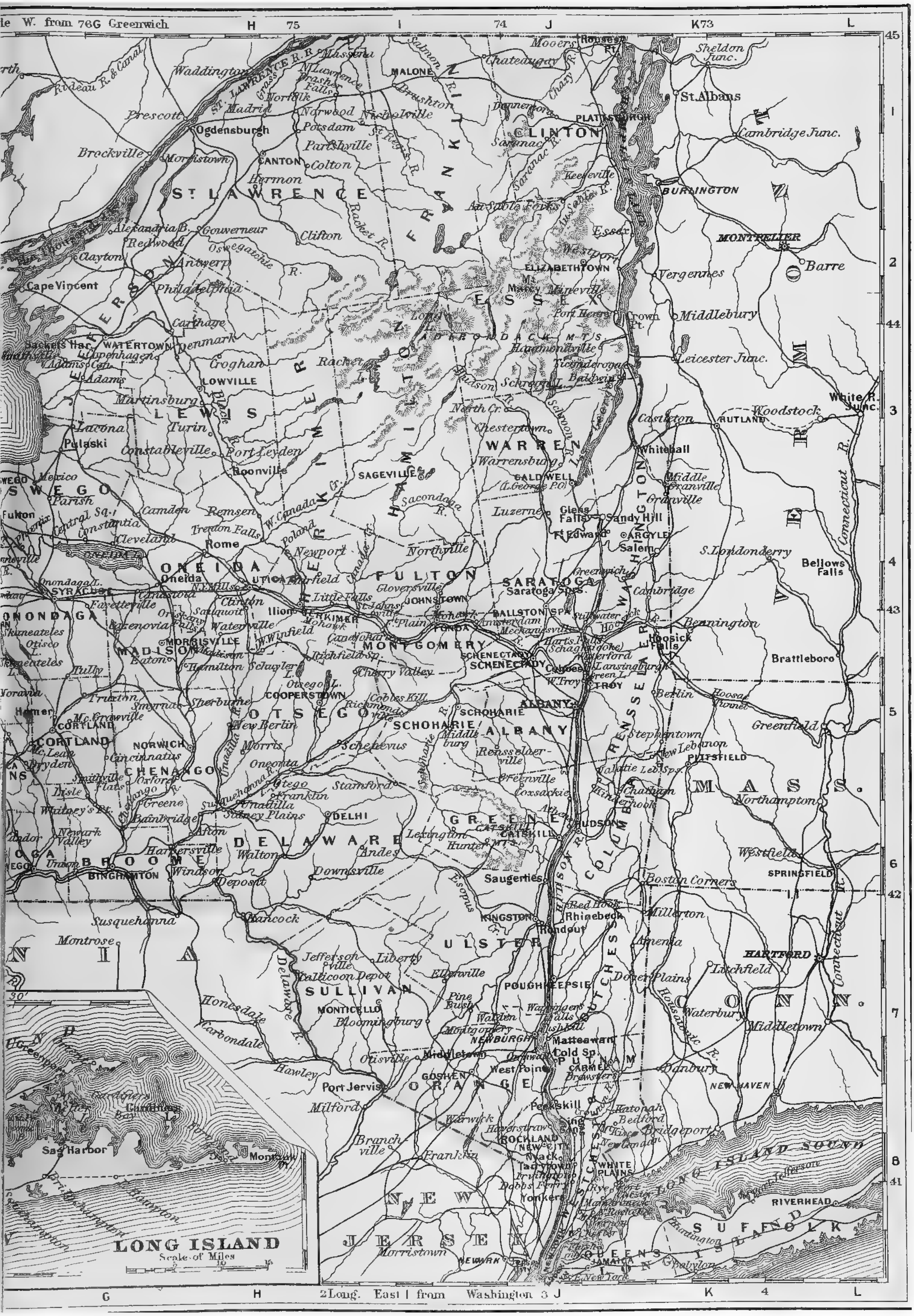
Drawn and Engraved on Copper-Plate

EXPRESSLY

FOR

JOHNSON'S CYCLOPÆDIA

Scale of Miles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Norwood
Potsdam
Parishville
Colton
Canton
Hermon
Brockville
Morristown
ST LAWRENCE
Malone
Salmon R.
Dickinson
Brushton
Nicholville
St. Regis R.
FRANKLIN
Chateaugay
Mooers
Rouses Pt.
Chazy R.
Dannemora
Plattsburgh
CLINTON
Saranac
Saranac R.
Keeseville
Au Sable Forks
Au Sable R.
Sheldon Junc.
St. Albans
Cambridge Junc.
Burlington
Montpelier
Barre
Essex
Westport
Elizabethtown
Mt. Marcy
Mineville
Port Henry
Crown Pt.
Vergennes
Middlebury
Leicester Junc.
ESSEX
Adirondack Mts.
Long L.
Racket L.
Racket R.
Hammondville
Ticonderoga
Baldwin
Schroon L.
Schroon R.
Hudson R.
North Cr.
Chestertown
WARREN
Warrensburg
Caldwell (L. George P.O.)
L. George
Alexandria B.
Redwood
Gouverneur
Oswegatchie R.
Clifton
Clayton
Antwerp
Cape Vincent
Philadelphia
Carthage
JEFFERSON
Sackets Har.
Watertown
Copenhagen
Denmark
Adams Cen.
Adams
Croghan
Lowville
LEWIS
Martinsburg
Black R.
Turin
Lacona
Pulaski
Constableville
Port Leyden
Boonville
HERKIMER
HAMILTON
Sageville
Sacondaga R.
Mexico
OSWEGO
Parish
Fulton
Phoenix
Central Sq.
Constantia
Camden
Remsen
W. Canada Cr.
Cleveland
Trenton Falls
Oneida L.
Rome
Poland
Newport
Northville
Luzerne
Glens Falls
Sandy Hill
Ft. Edward
Argyle
Salem
WASHINGTON
Whitehall
Castleton
Rutland
Woodstock
White R. Junc.
Middle Granville
Granville
Connecticut R.
S. Londonderry
Bellows Falls
VERMONT
ONEIDA
Oneida
N.Y. Mills
Utica
Fairfield
Canada Cr.
FULTON
Gloversville
Johnstown
SARATOGA
Saratoga Sps.
Greenwich
Cambridge
Onondaga
Syracuse
Fayetteville
Canastota
Clinton
Sauquoit
Oriskany Falls
Ilion
Herkimer
Little Falls
St. Johnsville
Mohawk
Ft. Plain
Fonda
Ballston Spa
Amsterdam
Mechanicsville
Stillwater
Hoosick R.
Bennington
ONONDAGA
Cazenovia
Waterville
Skaneateles
Otisco
Morrisville
W. Winfield
Canajoharie
Richfield Sps.
MONTGOMERY
Schenectady
Harts Falls
Schaghticoke
Waterford
Lansingburgh
Cohoes
W. Troy
Green L.
Troy
Hoosick Falls
Brattleboro
MADISON
Eaton
Madison
Hamilton
Schuyler L.
Otsego L.
Cherry Valley
Tully
Truxton
Smyrna
Sherburne
Cooperstown
Cobles Kill
Richmondville
Schoharie
Albany
Berlin
Hoosac Tunnel
Homer
McGrawville
Cortland
CORTLAND
OTSEGO
New Berlin
SCHOHARIE
Middleburg
ALBANY
Stephentown
Greenfield
McLean
Dryden
Norwich
Cincinnatus
CHENANGO
Morris
Schenevus
Rensselaerville
RENSSELAER
New Lebanon
Pittsfield
Smithville Flats
Oxford
Oneonta
Unadilla R.
Otego
Stamford
Schoharie R.
Greenville
Coxsackie
Valatie
Lebanon Sps.
Chatham
Kinderhook
MASS.
Northampton
Lisle
Whitney's Pt.
Greene
Chenango R.
Susquehanna R.
Unadilla
Franklin
Sidney Plains
Bainbridge
Delhi
GREENE
Athens
Hudson
COLUMBIA
Newark Valley
Afton
Harpersville
BROOME
Binghamton
Union
DELAWARE
Walton
Windsor
Lexington
Hunter
Catskill Mts.
Catskill
Andes
Downsville
Deposit
Saugerties
Westfield
Springfield
Boston Corners
Susquehanna
Hancock
Esopus Cr.
Kingston
Rondout
Red Hook
Rhinebeck
Millerton
Amenia
Montrose
Jeffersonville
Liberty
Callicoon Depot
Ellenville
ULSTER
DUTCHESS
Hartford
Litchfield
Dover Plains
Honesdale
SULLIVAN
Monticello
Bloomingburg
Pine Bush
Poughkeepsie
Wappingers Falls
Fishkill
Housatonic R.
Connecticut R.
CONN.
Waterbury
Middletown
Carbondale
Walden
Montgomery
Newburgh
Matteawan
Cold Sp.
Delaware R.
Hawley
Otisville
Middletown
Goshen
ORANGE
West Point
PUTNAM
Carmel
Brewsters
Danbury
New Haven
Port Jervis
Milford
Warwick
Haverstraw
Peekskill
Croton R.
Katonah
Bedford
Mt. Kisco
New Canaan
Bridgeport
Rockland
New City
Nyack
Tarrytown
Irvington
Dobbs Ferry
Yonkers
White Plains
WESTCHESTER
Rye
Port Chester
Mamaroneck
New Rochelle
Long Island Sound
Port Jefferson
Riverhead
SUFFOLK
Huntington
LONG ISLAND
Babylon
QUEENS
Jamaica
New York
Branchville
Franklin
NEW JERSEY
Morristown
Newark
PENNSYLVANIA
Sag Harbor
Gardiners Bay
Montauk
Southampton
East Hampton
Bridgehampton
Greenport
LONG ISLAND
Scale of Miles
0
5
10
15

including iron and steel, textile fabrics, furniture, wooden-ware, pottery, glass, machinery, agricultural implements, watches, jewelry, hardware, drugs, etc. The aggregate value of iron and steel manufactured alone in 1880 was $22,219,219, the State ranking next to Pennsylvania. New York had, in 1880, 12,822 cotton-looms, with 578,512 spindles, employing 10,710 persons. There were, in 1880, 69 salt-manufacturing establishments, employing a capital of $2.286,081, producing 8,748,203 bushels of salt; aggregate value, $1,107,760.

Railroads and Canals.—There were in operation, Jan. 1, 1882, within the State of New York 6279 miles of railway, costing $564,737,784, with net earnings of $29,108,551, and paying interest and dividends to the amount of $23,149,511. Of these several are very important trunk lines, as the New York Central and Hudson River, the New York Lake Erie and Western, the Delaware and Hudson Canal Co.'s R. R., and the New York Ontario and Western. There are 11 canals, of which the Erie is the principal, owned by the State. These with their navigable feeders have a total length of 906.95 miles. Besides these State canals there are two others, partly in this State, which belong to corporations—viz. Delaware and Hudson Canal, of which 87 miles are in this State, and the Junction Canal, 18 miles long.

Finances.—The assessed valuation of property in New York for 1881 was: real estate, $2,329,408,450; personal, $339,702,783; total, $2,669,111,233. Rate of State tax, 6½ mills on the dollar, producing, in 1881, $9,232,542. The real estate bears about 88 per cent. of the entire taxation, and personal property only about 12 per cent. State debt, less sinking fund, 1881, $7,000,000; total net indebtedness, State, county, and municipal, $218,723,314; total raised by taxation, State and local, 1880, $56,401,099.

Banks, etc.—In Oct., 1881, there were in operation in New York 291 national banks, with aggregate capital of $83,980,160; circulation, $46,529,277, secured by U. S. bonds to the value of $52,703,400; deposits, $322,202,691. There were, in addition, 81 State banks and trust companies, with $27,805,221 capital and $131,258,430 deposits; 120 savings-banks, with $352,149,128 deposits; and 674 private bankers, with $47,583,862 capital and $59,724,923 deposits. Of insurance companies there were 91 in operation in 1881, paying losses in that year to the amount of $10,301,500; risks written in 1880, $2,861,479,452; premiums received, $15,957,977.

Commerce.—Both in foreign and interior commerce New York takes the lead among the States. Her shipping in 1881 aggregated 1,150,222 tons, numbering 1048 steam vessels, 2948 sailing vessels, 971 canal-coats, and 444 barges. Value of direct importations from foreign countries, 1881, $453,969,119; of exports, $398,065,346, the latter being of American production solely. New York Harbor is the great entrepôt for the foreign commerce of the country, whence it is distributed all over the States and Territories. The internal commerce by Erie Canal and the great R. R. lines is prodigious and constantly increasing.

Education.—The number of children of school-age (five to twenty-one years) in 1880 was 1,641,173, of whom 1,027,938 were enrolled in public schools, with average daily attendance of 551,958. Total expenditure for public schools in 1880, $9,936,662, of which there was expended for teachers' salaries $7,438,277. Number of universities and colleges in 1880, 29, with 524 instructors and 6625 students, paying in tuition fees, $474,229. Among the principal colleges are Columbia College, New York City; Cornell University, Ithaca; Union College, Schenectady; Vassar (female) College, Poughkeepsie, etc. Normal schools, academies, and female seminaries are very numerous; technical schools and commercial colleges are found in nearly all the large cities; while the metropolis abounds in institutions for instruction in music, art, telegraphy, household economy, decorative art, etc. The law and medical schools of New York are extensively patronized, and the leading religious denominations have theological seminaries. In 1882 there were 1319 newspapers and periodicals published in the State, of which 131 were daily journals.

Churches.—The Methodist Episcopal denomination comes first, with 1858 churches, 1121 ministers, and 214,836 members; Presbyterian, 789 churches, 979 ministers, 125,298 members; Baptist, 863 churches, 773 ministers, 113,215 members; Roman Catholic, 666 churches, 975 priests, and more than a million Catholic population; Protestant Episcopal, 592 churches, 709 ministers, 86,211 members; Lutheran, 365 churches, 203 ministers, 44,660 members: Reformed Church, 280 churches, 289 ministers, 47,732 members; Congregational, 253 churches, 258 ministers, 33,386 members; Jews, 51 synagogues, 40 rabbis, 3400 members (Hebrew population about 80,000); and about 30 other denominations, having from 10,000 down to 50 members each.

Population.—In 1860, 3,880,735; 1870, 4,382,759; 1880, 5,082,871 (white 5,016,022, colored 66,849, including 909 Chinese, 819 Indians, and 17 Japanese).

Principal Cities and Towns, Pop. 1880.—New York, 1,206,299; Brooklyn, 566,663: Buffalo, 155,134; Albany (cap.), 90,758; Rochester, 89,366; Troy, 56,747; Syracuse, 51,792; Utica, 33,914; Auburn, 21,924; Oswego, 21,116; Elmira, 20,541; Poughkeepsie, 20,207; Cohoes, 19,416; Yonkers, 18,892; Kingston, 18,344; Newburg, 18,049; Binghamton, 17,317; Schenectady, 13,655; Lockport, 13,522; Rome, 12,194; Watertown, 10,697; Amsterdam, 9466; Jamestown, 9357; Ithaca, 9105; Saratoga Springs, 8421.

COUNTIES.	*Ref.	Pop. 1870.	Pop. 1880.	COUNTY TOWNS.	Pop. 1880.
Albany	5–J	133,052	154,890	Albany	90,758
Allegany	6–D	40,814	41,810	Angelica Belmont	705 804
Broome	6–G	44,103	49,483	Binghamton	17,317
Cattaraugus	6–C	43,909	55,806	Little Valley	566
Cayuga	4–F	59,550	65,081	Auburn	21,924
Chautauqua	6–B	59,327	65,342	Mayville	362
Chemung	6–F	35,281	43,065	Elmira	20,541
Chenango	5–G	40,564	39,891	Norwich †	5,756
Clinton	1–J	47,947	50,897	Plattsburg	5,245
Columbia	6–K	47,044	47,928	Hudson	8,670
Cortland	5–G	25,173	25,825	Cortland	4,050
Delaware	6–H	42,972	42,721	Delhi	1,384
Duchess	7–J	74,041	79,184	Poughkeepsie	20,207
Erie	5–C	178,699	219,884	Buffalo	155,134
Essex	2–J	29,042	34,515	Elizabethtown	445
Franklin	1–I	30,271	32,390	Malone	4,193
Fulton	4–I	27,064	30,985	Johnstown	5,013
Genesee	4–D	31,606	32,806	Batavia	4,845
Greene	6–J	31,832	32,695	Catskill	4,320
Hamilton	3–I	2,960	3,923	Sageville.	
Herkimer	4–H	39,929	42,669	Herkimer	2,359
Jefferson	2–G	65,415	66,103	Watertown	10,697
Kings	8–B	419,921	599,495	Brooklyn	566,663
Lewis	3–H	28,699	31,416	Lowville †	3,188
Livingston	5–D	38,309	39,562	Geneseo	1,925
Madison	4–G	43,522	44,112	Morrisville	711
Monroe	4–D	117,868	144,903	Rochester	89,366
Montgomery	4–I	34,457	38,315	Fonda	944
New York	8–J	942,292	1,206,299	New York	1,206,299
Niagara	4–C	50,437	54,173	Lockport	13,522
Oneida	4–H	110,008	115,475	Utica	33,914
Onondaga	4–F	104,183	117,893	Syracuse	51,792
Ontario	5–E	45,108	49,541	Canandaigua	5,726
Orange	7–J	80,902	88,220	Goshen Newburg	2,557 18,049
Orleans	4–D	27,689	30,128	Albion †	5,147
Oswego	3–G	77,941	77,911	Oswego	21,116
Otsego	5–H	48,967	51,397	Cooperstown	2,199
Putnam	7–J	15,420	15,181	Carmel	571
Queens	8–C	73,803	90,574	Jamaica L. I. City	3,922 17,129
Rensselaer	5–J	99,549	115,328	Troy	56,747
Richmond	8–A	33,029	38,991	Richmond	88
Rockland	8–J	25,213	27,690	New City	270
Saratoga	4–J	51,529	55,156	Ballston	3,011
Schenectady	4–J	21,347	23,538	Schenectady	13,655
Schoharie	5–I	33,340	32,910	Schoharie	1,188
Schuyler	5–F	18,989	18,842	Watkins	2,716
Seneca	5–F	27,823	29,278	Ovid Waterloo	705 3,893
Steuben	6–E	67,717	77,586	Bath Corning	3,183 4,802
St. Lawrence	1–H	84,826	85,997	Canton	2,049
Suffolk	8–K	46,924	53,888	Riverhead	1,757
Sullivan	7–I	34,550	32,491	Monticello	941
Tioga	6–F	30,572	32,673	Owego	5,525
Tompkins	5–F	33,178	34,445	Ithaca	9,105
Ulster	7–J	84,075	85,838	Kingston	18,344
Warren	3–J	22,592	25,179	Lake George	319
Washington	4–K	49,568	47,871	Argyle	316
Wayne	4–E	47,710	51,700	Lyons	3,820
Westchester	8–J	131,348	108,988	White Plains	2,381
Wyoming	5–D	29,164	30,907	Warsaw	1,910
Yates	5–E	19,595	21,087	Penn Yan	3,475
Total		4,382,759	5,082,871		

History.—The bay of New York was first discovered in 1524 by Juan de Verazzano, a Florentine navigator in the French service. In Sept., 1609, Hendrik (or Henry) Hudson, a navigator in the service of the states-general of Holland, again discovered the bay, and ascended both it and the Hudson River to a point a little below Albany. On his return, landing in England, he despatched to Holland an account of his discoveries. In 1610 some Amsterdam merchants sent a small vessel to the Hudson River to trade with the Indians for furs, etc. In 1613, two small trading-forts were built on the river and four houses erected on Manhattan Island. These explorers ran along the whole length of Long Island, ascended the strait now known as the East River, entered the Sound, and also passed up the Hudson and along the Jersey coast to the Delaware River, which they ascended for some distance. In 1614 an expedition consisting of five vessels was sent out by the states-general to explore this region. In Oct., 1614, the states-general granted to the explorers the exclusive right to trade between the Delaware and Connecticut rivers for three years from that date. In 1615 a fort and a trading-house were erected just below the present site of Albany, another on Manhattan Island, and messengers were despatched to the Indian tribes to induce them to trade with the company which they had organized as the United New Netherlands Company. On the expiration of their grant the states-general refused to renew it, but they continued to trade thither until about 1623 or 1624, when the Dutch West India Company took possession of the lands. In 1623 they erected Fort Nassau on the Delaware River, and Fort Orange on the site of Albany. In 1624, Peter Minuit was appointed director of the New Netherlands, and brought over colonists who settled on Long Island. Up to 1629 the settlements were simply trading establishments. In that year the West India Company's council granted to certain individuals extensive seigniories or tracts of land with feudal rights over the lives and persons of their subjects. Under this grant Kiliaen van Rensselaer, a pearl-merchant of Amsterdam, secured in 1630 and subsequently a tract of land 24 by 48 miles in extent, composing the present counties of Albany, Rensselaer, and part of Columbia; Michael Paauw purchased Staten Island, Jersey City, and Harsimus; and others other tracts of great extent. Minuit's administration came to an end in 1632, and he was succeeded by Wouter van Twiller. Van Twiller extended the colonies, planted a new one on the Connecticut River on the site of Hartford, erected a fort there, and furthered the interests of the company. He was succeeded in 1637 by Willem Kieft, whose administration of eight years was one of constant turbulence and trouble with the colonists, with the Indians, and with the English settlers on Long Island and in Connecticut. In 1645, Petrus Stuyvesant was appointed director in Kieft's place. In Sept., 1664, the colony of New Netherlands—which, in violation of all national comity, Charles II. had granted to his brother, the duke of York—was conquered by the capitulation of New Amsterdam, and its name changed to New York. In Aug., 1673, the colony was recaptured by the Dutch, and remained in their possession until the following February, when it was restored to the English by treaty. The feudal relations of the patroons or seigneurs and their tenants and subjects were not materially changed during this period. On July 9, 1776, the provincial congress which had been organized in May, 1775, reassembled at White Plains and took the title of "The Representatives of the State of New York." At the same session they approved the Declaration of Independence. New York had from the first taken an active part in the movements which led to the Revolution, though there were many Tories in the State. The earliest captures of British forts, as Ticonderoga, Crown Point, and Skenesborough (Whitehall), were within her limits, while the disastrous battle of Long Island, the minor actions of Harlem Heights, White Plains, and the capture of Forts Washington and Lee were among the early misfortunes of the New York patriots. New York City and the Hudson below Peekskill, as well as Staten Island and the most of Long Island, were occupied by the enemy, the N. border was held by British troops from Canada, and the E. central counties, along the Mohawk, Schoharie Creek, and the Delaware, were ravaged by Tories and Indians under the leadership of Sir John and Sir Guy Johnson, the bloodthirsty Butlers, and the Indian chief Brant. Yet occasionally the patriots were cheered by success. Burgoyne was compelled to surrender Oct. 17, 1777, near Schuylerville, Saratoga co. The frequent incursions of Gen. Lord Howe up the Hudson and on Long Island were not productive of very serious losses, and even the treason of Arnold was discovered too soon to cause serious disaster. Its first State constitution was adopted Apr. 20, 1777, and Gen. Clinton was elected its first governor, and continued in office till 1795. The Articles of Confederation for the States were approved by New York in Feb., 1778. The Constitution was ratified by New York July 26, 1788. In the war with Great Britain (1812–15), New York took an active part, and, aside from the victories gained by her heroes on the ocean, many of the minor conflicts and the important land and naval battle of Plattsburg were fought on its N. and N. W. frontier. The battle of Lundy's Lane, one of the most decisive of the war, was fought on the Canada side of the Niagara River, less than 2 miles from the Falls. Soon after the war the project of a canal from Albany to Buffalo, which had been previously broached, was revived, and in 1817 both the Erie and the Champlain canals were commenced and pushed forward to completion. the latter in 1823, and the former, with great rejoicings, in 1825. A constitutional convention was held in 1821, and a new constitution adopted and ratified by the people. The Anti-Masonic excitement in 1826 caused a great commotion and many political changes in the State. The popularity of the Erie and Champlain canals led to a great pressure upon the State for the construction of other canals, unwarranted by the business of the regions through which they were to pass. In an evil hour they were commenced, and have ever since been a constant source of loss to the State. The enlargement of the Erie Canal, begun in 1835, has increased the cost of that great work to $100,000,000, but with advantages perhaps commensurate with its cost. In 1846 another constitutional convention was held, and a new constitution, differing materially from the preceding, adopted and ratified by the people. Her quotas in the civil war were promptly filled, and the State paid $40,000,000 in bounties to her volunteers. In 1867 another convention was held and a new constitution promulgated, which was, however, rejected by the people, except the articles on the judiciary, which were incorporated into the constitution of 1846, which became the governing law of the State.

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* Reference for location of counties. See map of New York.
† Township.

Governors of the Colony and the State.

(Those marked with a star (*) died in office.)

Under the Dutch.	
Peter Minuit	1624–33
Wouter van Twiller	1633–37
Willem Kieft	1637–47
Petrus Stuyvesant	1647–64
Under the English.	
Richard Nicolls	1664–67
Francis Lovelace	1667–73
Dutch administration resumed.	
Anthony Colve	1673–74
English administration resumed.	
Edmund Andros	1674–83
Thomas Dongan	1683–88
Edmund Andros	1688–89
Jacob Leisler	1689–91
Henry Sloughter*	1691
Richard Ingoldsby	1691–92
Benjamin Fletcher	1692–98
Richard, Earl Bellomont*	1698–1701
John Nanfan	1701–02
Lord Cornbury	1702–08
John, Lord Lovelace*	1708–09
Richard Ingoldsby	1709–10
Gerardus Beekman	1710
Robert Hunter	1710–19
Peter Schuyler	1719–20
William Burnet*	1720–28
John Montgomerie*	1728–31
Rip van Dam	1731–32
William Cosby*	1732–36
George Clarke	1736–43
George Clinton	1743–53
Sir Danvers Osborne*	1753
James de Lancey	1753–55
Sir Charles Hardy	1755–57
James de Lancey*	1757–60
Cadwallader Colden	1760–61
Robert Markton	1761
Cadwallader Colden	1761–65
Sir Henry Moore*	1765–69
Cadwallader Colden	1769–70
John, Lord Dunmore	1770–71
William Tryon	1771–77
Governors of the State.	
George Clinton	1777–95
John Jay	1795–1801
George Clinton	1801–04
Morgan Lewis	1804–07
Daniel D. Tompkins	1807–17
De Witt Clinton	1817–22
Joseph C. Yates	1822–24
De Witt Clinton*	1824–28
Nathaniel Pitcher	1828–29
Martin Van Buren	1829
Enos T. Throop	1829–33
William L. Marcy	1833–38
William H. Seward	1838–42
William C. Bouck	1842–44
Silas Wright, Jr	1844–46
John Young	1846–49
Hamilton Fish	1849–51
Washington Hunt	1851–53
Horatio Seymour	1853–55
Myron H Clark	1855–57
John A. King	1857–59
Edwin D. Morgan	1859–63
Horatio Seymour	1863–65
Reuben E. Fenton	1865–69
John T. Hoffman	1869–73
John Adams Dix	1873–75
Samuel J. Tilden	1875–77
Lucius Robinson	1877–80
Alonzo B. Cornell	1880–83
Grover Cleveland	1883–85
David B. Hill (acting)	1885–86
David B. Hill	1886–88

REVISED BY A. R. SPOFFORD.

New York (the *New Amsterdam* of the Dutch; lat. of City Hall, 40° 42.7′ N., lon. 74° 00.1′ W. from Greenwich), the chief commercial city in the U. S., and the most populous, is situated at the junction of the Hudson or North River and the extension of Long Island Sound known as the East River (see map of New York, ref. 8–J, for location of county). The limits of the city and county (of the same name) are identical, and include the S. part of the former county of Westchester, together with Manhattan, Blackwell's, Ward's, Randall's, Bedloe's, Ellis, and Governor's islands, of which the last three have been ceded for federal purposes to the U. S. government.

Area.—The total area of the city before the recent additions from Westchester co. was 22 square miles, or 14,080 acres: the additions amount to 13,000 acres. That of Manhattan Island, the seat of population, and divided from the mainland by the Harlem River, is 22 square miles and 20,424 square yards. Of this, 8.712,000 yards are devoted to public parks. The length of the island is 13½ miles; its width averages 1¾ miles. The outlying islands are set aside for public purposes– almshouses, penitentiaries, etc. They contain about 300 acres; those ceded to the government, 100 acres.

Commerce and Immigration.—Nearly 60 per cent. of the foreign trade of this country passes through this port. the total aggregate of inward and outward trade being, for all the U. S., for the fiscal year 1883–84, $1,512,770,947, of which New York had $870,968,559. Of this, the imports, exclusive of specie and bullion, amounted to $465,119,630, and the exports to $320,968,559. The importation of sugar at New York for the fiscal year 1883-84 was valued at $62,608,160; of coffee, $39,428,050; of tea, $9,844,545. Imports of silk manufactures, $34,638,973; of cotton, $25,580,202; woollen, $38,428,035: flax, $17,165,780; iron and steel, $24,537,024; hides and skins, $15,929,621; tin, in bars and plates, $15,237,468; tobacco, $8,171,190; coin and bullion, $21,235,725. The exports from New York for same fiscal year: Breadstuffs, $60,819,580; provisions, $75,565,751; cotton, $30,428,144; oils, $37,272,620; tobacco, $10,658,506; specie and bullion, $43,039,148. The number of vessels, steam and sail, engaged in the foreign trade of New York, was, in the fiscal year ending June 30, 1884, 6066, of which 4197 were foreign and 1869 American. The number of ocean steam vessels was 1963, of which 1724 were foreign and 239 American. The whole number and tonnage of sailing vessels, steam vessels, barges, and canal-boats belonging to the port of New York, June 30, 1884, was 5619, of 1,203,953 tons.

The transportation to tidewater on the canals from the Western States and from the interior of the State amounted in 1884 to 2,853,764 tons, and the returns to 1,293,500 tons. The canals were freed from tolls by late legislation. The arrivals of immigrants at the port were 330,030 in 1884.

Manufactures.—By the census of 1880 the number of manufactories in the city of New York was 11,339, with $181,206,356 capital, producing a value of $472,926,437.

Finances.—The official value of the property of the city for purposes of taxation was, for 1884, real, $1,119,761,597; personal, $218,536,746; total, $1,338,298,343.

Banks.—There are 61 banks in the city, with a capital of $63,432,500, a circulation of $11,939,600, and deposits of $246,263,700. These banks are associated in a clearing-house for their daily exchanges, the transactions of which amounted in 1884 to $34,000,000,000. There are also 25 savings banks, with deposits of $244,425,378, from 618,088 depositors.

Courts.—The U. S. circuit court for the southern district of New York State has ten counties under its jurisdiction, one of which is that of New York. This holds two general terms, one criminal and one equity term, each year. The U. S. district court holds a general term monthly and a special term weekly. These courts have their chambers in the new post-office building. The State courts are civil and criminal; the civil and the supreme, superior, common pleas, held in the county court-house; the marine, held in the City Hall; and ten districts, each covering a number of wards in jurisdiction. The criminal courts are the oyer and terminer, which sits twice in each year at the county court-house; the general sessions, held monthly at its chambers; the special sessions, at the Tombs. In addition to these there is a court of arbitration of the Chamber of Commerce, established by law in 1874, for adjudication of cases voluntarily submitted.

Churches.—There are 379 religious organizations, of which 72 are Protestant Episcopal, 55 Methodist Episcopal, 50 Presbyterian, 38 Baptist, 21 Lutheran, 20 Reformed Dutch, 5 Congregational, 4 Universalist, 3 Unitarian, 3 Evangelical, 2 Friends, 58 Roman Catholic, 25 Jewish, and 23 miscellaneous. The oldest denomination is the Dutch Reformed, established by the Holland settlers. The Church of England and the Presbyterian Church were founded by the English; the Jews built a synagogue as early as 1730; the Roman Catholics erected their first edifice in 1786. The churches noted for their size, cost, and architectural beauty are Trinity, St. Paul's, St. George's, the Fifth Avenue Presbyterian, the Reformed Collegiate, the Jewish Synagogue, and the Roman Catholic cathedral.

Public Institutions and Charities.—The municipal charities of New York are intrusted to a board entitled the commissioners of public charities and correction, who have under their control 23 institutions, viz. Almshouse, Bellevue Hospital, Bureau of Medical and Surgical Relief for the Outdoor Poor, City Prison, Colored Home, Colored Orphan Asylum, epileptic, fever, and incurable hospitals, Blackwell's Island, idiot, homœopathic, inebriate, and infants' hospitals, lunatic asylum, New York City Asylum for Insane, nursery hospital, out-door poor department, penitentiary, penitentiary and charity smallpox hospitals, and workhouse. The immigrants are under the care of the commissioners of emigration, by whom large numbers of them are relieved, forwarded, and provided with employment. The institutions incorporated by the State are subject to the visitation of the State board of charities, who render an annual report to the legislature. Besides these there are numerous private institutions endowed and supported by voluntary contributions, and in some cases assisted by State or municipal appropriations. The oldest and most efficient of these is the Association for Improving the Condition of the Poor. Their expenditures for the year 1882 were about $30,000; a new and commendable feature in their work is the tenement-house inspection. Besides this central institution, there are numerous private and church charities and 74 district asylums and homes which give shelter. Independent of the city institutions, 24 hospitals are maintained by subscription. Many of these are on an extensive scale, occupying large buildings arranged in accordance with the best sanitary improvements, and giving relief to a large number of sick and injured. The Roosevelt Hospital, in its absolutely liberal and unsectarian administration, is a model for universal imitation. The dispensaries, 28 in number, are of the highest value in their gratuitous supply of physicians and medicine. For these various forms of public benefactions New York has been noted from her earliest history. She perhaps has no equal on this continent, certainly none on the other, in the extent and wisdom of her benevolence. The organized local charitable societies and institutions receive and distribute annually about $3,000,000.

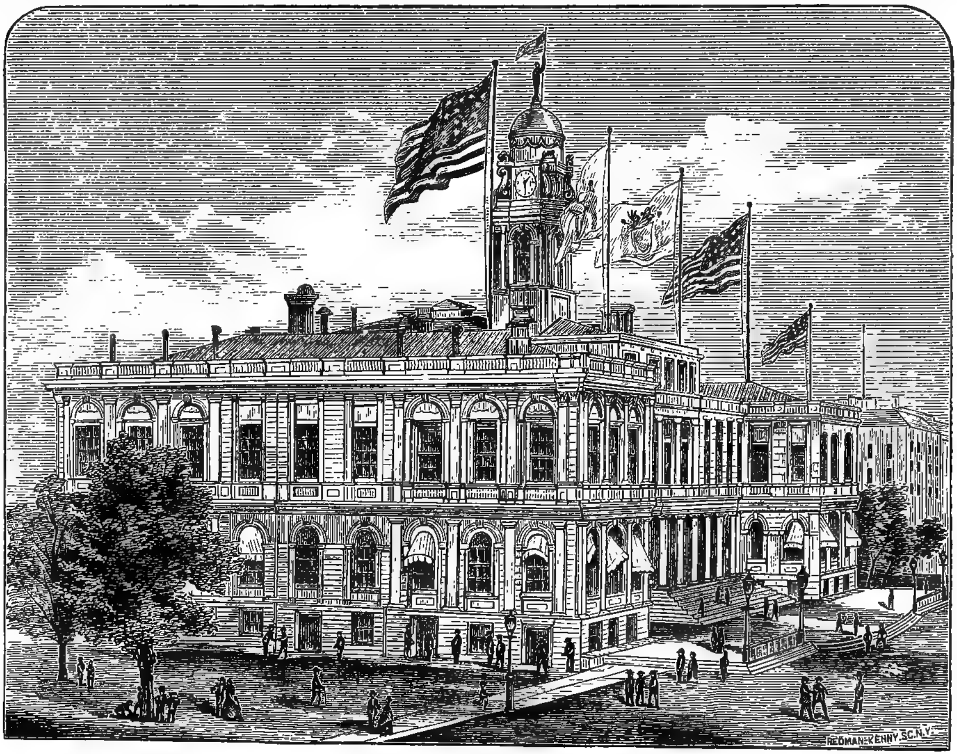
Education.—The public instruction is under charge of a board of education: the whole number of schools within their jurisdiction in 1881 was 299, with an attendance of 275,899 pupils. There are a female normal school, a normal school for teachers, and a model training school in connection with the normal college. The College of the City of New York—better known as the Free Academy—is a part of the general system of public instruction. There are two important literary colleges, Columbia and the University of the City of New York. Besides these, there are the College of St. Francis Xavier, Manhattan College, and many other institutions of learning; Peter Cooper established an institute in this city for the education of the working classes, which is under the charge of a board of trustees, and to which he gave a building valued at $500,000, and made other munificent donations. The instruction includes engineering, the arts of design, and modelling. The tuition and lectures are free. (See COOPER, PETER, and TRADE-SCHOOLS.)

There are several societies for the promotion of the fine arts. The National Academy of Design, instituted in 1826, owns a fine building of gray and white marble and bluestone on the corner of Twenty-third street and Fourth avenue, and has large and valuable collections. The Metropolitan Museum of Art, incorporated in 1870, situated in Central Park, has a carefully selected and choice collection of antiquities and curiosities, chief among which is the Cesnola Collection.

Libraries.—The oldest library in the city is the New York Society Library, situated in University Place between Twelfth and Thirteenth streets. It was organized in 1740 and incorporated in 1754, has a collection of about 70,000 volumes for circulation and reference, and has a reading-room. It is maintained by annual dues. The most important in number of volumes, in its special wealth in technical information in all languages, is the Astor Library, the noblest individual contribution to the cause of education in the U. S. It was founded on a bequest of John Jacob Astor, organized under a board of trustees in 1848, and opened in 1854 with a collection of 70,000 volumes, made by the distinguished Dr. Joseph G. Cogswell, with a view to the providing of a reference library of works not otherwise of easy access. The original building, 65 feet front by 120 feet deep, is situated on Astor Place. William B. Astor, son of the founder, has since added a second building of similar size, and the number of volumes had increased to 192,547 on Jan. 1, 1884. The buildings are elegant and commodious. The books are free to the public, for use only in the library. This institution is increased by the continual care and endowment of each succeeding generation of the family whose name it bears. The next important library is that of the New York Historical Society, a collection rich in American history. It occupies a fine building on the corner of Eleventh street and Second avenue, the capacity of which it has for some years outgrown. It has a collection of historical works, newspapers from 1704 to the present date, manuscripts, public and private documents of great value, and is the favorite receptacle for family papers of historical importance. It has also a large collection of American antiquities, the famous Abbot Egyptian collection, the Lenox Nineveh marbles, and one of the most extensive and finest art collections in the country. It is supported by a large membership of the leading citizens. The great circulating libraries are those of the Mercantile Library Association and the Apprentices' Library, the latter free to the working class. The Mercantile Library Association, Clinton Hall, Astor Place, originally organized for the benefit of merchants' clerks, to whom access is given at a merely nominal charge, has a very large collection of current literature, 193,000 volumes, and a fine and extensively used reading-room, where both foreign and domestic reviews, magazines, and periodicals are amply supplied. The library is chiefly used for circulation. In addition, there is an admirable system of lectures and classes. Among the special collections the most extensive are those of the Union Theological Seminary, the American Institute, the Law Institute, the New York Hospital and Academy of Medicine. The Lenox Library is an amateur collection rich in American history, Shakespeareana, and Bibles. It was incorporated Jan. 21, 1870, and has a large and beautiful building, opened in 1877, covering the whole front of the block on Fifth avenue between Seventieth and Seventy-first streets, and commanding a fine view of Central Park. In it the large and valuable collection of the founder, James Lenox, whose munificent gift includes also the real estate and buildings, has been deposited. It has also a fine-art gallery and a collection of curiosities. The American Geographical Society has a good library of books on geography and a valuable collection of charts, maps, and other documents. It is the only institution in the country wholly devoted to geographical science. The Episcopal Theological Seminary has a large library. The Chamber of Commerce has a small but extremely valuable collection of works on finance and subjects of commercial interest. The city possesses no great public library for circulation like the model institution of Boston. The necessity is seriously felt by literary, professional, and working men, and by none more than the large class who provide material for the press. An institution organized under the name of the Free Circulating Library was undertaken to supply reading-matter to the poor in the different wards of the city, and has made in the last few years a successful experiment on a small scale. It is a most deserving charity, but in no manner covers the general ground. A large public library is the one great want of the city.

Newspapers.—The leading morning newspapers are the *Herald, Times, Tribune, World, Sun, Journal of Commerce, Morning Journal, Staats-Zeitung, Courrier des Etats Unis;* the evening papers are the *Evening Post, Mail and Express, Commercial Advertiser, Daily News,* and *Telegram.* Of the illustrated papers, the daily *Graphic, Harper's Weekly,* and *Frank Leslie's Illustrated News* are the most popular. In addition to these, there are more than 400 minor sheets devoted to literature, science, and art.

Principal Buildings.—The most noted buildings are the City Hall, a graceful structure in City Hall Park, built 1803; adjoining is the new court-house, a large edifice; they are both in marble, except the rear of the City Hall, which is brownstone, the authorities having then no idea that the city limits would extend any higher. The custom-house, formerly the merchants' exchange, is an immense and massive building of Quincy granite; the columns are 38 feet in height and 4½ feet in diameter; the sub-treasury occupies the old custom-house; the new post-office, the finest public edifice in the city, was finished in 1875. It is admirably adapted for its purpose, and occupies the southern angle of the Park. The buildings erected during the last few years are of an entirely new order, both in construction and in style, and combine all the modern appliances of convenience and comfort. In the lower part of the city vast structures many stories in height have greatly extended the accommodations for the business community. In the upper part numerous buildings not less extensive have been erected on what is known as the apartment plan (see Apartment-Houses), which unite the privacy of home to the advantages of a common light, heat, and general service. These have changed the appearance of the principal thoroughfares. In addition, a large number of private houses palatial in their luxury and elegance now appear in the avenues devoted to fashionable residences.


REDMAN-KENNY SC.N.Y.

The City Hall.

Markets, etc.—The market system needs a radical change, but changes have been found difficult, in view of the old habits and prejudices of the people. The great receptacles of country supply are Fulton, for the products of Long Island; Washington and Clinton, for those of New Jersey. These are on or near the river-fronts. Besides these, there are ten others, owned by the city and rented by stalls. The great body of the population, however, supply themselves daily from street shops or stands. The street vender is not in repute, as in London or Paris. Consumers and producers suffer from the want of system and regulation, both being at the mercy of the middlemen. Hence, with a supply abundant and various beyond that of any modern capital, food rarely reaches the consumer except in an imperfect condition and at an unreasonable price. Jefferson, Fulton, and Washington markets have lately been excellently rebuilt.

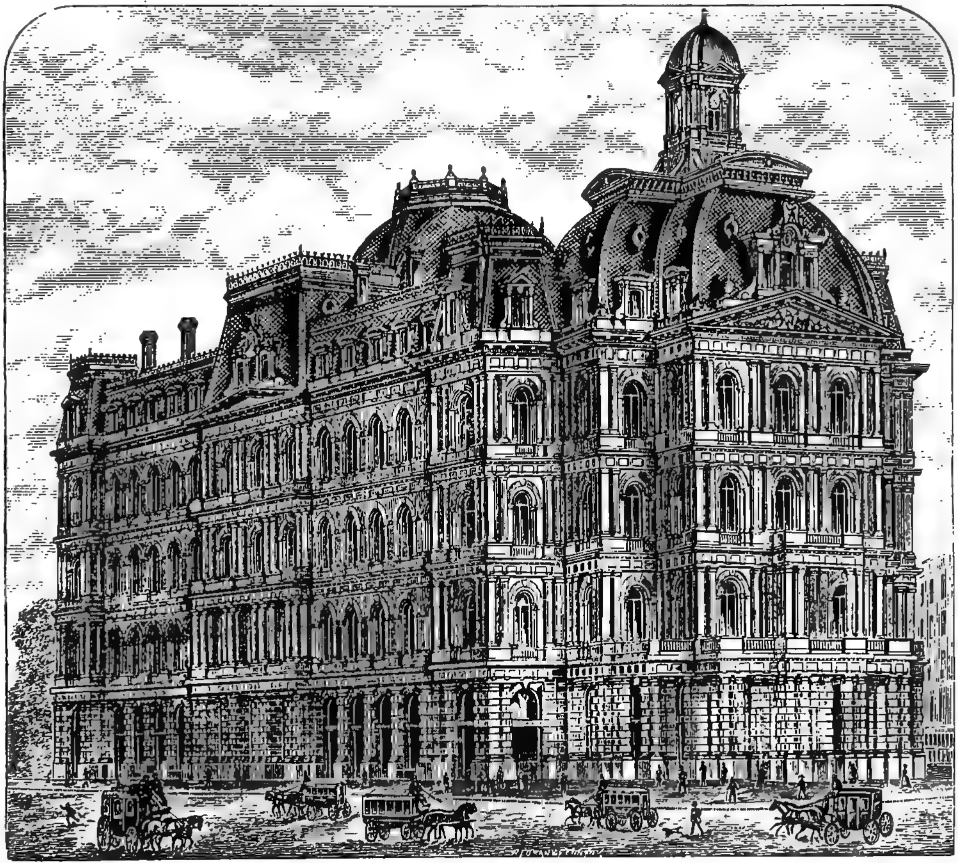
The fire department is a well-organized and thoroughly disciplined corps under the control of a board of commissioners. Steam-engines stand ready to move at any moment, and the several stations are connected by telegraph with the headquarters of the department. The details of the alarm service are perfect.

Parks and Cemeteries.—The city is admirably provided with parks, the chief of which is the Central Park (which see). The total area in acres, all included, is 1007. There are also the Battery, the Bowling Green, the City Hall Park—all historical grounds—Tompkins, Washington, Union, Madison, Reservoir, and Manhattan squares, and, to the N. of the island, Mount Morris, High Bridge, Morningside, and Riverside parks. The superb drive along the margin of the latter from 72d street to 125th street, overlooking the Hudson, with a view of the Palisades, is of incomparable beauty. An extensive park system for the newly-annexed district has been favorably reported by commissioners appointed for the purpose, but the subject is still in suspense.

The practice of burial in the city graveyards, with the exception of private vaults, has long been discontinued, for sanitary reasons. The only public cemeteries within the city limits are Trinity church cemetery, on the banks of the Hudson, at 155th street, and Woodlawn, 7 miles W. of the Harlem River, in the recently annexed district. Besides these, there are 13 which have offices in the city; of these, Greenwood, Cypress Hills, and Calvary—all on Long Island—are the most noted.

Streets and Avenues.—The lower part of the city is irregularly built, but from Houston street, about a mile N. of the City Hill Park, the construction is regular, with long avenues running to the N. end of the island and laterally traversed by streets, which, like the avenues, are designated by numbers. Broadway, the most famous of the avenues, is an exception to this rule, and its long extent of 6 miles crosses five of the avenues in a N. W. direction. Broadway is lined with shops and hotels, and is one of the gayest streets in the world. Fifth avenue, with its magnificent private residences, churches, and club-houses, is one unbroken series of architectural display from Washington Square to the Central Park. The natural advantages of this fine avenue, which runs along the ridge of the island, make it the favorite site for residence. In the upper part of the island there are broad and extensive boulevards, which extend from the Central Park into the territory beyond the Harlem River.

Railways and Rapid-Transit Roads.—The first city R. R. was chartered in 1852, since which time the system of travel by horse-cars has reached an enormous development. There are now surface R. Rs. in all the longitudinal avenues except Fifth avenue, and there are also numerous transversal lines connecting the ferries of the East and North rivers. Broadway Horse R. R. to Battery was opened June, 1885. The first elevated R. Rs. were opened for travel in 1872, and the entire island is now girdled by them; they carried 92,490,051 passengers in 1883. The N. Y. Central, Hudson River, Harlem, and New Haven R. Rs. have their terminus in this city at the Grand Central dépôt.



The Post-Office.

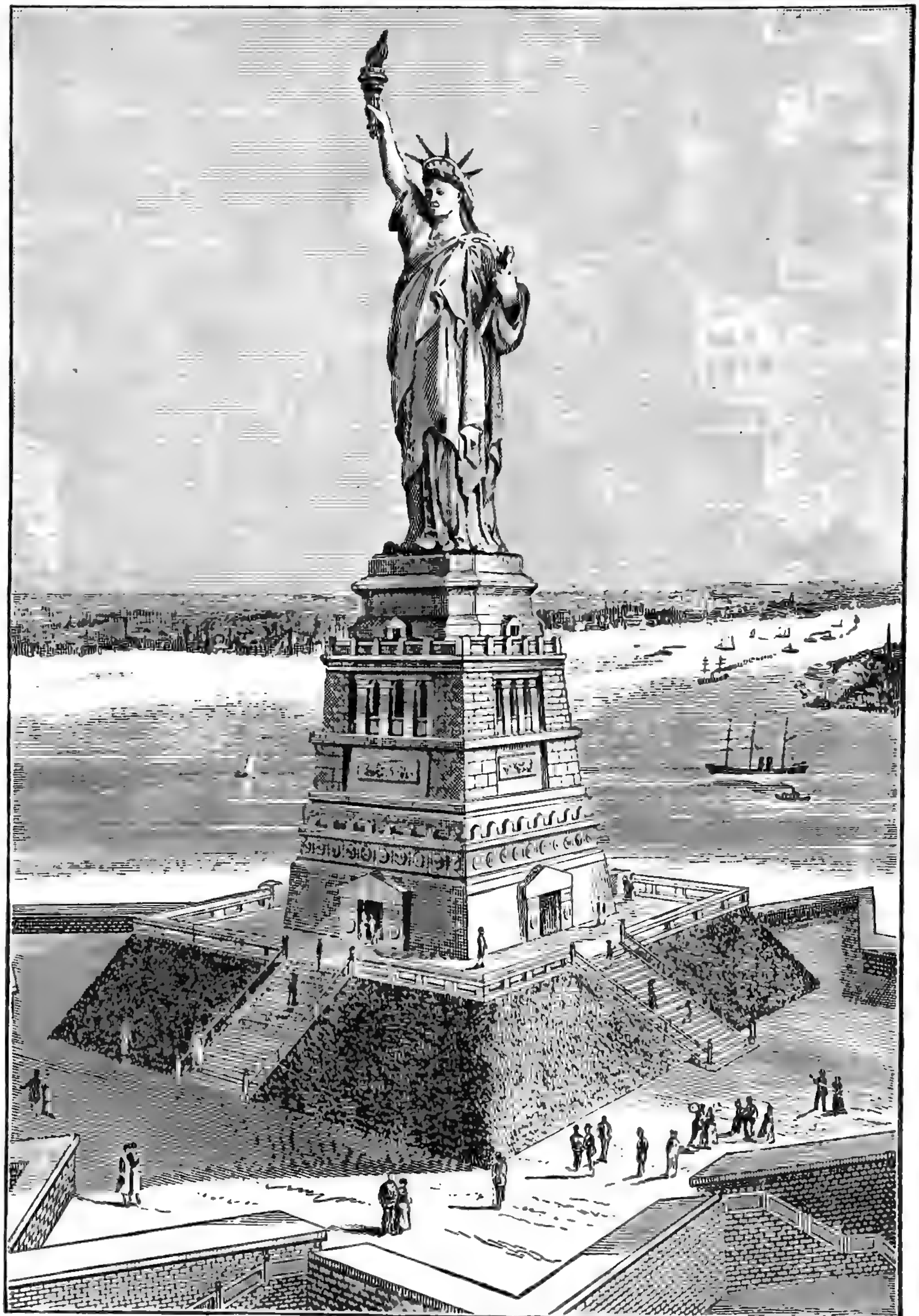
Ferries.—There are 24 ferries connecting New York with the W. shores of the Hudson, Hoboken, Jersey City, Staten Island, and Long Island.

Bridges.—Brooklyn, or East River, Bridge (see BROOKLYN), connecting New York and Brooklyn, commenced in 1870 and finished in 1883, cost about $15,500,000. A bridge across the East River at Blackwell's Island is contemplated. There are several bridges across the Harlem River, the most noted of which is High Bridge, over which the Croton water is brought. (See AQUEDUCT.)

Hudson River Tunnel.—Among the important new enterprises is the proposed connection of the city of New York with the mainland on the W. side of the Hudson by means of the Hudson River tunnel, by which the R. Rs. which now end at Jersey City will reach a convenient point in New York City, and the delays occasioned by the passage of the river—sometimes serious because of fog and ice—will be avoided. The work is about half completed.

Water-Works.—The city is supplied with water drawn from the Croton River, a clear, pure stream in Westchester co., which is conducted to the city through an aqueduct of solid masonry 40¼ miles long, opened in 1842. In over forty years which have ensued the city has outgrown even its enormous capacity, and an entire new system of supply must be devised or the old duplicated. Contracts have been made for a new aqueduct.

Gas, etc.—Five principal gaslight companies formerly supplied the city. These were the Manhattan, New York, Metropolitan, Mutual, and Harlem. They are now consolidated. In addition to these, the new system of electric lights is rapidly coming into use. The public squares, Broadway, and Fifth avenue are in part lighted in this manner. Still another new feature in city progress is the heating of houses by steam conveyed from reservoirs through street mains and distributed in the same manner as water or gas. The system of paving has greatly improved: the old cobble-stone has almost wholly disappeared; wood has been abandoned; asphalt has been found unsuitable to a climate of such extremes in heat and cold; trap-block has nearly superseded all others. The system of sewerage is totally unworthy of a metropolitan city with unequalled opportunities for drainage to the rivers on either side.



Bartholdi's Statue of "Liberty Enlightening the World."

This colossal statue (see BARTHOLDI (FRÉDÉRIC A.), in Vol I, APPENDIX, illuminated by electric light, was presented, July 4, 1884, by the people of France to the people of the U. S. in commemoration of the one hundredth anniversary of their national independence. The presentation was made to Mr. Morton, the American minister at Paris as the representative of the U. S. Upon a tribune erected in front of the colossal bronze figure sat the Franco-American Union committee, with its president. M. de Lesseps, M. Bartholdi. M. Brisson, the president of the Chamber of Deputies. M. Cazot, president of the supreme court, Admiral Peyron, minister of marine, and several other members of the French Cabinet, besides Senator de Lafayette and many other distinguished citizens of France. M. de Lesseps, speaking in the name of the Union, presented the great statue, which he called the eighth wonder of the world. Mr Morton responded by reading a telegram from Mr Frelinghuysen, directing him to accept the statue, and by explaining the action of the President and of Congress in the matter. At the close of the addresses the official deed of presentation was signed by the president of the Chamber of Deputies and M. Jules Ferry in the name of France, and by Mr. Morton in the name of the U. S. M. de Lesseps and M de Lafayette and others signed the document as witnesses. The deed of presentation was sent to the department of state for preservation in the national archives. The height of the statue from its base to top of torch is 151.14 feet; to top of diadem, 116.44 feet. The height of pedestal above its base is about 90 feet, and the total height of the structure, statue and all, above the water is precisely 305 feet 11 inches. At the Paris Exhibition of 1878, forty persons at one time could find standing-room within the head of the statue. The pedestal was built by the people of the U. S., and the statue was erected in 1886. The U. S. government relinquished Bedloe's Island, in New York Harbor, for it, and is to maintain it for ever. The pedestal was designed by Richard M. Hunt, N. Y. Gen. Charles P. Stone, U.S.A., had charge of its construction and the erection of the statue. A reduced copy was formally presented May 13, 1885, by the American residents of the French capital to the municipality of Paris. The ceremonies took place on the site of the statue, the Place des Etats Unis. The Hon. Levi P. Morton, ex-U. S. minister, on behalf of the American donors, made the speech of presentation, and that of acceptance was delivered by M. Boné, president of the municipal council of Paris.

History.—Immediately after the discovery of Hudson, in 1609, the Dutch undertook the occupation and settlement of Manhattan Island, and in 1614 erected a fort and trading-house at the S. W. extremity of the island, to which they gave the name of New Amsterdam. In 1652 the city of New Amsterdam was incorporated. It remained under the peaceful rule of the Dutch for about half a century, when, Charles II. coming to the English throne, the territory occupied by the Dutch was granted by royal charter to his brother, the duke of York, Mar. 12, 1664, and an English fleet took possession in August of the same year. Cols. Nichols and Lovelace ruled the settlement for ten years in the name of the duke, and the name of the city was changed, in his honor, to New York. In Aug., 1673, a Dutch fleet recaptured the city, which it held in the name of the states-general of Holland, changing the name again to New Orange, in compliment to the prince of Orange. It was again restored to English rule by treaty in 1674, and resumed its name. The most important events in the history of the city since the English occupation have been the usurpation of the government by Leisler in 1689, and his trial and execution in 1691. The same year the laws of the duke of York and provincial laws were framed. The first assembly met in the city Apr. 9. In 1696 the first Trinity church was built; in 1725 Bradford established the New York *Gazette;* in 1729 a city library was founded: in 1754 King's (now Columbia) College was chartered; in 1765 the famous congress known as the Stamp Act Congress met in the city; the Sons of Liberty were organized, with affiliations throughout the colonies; the Stamp Act was burned, and an agreement not to import goods from Great Britain until the repeal of the obnoxious act signed by a large concourse of merchants; in 1768 the Chamber of Commerce—the first institution of its kind in America—was organized at the Queen's Head tavern. The colonial assembly finally adjourned Apr. 3, 1775. On the news of the battle of Lexington reaching the city, the Committee of Safety took control in the name of the citizens, and the royal governor sought refuge on board of an English man-of-war in the harbor. Delegates were elected to the Continental Congress July 25, 1775. Aug. 22, Congress having ordered the withdrawal of the cannon to the interior, the Asia man-of-war fired upon the city. In Jan., 1776, a detachment of militia took possession of the city, and in the spring the American army followed. On July 8 the Declaration of Independence was proclaimed and read to the army. Aug. 26, after the battle of Long Island, the city fell into the hands of the British. On Nov. 25, 1783, the British evacuated the city, and Gen. Washington entered at the head of the American army. In Jan., 1785, Congress removed from Philadelphia to New York, and met in the City Hall, corner of Wall and Nassau streets, now the site of the U. S. sub-treasury. The Bank of New York was organized this year, and a manumission society was established. On July 26, 1788, the new Constitution of the U. S. was adopted by the legislature. On Apr. 30, 1789, Gen. Washington was inaugurated President of the U. S. on the gallery in front of the old City Hall, facing Broad street. In 1805 the New York Free School was incorporated; in 1806 steam navigation was first successfully inaugurated on the Hudson by Robert Fulton; in 1807 the city was surveyed and laid out by a commission of the city legislature upon a plan which has been substantially adhered to; in June, 1812, declaration of war with Great Britain, a large number of privateers sailing from the port; this year the first steam ferry was established to Jersey City. Aug. 15, 1824, Gen. La Fayette arrived in the city. In Oct., 1826, the Erie Canal was opened, and on Nov. 11 the first canal-boat arrived at New York from Buffalo. In 1832 the Asiatic cholera ravaged the city. In Dec., 1835, a disastrous conflagration raged for three days, and destroyed more than six hundred buildings and property worth over $20,000,000. The Croton aqueduct was completed in 1842. In 1844 began the enormous immigration to this country, the greater part of which has passed through this port. In 1851, Kossuth, the Hungarian patriot, received an enthusiastic public welcome. In 1853 there was an exhibition on Reservoir Square of the industry of all nations. In 1858 the successful laying of the Atlantic cable was celebrated. In 1860 the first Japanese embassy was entertained with great splendor: in the same year the prince of Wales was received with a grand military display. In Apr., 1861, the attack upon Fort Sumter by the secessionists caused intense excitement, and was responded to by a spontaneous uprising of the loyal element. In July, 1863, an attempt being made to enforce the military draft ordered by the U. S. government, a serious riot occurred, which, in the absence of the militia at the seat of war, was with difficulty repressed. During the war the city furnished 116,382 troops to the government. In Apr., 1865, the remains of Lincoln, the murdered President, were escorted through the city by an enormous and imposing procession, the magnitude of which has never been equalled in its streets. In July, 1871, there was a conflict in the streets between the Orangemen and Ribbonmen, Irish associations, and the riot was only suppressed by military force after the loss of many lives. In 1879 the successful resumption of specie payments gave a new impetus to the enterprise of the city, and its material growth and prosperity have been marvellous. In Sept., 1876, the battle of Harlem was celebrated on Bloomingdale Heights, the scene of the action, and in Oct., 1881, the delegation appointed by the French government to represent our ancient allies at the Yorktown anniversary were received and entertained on their arrival and departure from this port with munificent hospitality. On May 24, 1883, the opening of the bridge to Brooklyn was the occasion of a grand celebration by day and an illumination in the evening. The President of the U. S. was present. On Nov. 26, 1883, the centennial anniversary of the evacuation of New York City by the British army was celebrated by an immense military and civic procession. The grand water and land civic and military reception of the French officers in charge of the statue of "Liberty Enlightening the World," the gift of the French people to the U. S., took place June 19, 1885. General Grant was buried in Riverside Park, New York City, Aug. 8, 1885; the funeral procession was never equalled in the U. S. in extent, and in attendance of famous men.

Population.—In 1790, 33,131; 1870, 942,292; 1880, 1,206,299. JOHN AUSTIN STEVENS.

New York College of Physicians and Surgeons. See APPENDIX.

New York, University of the City of. This institution was incorporated in 1831, and was opened for the reception of students in Oct., 1832. The first class graduated in 1833. The buildings on Washington Square were occupied for purposes of instruction in 1835. The original charter vested the government of the university in a council of thirty-two members, to be chosen by shareholders (subscribers to the endowment); to these were added the mayor of the city, *ex-officio,* and four members of the common council, annually selected. In accordance with amendments to the charter made in 1883, the council is now empowered to fill its own vacancies, and the mayor and common council of the city are no longer represented. A clause of the charter forbidding any religious sect from having a majority of the board has also been stricken out. The ordinances of the university expressly state that no faculty of theology shall be established; but, "recognizing the paramount importance of a careful acquaintance with the Holy Scriptures for the present and future welfare of man," they provide that "instruction shall be regularly given in the evidences of revealed religion, in the literature and antiquities of the Bible, and in its contents as the inspired rule of human duty." There are four faculties—viz. the faculties of arts, medicine, law and science. Of these, the faculties of arts, law, and science occupy the buildings on Washington Square. The faculty of medicine has its separate buildings on 26th street, opposite Bellevue Hospital. The library contains not far from 10,000 volumes. The collections in the medical department are of great value, but as yet do not equal in importance the former museum of that department, destroyed by fire a few years since, in which were the admirable collections made by Drs. Valentine Mott, Bedford, Post, Draper, and Paine. The collections in the departments of arts and science are as yet comparatively limited, but they are increasing rapidly. The courses in the departments of arts and science cover a period of four years, and lead to the degrees of bachelor of arts, bachelor of science, and civil engineer; the course in medicine requires attendance upon two courses of lectures, together with private study, the whole extending through three years and leading to the degree of doctor of medicine; the course in law covers two years, and leads to the degree of bachelor of laws. In the two departments of arts and science, tuition is free. The endowment of the university has come wholly from private munificence. To an original stock subscription of $100,000 large additions have from time to time been made; so that the available property of the institution now amounts to over $600,000. Of its benefactors, Myndert Van Schaick, John Johnston, George Griswold, John C. Green, Loring Andrews, and Julius Hallgarten may be mentioned among the dead; and Charles Butler, John Taylor Johnston, and William A. Wheelock among the living. The present chancellor is Rev. John Hall, D. D., LL.D. His predecessors in office were Rev. James Matthews, D. D., Hon. Theodore Frelinghuysen, Rev. Isaac Ferris, D. D., and Rev. Howard Crosby, D. D., LL.D. Among the prominent men that have held chairs in the different faculties may be noted Rev. Dr. Henry P. Tappan, subsequently chancellor of Univ. of Mich.; Samuel F. B. Morse, LL.D., who within the walls of the university perfected the telegraph bearing his name; Isaac Nordheimer, the Hebraist; George Bush, the biblical commentator; Tayler Lewis; John W. Draper, and his son Henry Draper, distinguished for their discoveries in physics and astronomy, etc. HENRY M. BAIRD.

New Zea'land, a group of islands lying in the South Pacific Ocean between 34° and 48° S. lat., and between 166° and 179° E. lon., and forming a colony of Great Britain. The group consists of three large islands, respectively called Northern, Middle, and Southern Island, and a number of islets, comprising an area of 106,259 square miles, with an estimated population, in 1883, of about 560,000, of whom not quite 45,000 were aboriginal inhabitants, with a very small proportion of females. Northern and Middle Islands, which are by far the largest and most important, are divided from each other by Cook Strait, which is 18 miles wide at its narrowest passage, but in all physical relations they are very similar. They are of volcanic origin, and Tongariro, a peak on Northern Island 6000 feet high, is still an active volcano. A lofty range of mountains, which on Northern Island reaches a height of 9000 feet (Mount Ruapahu), and on Middle Island a height of 12,300 feet (Mount Cook), traverse them from N. to S., covering Northern Island with alpine regions and forming table-lands on Middle Island. The soil is everywhere fertile, and the climate is perhaps the most healthful and delicious on earth. The difference between the highest and lowest temperature is hardly 20°; fresh winds from the ocean are always blowing, and rains are abundant. Large tracts, especially of the mountain-regions, are covered with forests of evergreen trees which yield excellent timber. The flora of the islands presents many peculiar species, among which is the celebrated New Zealand flax, but all varieties of European grains and fruits succeed eminently well and develop luxuriantly. When Cook first visited the islands in 1770 the dog and the rat were the only quadrupeds he found, but since then pigs, sheep, cattle, horses, deer, quails, pheasants, partridges, etc. have been introduced and thrive very well. The country is in every respect well suited to agriculture and cattle-breeding, and these two occupations form, consequently, the chief branches of industry carried on. The islands are divided into nine provinces. The chief towns are Auckland, Dunedin, and Christchurch. New Zealand was discovered by the Dutch navigator Tasman in 1642. He anchored in a bay of the southern island, which he called Massacre Bay because he lost four men of his crew in an encounter with the natives. He gave the country its name. In 1769 the English navigator Cook landed at Tauranga, in the province of Auckland, and took possession of the country for the Crown of England. In 1820 one of the Maori chiefs visited England and gave his assent to the introduction of Christianity and European civilization. In 1839 England appointed the first lieutenant-governor, and in 1883 the colony had 1461 miles of railway and 4011 miles of telegraph-lines. In 1881 the live-stock of the colony consisted of 161,736 horses, 698,637 cattle, 12,985,085 sheep, 200,083 pigs, and 1,563,216 poultry. (Compare Hochstetter, *Neu Seeland* 1836, Eng. transl. 1868; Anthony Trollope, *Australia and New Zealand*, 1873; and G. W. Rusden, *History of New Zealand*, 3 vols., 1883.)

Ney (MICHEL), duke of Elchingen, prince of Moskva, marshal and peer of France, b. at Saarlouis Jan. 10, 1769, in humble circumstances; entered the French army in 1787; was made a captain in 1794, brigadier-general in 1797 after the battle of Neuwied, general of division in 1799 after the capture of Manheim, and marshal in 1804. He commanded in the Austrian, Prussian, and Spanish campaigns, and distinguished himself at Elchingen, Austerlitz, and Friedland. But his greatest exploits were the battle of Borodino while the grand army crossed the Moskva, his command of the rear-guard during the retreat from Moscow, and his exertions in order to organize a new army. After the abdication of Napoleon he submitted to the Bourbons, and was well received by Louis XVIII. When Napoleon returned from Elba, Ney repaired to Paris, assured the king of his fidelity, and received the command of a corps of 4000 men, with which he marched against the emperor, purposing to capture him and carry him to Paris. But when he saw the enthusiasm with which Napoleon was received everywhere he yielded to the demands of his soldiers and went over to the side of the emperor. After the second restoration he fled from Paris, but was captured, arraigned for high treason, and placed first before a court-martial, which declared itself incompetent, and then before the Chamber of Peers, which by a large majority condemned him to death. He was shot Dec. 7, 1815, in the garden of the Luxembourg, where a monument now stands in his honor. (See *Histoire complète du Procès du Maréchal Ney*, 2 vols., 1815.)

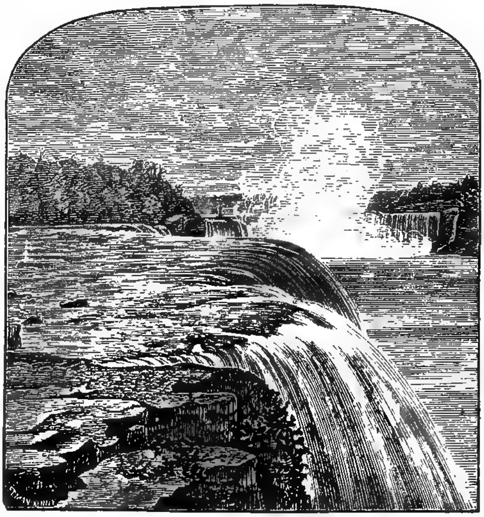
Nezheen', or **Nejin,** town of European Russia, government of Tchernigov, on the Oster. It has many good educational institutions and a very large trade in tobacco. Pop. 21,590.

Nez Percé Indians [the "pierced noses," so named by the Canadian *voyageurs*], properly **Sahaptins,** a tribe of Indians of Northern Idaho and the Indian Territory, belonging to what is called the Sahaptin stock, remarkable for certain grammatical peculiarities in their languages. They occupy a reservation of 746,651 acres in Idaho, and one of 90,711 acres in Indian Territory. They are generally friendly to the whites, but there are many who are discontented and refuse any favors from white men. The "treaty" Nez Percés are somewhat prosperous.

Ngan-King', town of China, the capital of the province of Ngan-Hwi, on the Yang-tze-Kiang, manufactures cloth and porcelain and carries on a very extensive trade. The number of its inhabitants is unknown.

Niagara, a river of North America, forming the boundary between the State of New York, U. S., and the province of Ontario, Canada, and connecting Lake Erie with Lake Ontario, is 36 miles long, and has a total fall of 333 feet. It is navigable in its upper course from its issue from Lake Erie to the commencement of the rapids at Niagara Falls, a distance of 16 miles, during which its fall is only 20 feet; and in its lower course from Lewiston to Lake Ontario, a distance of about 8 miles, during which its fall is only 2 feet. Along its middle course, which contains the celebrated Niagara Falls and is crossed by two suspension bridges, on the Canadian side is the Welland Canal, through which the navigation interrupted by the rapids and falls of the middle course of the river is carried on. In its upper course it forms many islands, and its average depth is 25 feet. In its lower course, from Lewiston to its mouth in Lake Ontario, its depth varies from 100 to 150 feet.

Niagara Falls received their name from the Iroquois Indians, in whose language the word *Niagara* signifies the "thunder of water." The name is very appropriate, as that feature of the whole grand phenomenon which strikes the senses first and most powerfully is the tremendous roar of the falling waters, filling the air for a distance of several miles. With respect to height and picturesqueness of surroundings, Niagara Falls are surpassed by several Swiss and Norwegian falls, not to speak of certain less-known falls in the Himalaya Mountains or in the north-eastern part of Central Africa. It is the immense volume of water which makes Niagara Falls unique, about 2,000,000 tons being hurled every minute over the ledge of the rock into the chasm below. Hence the explanation of the observation often made, that the first view of Niagara Falls is rather disappointing, while a closer acquaintance with the true character of the phenomenon, the awful and frantic forces which here are let loose, and the calm, irresistible power which holds every minute particle of this boiling chaos and bends it into a regulated course, leaves in the mind an everlasting impression of the sublime.



Niagara Falls, from the American side.

During the first 16 miles of its course after issuing from Lake Erie the Niagara River has a fall of only 20 feet, and below Grand Island it resembles a lake rather than a stream; it is from 2 to 3 miles wide, and presents a calm surface studded with islands. But at this point, about 16 miles below Lake Erie and a little more than 1 mile above the great cataract, it contracts into a narrow current, and before it makes the great leap it descends 52 feet over a series of rapids. At the edge of the cataract the width of the river is about 4750 feet, but the edge itself does not form one straight line. First, it is broken by Goat Island, which, about 1000 feet wide and 2000 feet long, rises 40 feet above the water and extends out to the very brink, thus dividing the fall into two. Next, it forms between Goat Island and the Canadian shore a large curve, bent inward, which, resembling a horseshoe, gives this part of the fall the name of the Horseshoe Fall. The height of the cataract is 164 feet on the American side of Goat Island and 150 on the Canadian. From the foot of the fall to Lewiston, a distance of 7 miles, after which it enters a level region, the river descends 104 feet, running through a deep and narrow gorge, whose width varies from 200 to 400 feet, and whose sides rise almost perpendicularly, so that access to the river can be had only by stairways. About one-eighth of a mile below the falls a suspension bridge is thrown across the river, 190 feet above the water, 1190 feet from cliff to cliff and 1268 feet from tower to tower; it was finished in 1869, and presents a magnificent view of the falls. In 1855 another suspension bridge was constructed across the river about 2 miles below the falls, 245 feet above the water and 821 feet from tower to tower. About 3 miles below the falls the great "Whirlpool" is formed by a sudden turn in the narrow channel, forcing the water with great violence into a depression on the Canadian shore, and thence immediately back again to the American side. The power of this whirlpool is immense. Huge tree-trunks, from 2 to 3 feet in diameter and 50 feet long, are drawn down lengthwise, submerged for a time, and then ejected with great force, only to resume their monotonous "rounds," in which they are detained from four to six weeks before they finally escape to the channel below. It has happened several times—last in 1856—that in very cold winters the ice below has increased to immense thickness by the frozen spray and formed a bridge across the river.

The first notice of Niagara Falls which exists is due to the French missionary Father Hennepin, and was made in 1678, containing a view and a description. The aspect of the falls, such as they are represented by this view, shows one striking difference from the present aspect—namely, a third fall formed on the Canadian side by a huge rock which divided and turned the current. In a description published in 1751 in the *Gentleman's Magazine* by a Swedish naturalist, Kalm, who visited the falls in 1750, this rock is said to have fallen down a few years previously. Other and very considerable changes have taken place quite recently. In 1818 large parts of the edge of the precipice broke down on the American side of the falls; in 1828 on the Canadian side, and again in 1855. But it is due to very minute and careful scientific researches, especially those of Prof. James Hall, who in 1842 undertook a trigonometrical survey of the falls for the State geological survey, and made an accurate map, that a vivid and exact idea has been formed of the enormous mechanical powers which are at work here, uninterruptedly, in every second, and which have been so for centuries past. The falling water acts as a huge saw, cutting a channel in the rock at the rate of about one foot a year. It began its work at Lewiston, on the edge of the plateau which bears Lake Erie and faces with a bold terrace the low land extending around Lake Ontario. The immediate cause of the formation of the cataract was the filling up of the old channel of Niagara River. There is a lateral valley leading from the Whirlpool through the Queenstown precipice at a point a few miles W. of Lewiston. This valley formed the old gorge of Niagara River, but it became blocked up with drift of the Glacial period, and thus the river, when again in action, was compelled to open a new passage. It succeeded in bursting through at Lewiston, and set the saw agoing. The result of its labor, so far, is the gorge through which it flows from the present site of the falls to Lewiston, and through which the Maid of the Mist, a small but powerful steamboat, was safely brought down from the foot of the fall to Lake Ontario in 1861. If the rate of retrocession is computed at 1 foot a year, it will have required over 31,000 years to make this distance. But Mr. Desor, after studying the falls, came to the conclusion that the rate of retrocession was more nearly 3 feet a century than 3 feet a year; and if the rate is estimated at 1 inch a year, or 8⅓ feet a century, the distance made will have required 380,000 years. The manner in which the retrocession takes place may be described as follows: The edge of the precipice is formed, on the present site of the cataract, of a layer from 80 to 90 feet thick of the so-called Niagara limestone. Below this are shaly layers of the same formation, softer and more easily hollowed out by the action of the spray. Thus has been formed the so-called "Cave of the Winds," which runs behind the falling waters along the wall of the precipice, and connects the Canadian shore with Goat Island by a rough, slippery, half-subterranean, half-submarine pathway. But one day the roof of this cave may give way, and the falls recede many feet in one minute. There is, however, farther back in the course of the river, a point where the cataract will meet a solid bed of sandstone, and become stationary or nearly so. (See *Travels in North America*, by Sir Charles Lyell, 1845.) CLEMENS PETERSEN.

Niagara Falls, R. R. centre, Niagara co., N. Y. (see map of New York, ref. 4–C, for location of county), 20 miles N. of Buffalo, on the New York Central, the Erie, and the Buffalo and Niagara Falls R. Rs. It contains an extensive car manufactory and repair-shop, a paper-mill, grist-mills, and a machine-shop. The great falls bound the village on the S., while above are the rapids with Goat, Luna, and other islands. The Niagara Falls suspension carriage bridge is 50 rods below the American Fall, and is the longest of its kind in the world, being 1200 feet between the towers and its road-bed 230 feet above the water. A steam-elevator on the Canadian side enables travellers to reach the top, from which an extensive view is obtained. The existence of the rapids is due to an angle which the river makes to the left as one looks up-stream, so that the channel above the falls is now *rising* on the *dip* of the bedrock which underlies it; whereas before this change of direction the channel was concurrent with the dip, and the water above the precipice, being deeper than at its edge, was unbroken at its surface, as that in a mill-pond above its dam. Bath and Goat islands are reached by means of iron-frame bridges resting on piers, the latter being one of the most attractive spots about the great cataract. It contains nearly 70 acres, and is 150 rods long by 70 rods wide. The old stone tower which formerly stood in the rapids near its S. W. corner has been removed. Near the centre of the lower end is the "Biddle Stairway," by which access is gained to the "Cave of the Winds." This is an irregular arch about 50 feet wide, 70 feet high, and 30 feet deep, formed by the detrition and crumbling away of the perpendicular face of the rock at the foot of Luna Island. Visitors provided with oilskin dresses and attendant guides make the tour of the cave, which forms an exciting and novel amusement. Pop. in 1870, 3006; in 1880, 3320.

GEORGE W. HOLLEY.

Niagara Falls Reservation. See APPENDIX.

Niare, Zamouse, or **Bush Cow,** the *Bos brachyceros*, a species, or probably a marked variety, of wild-ox, having a wide range in Africa. It has no dewlap, has sharp, crooked, and short horns, large and finely fringed ears, and a fierce disposition. It is of a rather small size. It is sometimes trained for the saddle, and may be taught to obey the bit as well as may horses. It is not very swift, its pace being only about 4 or 5 miles an hour, and, as the skin is loose on the body, the saddle is always swaying.

Nias', an island of the Malay Archipelago, is a short distance to the W. of Sumatra, near the equator. It is 70 miles long, with an average breadth of 16 miles; high, mountainous, surrounded with coral-reefs, but fertile and producing rice, sugar, and large quantities of pepper. The inhabitants, numbering about 110,000, are of the Malay race, well-built, peaceable, and industrious. A considerable slave-trade is carried on here, partly by the connivance of the Dutch government, partly covered by legal enactments, which produce the state of slavery without employing the name. The insolvent debtor is doomed to a certain number of days of forced labor, and the European immigrants to Sumatra buy such forced labor from the Dutch government of Nias by paying the debt on it.

Ni'belungen-Lied, or **Lay of the Nibelungers,** an anonymous epic of the Old High German, and the longest, most complete, and most artistic of the ballads or popular songs (Ger. *Volk-lieder*) of the Middle Ages. In its present form the poem dates from that age which was so fruitful of ballads and minstrels, the latter part of the twelfth or the beginning of the thirteenth century. But this is believed to be only a reproduction or recomposition from earlier songs. Long forgotten, brought to light again and printed for the first time in 1757, it was received with great enthusiasm in Germany, where it is still much admired and studied as a classic. The metrical form of the poem is easily reproduced in English verse. It consists of strophes or stanzas, each of four iambic and trochaic lines in rhymed couplets, with a strongly-marked feminine cæsura in the middle. It contains nearly 6000 lines, and so is not far from two-fifths of the length of Homer's *Iliad*.

It is divided into thirty-nine books or sections called Adventures, which might be sung in separate lays like the rhapsodies of the Homeric poems. It further divides itself into two nearly equal parts, in the first of which the scene is laid on the Rhine, chiefly at Worms, the ancient capital of Burgundy, but partly also in the Netherlands or Low Countries, towards the mouth of that river; in the other, on the Danube, at Vienna and Buda, chief cities of Attila, king of the Huns. The chief subject of the first part is the love, courtship, and marriage of Siegfried, prince of the Netherlands, to Kriemhild, a Burgundian princess, and of Günther, king of Burgundy and brother of Kriemhild, to Brunhild, a heroine of the fabulous North; together with the journeys, marches, and adventures, the festivities, tournaments, wars, and battles, which preceded or attended them, and the envy, jealousy, and contention which ensued first between the two brides, and consequently between the bridegrooms and among their friends and followers, and the tragical issue in the murder of Siegfried by Hagen, Kriemhild's uncle, at the instance of Brunhild and with the consent of Günther. The subject of the second part is the wrath and vengeance of Kriemhild; her marriage to Attila, simply that she may have the means of avenging herself on the murderers of her former husband; the chivalrous and romantic march of Günther with his younger brothers (Gernot and Geiselher), his uncles (Hagen and Dankwart), and a retinue of 60 heroes, 1000 select warriors, and 9000 ordinary ones, from Worms to Vienna, at the invitation of Kriemhild and Attila, and the slaughter of them all to a man, with a still larger number of Huns and their allies, at a festival which ends in a *mêlée* and a battle or massacre; and, finally, the slaying of Kriemhild herself, leaving only Attila and his friend Dietrich (the Theodoric of history) to lament the dreadful catastrophe. Well might the poem close with these lines, which contain the moral of the tale:

> "The feast of royal Etzel was thus shut up in woe:
> Pain in the steps of pleasure treads ever here below."

The leading characters, including Rüdiger of Bechelaren, who was manifestly a personal favorite of the author, and who is therefore drawn *con amore* as the noblest man, though not the greatest warrior and hero, of the poem, are all historical, and most of them appear again and again in the Eddas, in the Troubadours and Trouvères, in the mediæval myths and ballads of Northern and Southern as well as Middle Europe. Yet the poem abounds in anachronisms and historical and geographical inaccuracies. And well it may, for it was not composed until 700 or 800 years after the actors had passed off the stage, and the scene shifts from the Rhine in the S. W. and the Danube in the S. E. to that cloudland of the North from which the Nibelungers probably derived their name (Ger. *nebel*, "cloud"), and which was as little known to the author of the *Nibelungen* as the Western Mediterranean was to the author of the *Odyssey*.

No scholar can read a single Adventure of the *Nibelungen* without being often reminded of the *Iliad* and *Odyssey*. If the subject of the *Iliad* is "the wrath of Achilles," the vengeance of Kriemhild is more manifestly the theme of the second part of the *Nibelungen*. The ancient and the modern epic are alike objective. The author keeps *himself* entirely out of sight; and the same German critics who have annihilated Homer and disintegrated his poems have attempted the same work of destruction, but with even less success, on the *Nibelungen-Lied*. The episodes which narrate the story of the original Nibelungers, their conquest, and the capture of their fabulous treasure by Siegfried, and the ruin in which that treasure involves all its possessors, vie in romantic interest with the adventures of Ulysses and the far-famed "Tales of Alcinous" in the *Odyssey*. The giant and the dwarf who had charge of the treasure are a fair counterpart to the Cyclops and the Læstrygonians, and the magic cap and cloak and mighty sword which Siegfried wrests from them remind the reader of the cup of Circe, the song of the Sirens, and the bag of the winds which Æolus puts into the hands of Ulysses. The tragical and sanguinary scene at the conclusion also suggests the slaughter of the suitors and the battle of the gods near the close of the *Iliad* and the *Odyssey;* only it is far *more* tragical and bloody; it is monstrous, prodigious, shocking to the taste as well as the sensibilities of the modern reader. The society and manners of the Homeric age, the feudal chieftains and their retainers, the kind of armor and mode of warfare, the duels of individual heroes in the midst of great battles, the festivals and games,—these are all more or less repeated under exaggerated forms in the Middle Ages, and reproduced in the *Nibelungen-Lied*. Some of the characters tower far above any in the *Iliad* and *Odyssey* in true nobility, in knightly courtesy, and generosity. Both poems are highly dramatic. But the German wants the simple ease and grace of the Grecian, as well as its inimitable elegance and flexibility and affluence of language, and the abundance and aptness of its similes and other illustrations. The later epic is also inferior to the earlier in that nice discrimination and delineation of character by action and dialogue and descriptive epithets in which the Homeric poems stand without a peer and almost without a rival in the history of epic poetry. (See Grimm's *Deutsche Heldensage;* Carlyle's *Essays;* Fauriel's *Hist. of Provençal Poetry;* Ludlow's *Pop. Eps. of Mid. Ages;* translations into English verse by Birch and Lettsom, and German eds. or versions by C. H. Müller, Lachmann, Braunfels, Simrock, Pfitzer, Marbach, and Beta.)

W. S. Tyler.

Nicara'gua, republic of Central America, between lat. 10° 45′ and 14° 55′ N., and between lon. 83° 15′ and 87° 38′ W., bounded N. by Honduras, E. by the Caribbean Sea, S. by Costa Rica, and W. by the Pacific. Area, 49,500 square miles. Population 275,815, of which more than one-half are Indians, and the rest mestizoes, with comparatively few pure whites or pure negroes. A branch of the Cordilleras traverses the central part of the country, sending numerous spurs towards the Caribbean Sea. Another range—or rather series of isolated mountains, most of which are volcanoes, some still active (Cosequina, 3835 feet high; violent eruption in 1835)—runs parallel with the Pacific at a distance of from 10 to 20 miles. Between these two mountain-ranges extend the basins of the lakes of Nicaragua and Managua, surrounded by high plains, which afford excellent pasturage; here large herds of cattle are reared. The soil of the low Pacific coast is very fertile. All tropical plants grow abundantly—cacao, one of the principal products of the country, sugar, yielding two and even three crops annually, cotton, indigo, coffee, tobacco, rice, maize, vanilla, ginger, sarsaparilla, breadfruits, bananas, citrons, etc. The Caribbean coast is also very low, and along the rivers is swampy and unhealthy. The principal rivers are the Coco or Segovia, which forms the northern boundary, and the San Juan, which forms the southern; the mouth of the latter affords the only good harbor of the country on the Caribbean. The region between the eastern coast and the Cordilleras is covered with vast forests, yielding excellent timber, fine cabinet woods, mahogany, and rosewood, dyewoods—logwood, fustic, sandal, and Nicaragua-woods—and many medicinal trees. In the mountains of the northern part of the country gold, silver, and other metals are found, and coal, marble, alabaster, sulphur, alum, and other minerals are abundant. But the rich resources of the country are undeveloped. For the last forty years it has been distracted by revolutions and counter-revolutions. Its population, industry, and commerce are decreasing, and its principal interest to the civilized world is in the different schemes of forming a passage through it from the Atlantic to the Pacific. (See Ship-Canal.) Cap. Managua.

Nicaragua, or **Rivas,** town of the republic of Nicaragua, Central America, near the western shore of the lake of the same name, consists of seven Indian villages, without any noticeable public buildings and presenting a general appearance of decay and destruction, produced partly by earthquakes and partly by the civil wars. But the plain in which it stands is extremely fertile, and its one-story houses are surrounded with the most luxuriant gardens of oranges, citrons, bananas, and palm trees. Pop. about 10,000, of whom about 7000 are pure Indians.

Nicaragua, Lake, a lake of Central America, in the republic of Nicaragua, is about 100 m. long and 40 m. broad, separated from the Pacific only by a line of active volcanoes, and connected with the Caribbean Sea by the river San Juan de Nicaragua. It forms the basis of a great project of connecting the Atlantic with the Pacific by a canal, but the plan, though its practicability is admitted by all and its usefulness evident, has as yet led to no practical results. On an island, Pensacola, situated nearly in the centre of the lake, have been found some very interesting Indian antiquities, sculptures of black basalt, and exhibiting another style and a different kind of workmanship from those found in Yucatan. Most of those antiquities can be seen in the museum of Mexico. (See Ship-Canals.)

Nicas'tro, town of Calabria, province of Catanzaro, situated on the flank of the Apennines at the head of the lovely bay of Sant' Eufemia. It rises cone-like towards the top of a hill crowned by the ruins of an old castle, but the lower portions of the town often suffer severely from torrents. Nicastro is the centre of trade for all the little communes around the Gulf of Sant' Eufemia. It possesses many churches, an episcopal palace, and extensive buildings formerly used as convents. Nicastro occupies the site of the ancient *Numistro*, and it was in the castle of this town that Frederick II. made his rebel son Henry a prisoner. Near this place Cicero had his villa *Ipponio,* to which he retired when persecuted by Clodius. Pop. in 1881, 14,067.

Niccoli'ni (Giambattista), b. in 1782 at the Bagni di S. Giuliano; d. in Florence in 1861; studied at the University of Pisa, and profited much from his acquaintance with scholars, especially with Ugo Foscolo, who was strongly attached to him. Many have supposed Niccolini to be intended by the "Lorenzo" of the *Ultime Lettere di Jacopo Ortis*. Foscolo, when already very eminent, dedicated to the youthful Niccolini his translation of the *Hair of Berenice* by Callimachus. In 1804, on the occasion of the plague at Leghorn, Niccolini wrote a beautiful poem entitled *La Pietà;* then followed his tragedies, *Polissena, Medea, Edipo, Ino e Temisto, Matilda*, and the translations of the *Seven from Thebes* and of the *Agamemnon* of Æschylus. Under the government of Élise Bonaparte Niccolini was made professor of history and mythology. His lectures made an epoch in the Tuscan literary history of this century. Niccolini's tragedy of *Nabucco*, an allegory of the fall of the Napoleonic empire, was printed at London at the expense of the Marchese Gino Capponi, an intimate friend of the poet. In 1827 his new tragedy, *Antonio Foscarini*, was represented with great success in Florence. In 1830 he took a bolder step; his *Giovanni da Procida* was a revolutionary outcry. His highest fame was acquired by his bold and eloquent dramatic poem, *Arnaldo da Brescia*, printed at Marseilles in 1843, in which he combated the Guelph ideas then prevalent in Italy. The appearance of this poem was an event of real political importance for Italy. In 1847 he published his tragedy *Filippo Strozzi;* then his *Beatrice Cenci*, an imitation of Shelley; and a national tragedy, *Mario ed I Cimbri*. In 1858 the theatre of the Cocomero of Florence changed its name to that of Niccolini in the presence of the poet. After his death a monument was decreed to him in the church of Santa Croce. A complete edition of his works has been undertaken in Milan by Prof. Corrado Gargiolli, and several of them have been translated into other languages.

Ni'ce, or **Nicæa** [Gr. Νίκαια, "city of victory;" now *Isnik* = εἰς Νίκαιαν], an ancient city of Bithynia, at the E. end of the Lake Ascanius (10 miles long and 4 miles wide), 44 miles S. E. of Byzantium. According to Strabo (*Geog.*, xii. 4. 7), it was founded by Antigonus (d. 301 B. C.), and rebuilt by Lysimachus (d. 281 B. C.), who changed its name from Antigonia to Nicæa, the name of his first wife. It was rectangular, 16 stadia in circuit, and surrounded by massive walls with four gates. From 1204 to 1261 A. D. (while Constantinople was held by the crusaders), it was the capital of the Greek empire. Its chief historic renown is due to the two œcumenical councils that were held there—the first, of 318 bishops, mostly from the Orient, who in 325 condemned Arianism; and the other (the seventh of twenty in all), of 350 bishops, who in 787 sanctioned the use of images. Isnik, which contains about 100 families, occupies only a small portion of the old site. The ruins of walls, towers, gates, and buildings are still imposing. The first council is supposed to have met in the now ruined mosque of Orchan. A rude picture of the council may be seen in the one solitary Christian church (of the twelfth century) which still remains. (See Leake's *Asia Minor* (1824); Sir Charles Fellows's *Asia Minor and Lycia* (1852), and Stanley's *Eastern Church*, Lect. v. (1861).)

R. D. Hitchcock.

Nice, town of France, capital of the department of Alpes-Maritimes, is beautifully situated at the foot of the Alps, on both sides of the mouth of the Paglione. It consists of the old town, the new town, and the port, and the three divisions have very different appearances, but they are all connected with each other and surrounded by most beautiful promenades, drives, and public gardens, which, together with the exceedingly mild and salubrious climate, yearly attract thousands of foreigners who spend the winter here. It has several military magazines, tanneries, spinning and weaving factories, and manufactures of wax, essences, and preserved fruit. Its trade in wine, oil, hemp, silk, and fruits is very considerable. It belonged to the family of the duke of Savoy until 1388, but was in 1860 ceded to France. Pop. in 1881, 66,259.

Nice, Councils of. See Council, Œcumenical, and Nice.

Ni'cene Creed. See Creed.

Nich'ol (John), LL.D., son of Prof. John P. Nichol, b. at Montrose, Scotland, Sept. 8, 1833; educated at the universities of Glasgow (1848–55) and Oxford (1855–59); became professor of English literature in the University of Glasgow 1861; has been tutor to a large number of candidates for honors at Oxford; has been a popular lecturer on literature, especially to classes of ladies, in various cities of England and Scotland; was noted for his advocacy of the Union cause during the American civil war, and for his so-called "Broad Church" theology; has been a frequent contributor to the *Westminster, North British*, and other reviews; wrote for the eighth and is writing for the ninth ed. of the *Encyclopædia Britannica;* published a volume of essays entitled *Fragments of Criticism* (1860); a classical drama, *Hannibal* (1872); *Tables of European Literature and History* (1876); *Tables of Ancient Literature and History* (1877); *English Composition*, a literature primer (1879); *Byron*, in the English Men-of-Letters series (1880); *The Death of Themistocles, and other Poems* (1881); *Robert Burns*, a sketch of his career and genius (1882); *American Literature*, an historical review (1882).

Nichol (John Pringle), LL.D., b. at Brechin, Scotland, Jan. 13, 1804, the son of a bookseller; taught school in early life; studied for the ministry of the Scottish Church, and was licensed to preach, but soon devoted himself to science; became a successful popular lecturer upon astronomy, in which capacity he visited the U. S., and professor of practical astronomy in the University of Glasgow. Among his works were *Views of the Architecture of the Heavens* (1838), *The Stellar Universe* (1848), *The Planetary System, its Order and Physical Structure* (1851), and *Cyclopædia of the Physical Sciences* (1857). D. at Rothesay Sept. 19, 1859.

Nicholas I., Pope (858–868), a Roman by birth, an imperious and energetic character; asserted the papal authority with great success against the metropolitan in his controversy with Hincmar of Rheims, and even against the royal and imperial power, compelling Lothaire, king of Lorraine, who was supported by his brother, the emperor Louis, to abandon his mistress, Walrada, and reinstate his legitimate wife, Theutberga, in her rights as queen. Less successful was his contest with the patriarch of Constantinople, Photius, who had usurped the see after the deposition of Ignatius by the emperor. Nicholas excommunicated Photius and demanded the reinstatement of Ignatius, but the emperor, Michael III., supported Photius, who in his turn excommunicated Nicholas, arguing that the highest ecclesiastical authority had been transferred from the see of Rome to that of Constantinople by the transference of the imperial residence.—Nicholas II. (1058–1061) held the famous Easter Council in Rome, 1059, which placed the papal election in the hands of the cardinals, and issued the decree against the marriage of priests.—Nicholas III. (1277–1280).—Nicholas IV. (1288–1292), a weak man.—Nicholas V., Pope (1447–55), b. at Pisa in 1398, a peaceable and kind-hearted man, with great interest in learning; reorganized and enlarged the Vatican library and the University of Rome, and gathered in Rome a great number of the most celebrated scholars of the age, among whom were many Greeks who fled to Western Europe on the downfall of the Eastern empire.—In 1328, Louis of Bavaria raised Peter de Corbario as anti-pope to John XXII., under the name of Nicholas V., but he d. shortly after in the papal dungeon, and is not counted in the papal succession.

Nicholas I. (Nikolai Paulovitch), emperor of Russia (1825–55), b. at St. Petersburg July 7, 1796, the third son of the emperor Paul. On the death of Alexander I., the elder brother, Constantine, resigned the crown, and thus Nicholas succeeded to the throne. A formidable military conspiracy, which endangered not only his succession, but the very existence of the empire, he put down with admirable courage and presence of mind, but also with a relentless severity which almost resembled cruelty; and a similar hardness he showed after the suppression of the Polish rebellion in 1830. He was cold and despotic, but within the narrow compass of his ideas he was just. He had no pity, but he was free from caprices—a man of simple habits, industrious and trustworthy. During the reign of Alexander he had no share in the government. He travelled, visited England, married in 1817 the eldest daughter of Frederick William III. of Prussia, and lived at St. Petersburg in domestic retirement, occupied by military studies. In the wars, however, which Russia carried on during his own government in Central Asia, the Caucasus, Turkey, Hungary, Poland, and with the Western powers, he took no part personally, and military authorities found his ideas and views of military matters deficient. As an administrator he had a decided talent. That huge bureaucratic engine, with its foundation of a strong standing army and its appendage of a secret police, by which Russia has been governed during the last fifty years, was entirely his fabric; and being a man of immense working power, he managed the engine well; the country prospered and progressed. Systematization was his great idea. Protestants, Jews, etc. were harassed, even persecuted, for there ought to be only one Church in Russia; and after the suppression of the Polish rebellion he actually undertook to annihilate the Polish nationality and Russianize the country. As a diplomat he had also some talent. For several years after 1849, Russia occupied the first place in the political system of Europe, and her plans with respect to Turkey were rapidly maturing when they received a sudden check from Napoleon III. by the alliance between England, France, Sardinia, and Turkey, and the ensuing Crimean war. The misfortunes of the Russian arms during this war were a great humiliation to this haughty man, and are said to have shortened his life; d. Mar. 2, 1855.

Nicholas (George), son of Judge R. C. Nicholas, was b. at Hanover, Va.; graduated in 1772 at William and Mary College; served with distinction in the Revolutionary war, and exercised afterwards a remarkably wide influence in the public affairs of Virginia; removed in 1790 to Kentucky; was the principal author of its constitution (1792) and its first attorney-general. D. 1799.

Nicholas (Robert Carter), b. in Virginia in 1715; was educated at William and Mary College; became a prominent lawyer of James City; was appointed in 1779 a chancery judge, and was the father of several prominent statesmen. D. in Hanover co., Va., in 1780.

Nicholas (Thomas), Ph. D., F. G. S., b. in Pembrokeshire, Wales, in 1820; studied in Lancashire College and in Germany; became professor of biblical literature at Caermarthen College 1856; projected and founded the University College of Wales, an unsectarian institution which aims to assimilate the education of Wales to that of England; published *Middle and High Schools and University Education for Wales* (1863), *The Pedigree of the English People* (1868; 4th ed. 1874), *Annals and Antiquities of the Counties and Families of Wales* (1872), and a *History of the County of Glamorgan* (1874). Dr. Nicholas made many translations from the German for periodicals, and was known as an ethnologist by his advocacy of the doctrine that the English people are traceable chiefly to a Celtic ancestry. D. at London, Eng., May 14, 1879.

Nicholas (Wilson Cary), a son of Judge R. C. Nicholas; was educated at William and Mary College; served with distinction in the Revolution, in which he commanded Washington's body-guard; was in Congress 1807–09; U. S. Senator 1799–1804; U. S. collector at Norfolk 1804–07; governor of Virginia 1814–17. D. at Milton, Va., Oct. 10, 1820.

Nicholas Court-house, cap. of Nicholas co., West Va. (see map of West Virginia, ref. 5–D, for location of county), 48 miles E. of Charleston. Pop. not in census.

Nicholas of Myra, a saint of the Greek and also of the Roman Church, is reported to have been imprisoned during the persecution of Diocletian and not released until the time of Constantine. Many miracles are ascribed to him—the allaying of storms, the liberation of captives, etc.

Nicholasville, cap. of Jessamine co., Ky. (see map of Kentucky, ref. 3–H, for location of county), 12 miles S. by W. from Lexington, on the Cincinnati New Orleans and Texas Pacific R. R., has an academy, a seminary, and several mills. Pop. in 1870, 1089; in 1880, 2303.

Nichols (Clarinda Howard). See Appendix.

Nichols (Edward Tatnall), U. S. N., b. Mar. 1, 1823, in Georgia; entered the navy as a midshipman in 1836; became a passed midshipman in 1842, a lieutenant in 1850, a commander in 1862, a captain in 1866, a commodore in 1872; commanded the Winona at the passage of Forts Jackson and St. Philip and the Vicksburg batteries in 1862, and commended for "ability, steadiness, and sound judgment." Rear-admiral Feb. 26, 1878; May 23, 1881–85, chief of bureau of yards and docks, navy department; retired Mar. 1, 1885. Foxhall A. Parker.

Nichols (Ichabod), D. D., b. at Portsmouth, N. H., July 5, 1784; graduated at Harvard College 1802; was mathematical tutor there 1805–08; was ordained associate pastor with Rev. Dr. Deane of the First Congregational church (Unitarian) at Portland, Me., Jan. 7, 1809; was sole pastor from 1814 to 1855, when he received a colleague, and removed to Cambridge, Mass, where he d. Jan. 2, 1859. For many years he was a trustee of Bowdoin College and vice-president of the American Academy of Arts and Sciences. In 1830 he published a work on *Natural Theology,* characterized by originality both in ideas and exposition. A posthumous work, *Hours with the Evangelists* (2 vols., 1859–64), is mainly addressed to the refutation of the views of Strauss. A volume entitled *Remembered Words from the Sermons of the Rev. I. Nichols* appeared at Boston in 1860.

Nichols (John), F. S. A., b. at Islington, a suburb of London, England, Feb. 2, 1745; was apprenticed to the eminent printer William Bowyer; became his partner, successor, and biographer, and was a distinguished benefactor to English letters, not only by the enterprise and liberality displayed in several costly undertakings, but by his careful editorship of numerous works and by his own learned writings. Nichols printed in 1778 for private distribution a little brochure of 52 pages, *Brief Memoirs of Mr. Bowyer,* which was soon expanded into a quarto volume, *Biographical and Literary Anecdotes of William Bowyer, Printer, F. S. A., and of Many of his Learned Friends* (1782); and the latter work became so popular as to be ultimately recast into the valuable series entitled *Literary Anecdotes of the Eighteenth Century* (9 vols. 8vo, 1812–15), and was followed by *Illustrations of Literary History* (8 vols. 8vo, 1817–58), completed by his son, John Bowyer Nichols. From 1778 until his death Mr. Nichols was the editor and publisher of the *Gentleman's Magazine.* Among his elegant volumes upon English local history were *Bibliotheca Topographica Britannica* (52 Nos., 1780–90); *The Progresses, Processions, Festivities, and Pageants of Queen Elizabeth* (4 vols., 1788 -1821) and of *King James I.* (4 vols., 1828), and *The History and Antiquities of the Town and County of Leicester* (7 parts, 8 vols., 1795–1815). D. in London Nov. 26, 1826.

Nichols (John Bowyer), F. S. A., son of John, b. in London July 15, 1779; was educated at St. Paul's School; became an assistant in his father's publishing-house 1796, to which he succeeded in 1826, and maintained its reputation by producing a large number of magnificent topographical works, among which may be mentioned Ormerod's *Cheshire,* Surtees' *Durham,* Baker's *Northamptonshire,* Hutchin's *Dorset,* Hoare's *South Wilts,* and Hunter's *South Yorkshire.* Besides continuing his father's *Literary History,* he wrote *A Brief Account of the Guildhall in the City of London* (1819), *Historical Notices of Fonthill and its Abbey* (1836), and several other works; was editor of the *Gentleman's Magazine* (1833–56), and printer to the House of Commons. D. at Ealing, near London, Oct. 19, 1863.

Nichols (John Gough), F. S. A., son of John Bowyer Nichols, b. in London in 1806; was educated at Merchant Taylors' School, and followed the precedent established by his father and grandfather in uniting authorship with the business of publisher. He was editor of the *Gentleman's Magazine,* of the *Collectanea Topographica et Genealogica,* of the *Topographer and Genealogist,* of the *Herald and Genealogist,* and of many of the publications of the Camden and Roxburghe Clubs. Among his original works were the biographies accompanying the *Autographs of the Royal, Noble, Learned, and Remarkable Persons in English History* (1829), *Monuments of the Beauchamp Chapel, Warwick* (1833), and *London Pageants* (1837). D. at Holmwood, near Dorking, Nov. 14, 1873. (See his *Memoir,* by his brother, R. C. Nichols, 1874.)

Nichols (Mary Sergeant **Gove**), M. D., b. in Goffstown, N. H., in 1810; studied medicine, and became widely known while Mrs. Gove as a lecturer and writer upon the water-cure system. Mrs. Gove also wrote several tales and sketches under the *nom de plume* of "Mary Orme;" contributed to Godey's *Lady's Book* and to the *American Review,* and published *Lectures to Ladies on Anatomy and Physiology* (1844). She afterward became the wife of Thomas L. Nichols, M. D., of New York City, who is author of *Woman in all Ages and Nations* (1849) and of *Esoteric Anthropology* (1853).

Nichols (Rebecca S. **Reed**), b. at Greenwich, N. J., about 1818; married Mr. Willard Nichols at Louisville, Ky., 1838; resided for a time in St. Louis, and then settled at Cincinnati. She wrote verses for the Louisville papers about 1840, contributed to several magazines, edited a literary newspaper, *The Guest,* 1844, and published volumes of poems in 1844 and 1851.

Nichols (Richard), b. in England about 1620; was sent in 1664 as one of the four commissioners to inquire into the state of the American colonies and to organize an attack upon the Dutch at Manhattan; arrived at Boston in July; was present at the surrender of the Dutch in August; assumed the administration both of New York and New Jersey; resigned the latter to Carteret in 1666, and was succeeded in the former by Col. Lovelace in 1667. The administration of Gov. Nichols was characterized by prudence and integrity. He returned to England, and his subsequent history is unknown.

Nichols (Gen. William A.), b. in Pennsylvania in 1817; graduated at U. S. Military Academy 1838; served in the Mexican war; became lieutenant-colonel 1861; served throughout the civil war in the adjutant-general's department, rendering important though unobtrusive services; was promoted to be colonel and brevet brigadier-general 1864, and brevet major-general Mar. 13, 1865. Subsequently he became adjutant-general of the military department of the Missouri, and d. at St. Louis, Mo., Apr. 8, 1869.

Nicholson (Alfred O. P.), b. in Williamson co., Tenn., Aug. 31, 1808; graduated at the University of North Carolina, Chapel Hill, N. C., in 1827; studied medicine at Columbia, Tenn., and attended a course of lectures at Philadelphia in 1828; abandoned medicine in 1829; studied law, and commenced practising in 1833; in 1830 edited the *Western Mercury*, published at Columbia, in conjunction with the late chancellor, S. D. Frierson; was elected in 1833 to the house of representatives, and was re-elected in 1835, and again in 1837; upon the death of Felix Grundy, in 1840, was appointed by Gov. James K. Polk to fill the vacancy thereby occasioned in the U. S. Senate; served until the meeting of the legislature; was not a candidate for election; in 1843 was elected a member of the State senate; in 1845 removed to Nashville and became the editor of the Nashville *Union;* was here appointed a director of the Bank of Tennessee, and subsequently elected president; in 1850 returned to Columbia, and was appointed a chancellor by Gov. Trousdale, but resigned at the end of a year. Became in 1853 the editor of the *Union*, a newspaper published at Washington, D. C., the proprietor of which was public printer, and upon his death was elected public printer; conducted the *Union* for James Buchanan in 1856, and upon his election to the Presidency retired and returned to Columbia, Tenn.; in 1857 was elected to the U. S. Senate, and remained a member of that body until the State seceded from the Union in 1861; took part in all the proceedings of the extra session of the Senate called upon the inauguration of Pres. Lincoln, but did not return to the Senate at the extra session of Congress in July, 1861, for the reason that Tennessee, in June, 1861, decided to secede. Judge Nicholson was twice arrested at Columbia, and imprisoned as a sympathizer with the Southern Confederacy—first by Gen. Negley, who sent him S. of the Federal lines of occupation, and again, on his return in 1864, by Gen. Thomas, who imprisoned him in the penitentiary at Nashville. In 1870 he was elected a member of the convention to revise the constitution of the State, and in the same year was elected one of the six judges of the supreme court, and was by the judges elected chief-justice, which office he filled until his death, Mar., 1876. James D. Park.

Nicholson (Sir Francis), an English soldier, who was lieutenant (acting) governor of New York for Andros 1687–89; governor of Virginia 1690–92 and 1699–1705, of Maryland 1694–99, of Nova Scotia 1714–17, of South Carolina 1721–25; commanded the Port Royal expedition 1710; was knighted 1720; returned to England 1720; became a lieutenant-general 1725. D. London Mar. 5, 1728.

Nicholson (Commodore James), b. at Chestertown, Md., in 1737; was trained to the sea with his brothers Samuel and John, afterwards captains in the navy; was engaged in the capture of Havana 1762; took command in 1775 of the Defence, a small Maryland vessel, with which he recaptured several prizes from the British; was appointed June, 1776, to the command of the Virginia (26 guns), and in Jan., 1777, succeeded Commodore Esek Hopkins as commander-in-chief of the Continental navy, which post he retained throughout the war; was engaged with his crew as volunteers in the battle of Trenton; fought a severe but indecisive engagement with the British ship Wyoming June 2, 1780, and was taken prisoner after a gallant resistance with his vessel, the Trumbull (38 guns), in Aug., 1781, by the British vessels Iris and General Monk. After the war he became commissioner of loans in New York City, where he d. Sept. 2, 1804. One of his daughters married Albert Gallatin.

Nicholson (Gen. John), b. at Dublin, Ireland, Dec. 11, 1821; entered the military service of the East India Company in 1838; was engaged in the disastrous campaign of Afghanistan 1840–42, and for some months a prisoner to the Afghans; took part in the Sikh war of 1845; became assistant resident at Lahore; rendered important services in the Sikh war of 1848, after which he became deputy commissioner of the Punjaub, and acquired such influence over the savage tribes of the frontier that he became the object of a kind of hero-worship among a sect which sprang up called the "Nekkul-Seynees," which insisted upon paying him the honors of a prophet despite his energetic refusal, carried to the point of inflicting floggings to cure his misguided worshippers of their delusion. With Sir John Lawrence, Nicholson divides the honor of having saved the Punjaub to British allegiance during the great mutiny of 1857; raised the famous "movable column," with which he destroyed all the rebel forces between Lahore and Delhi, and was assigned the post of honor in the final assault upon Delhi, in which he was mortally wounded Sept. 14, and d. Sept. 23, 1857.

Nicholson (Com. John B.), b. at Richmond, Va., in 1783; entered the U. S. navy as midshipman 1800; was engaged in several naval actions during the war of 1812 as an officer of the United States and the Peacock; rose to be captain 1828, subsequently taking rank as commodore. D. at Washington, D. C., Nov. 9, 1846.

Nicholson (J. W. A.), U. S. N., b. Nov. 10, 1821, in Massachusetts; entered the navy as a midshipman Feb. 10, 1838; became a passed midshipman in 1844, a lieutenant in 1852, a commander in 1862, a captain in 1866, a commodore in 1873; commanded the Isaac Newton at the battle of Port Royal, Nov. 7, 1861, and the monitor Manhattan at the battle of Mobile Bay, Aug. 5, 1864; commended for "coolness, skill, and gallantry" by both Flag-Officer Dupont and Rear-Admiral Farragut. Became rear-admiral Oct. 1, 1881; retired Mar. 10, 1883.

Foxhall A. Parker.

Nicholson (Capt. Samuel), brother of James, b. at Chestertown, Md., 1743; was a lieutenant with Paul Jones on board the Bon Homme Richard; was made captain Sept. 17, 1779; cruised with the frigate Deane (32 guns) in 1782, capturing three sloops of war, besides other prizes, and was the first commander of the frigate Constitution. He was commissioned captain in the reorganized navy June 10, 1794, and was the senior officer of the navy at the time of his death, which occurred at Charlestown, Mass., Dec. 29, 1811.

Nicholson (Com. William Carmichael), b. in Maryland in 1800; entered the navy as midshipman June 18, 1812; was on board the President, commanded by Decatur, in the action off Long Island in Jan., 1815, when that vessel was captured by a British fleet; was made lieutenant 1821; served successively in all the squadrons; commanded the sloop Preble, of the Mediterranean squadron, in 1843; became fleet-captain of the Pacific squadron 1855; was in command of the Naval Asylum at Philadelphia 1861; served in important commands during the civil war, especially as commander of the steam-frigate Mississippi, of the East Indian squadron, 1858–60, and as captain of the steam-frigate Roanoke 1861; commissioned commodore July 16, 1862, and was retired in 1864, after a longer period of service than that of any other officer of the navy. D. at Philadelphia July 25, 1872.

Ni′cias, an Athenian statesman and general from the period of the Peloponnesian war; very wealthy, the leader of the aristocratic party after the death of Pericles, and the fierce opponent of Cleon; wary, cautious, and superstitious, but prudent and energetic. His military successes—the capture of Minoa in 427, of Melos in 426, of Sphacteria in 425, of Cythera in 424—enabled him after the death of Cleon to negotiate a peace of fifteen years between Athens and Sparta in 421, which received his name. Neither of the parties, however, fulfilled the conditions, and in 415 Alcibiades induced the Athenians to make an expedition against Sicily. Nicias tried to dissuade the people from the undertaking, but in vain.. He then accepted the command—first in connection with Alcibiades, afterwards alone—and laid siege to Syracuse. Reinforcements were sent to the city from Sparta. The Athenian fleet was defeated and destroyed, and when Nicias retreated with his troops to the interior, he was soon compelled to surrender, and he himself was put to death (413). Plutarch has written a very interesting sketch of his life and character.

Nick′el (symbol, Ni.; at. weight, 58.01; sp. gr., 8.97–9.25), a metal allied to cobalt and to iron, but much less abundant than the latter, and of annually increasing importance in the arts. Nickel has been long known, but it was only in 1751 that Cronstedt proved it to be a distinct element. It is associated with iron and cobalt in terrestrial ores, and is found in considerable amount in almost all aërolites or meteoric stones, the percentage in these sometimes rising to from 9–12. The terrestrial sources are the ores known as white nickel pyrites, or chloantite (diarsenide of nickel), nickel-bloom, or annabergite (arsenate of nickel), breithauptite (antimonide of nickel), gersdorffite, or nickel-glance (arsenio-sulphide), ullmanite (antimonio-sulphide), capillary pyrites, or millerite (oxide, sulphide), grunanite (sulphide of nickel and bismuth), emerald nickel (carbonate), pyromeline (sulphate), pimelite (silicate of nickel), and less important compounds, as nickel ochre. Kupfer-nickel contains 43.5 per cent. of nickel; chloantite, 27.8 per cent.; nickel speiss-glance, 31.4 per cent.; nickel-glance, 35.1 per cent.; and antimonial nickel-glance, 27.6 per cent. of the metal. Nickel is tolerably widely diffused, and is worked in England, Germany, Austria, Russia, Sweden, and the U. S., especially at Lancaster. Pa. Siegenite, a complex sulphide of nickel, cobalt, and iron, has been found in Missouri and Maryland. The methods of smelting and working nickel ores are various and complicated, and while some are well known, others are still kept a secret. Occasionally, nickel is produced from smelting products, and in rare cases the ores are worked directly for the production of the metal, without the previous formation of a speiss or matt. The following is a brief sketch of the ordinary methods.

(1) *Concentration Smelting of Nickel Ores for the Production of Matt.*—This process depends upon the fact that the oxidized iron in the ores upon smelting with quartz or some silicious substance, after roasting, becomes scorified, while the oxide of nickel, which is formed by the roasting process, and which is somewhat easier to reduce than the oxide of iron, becomes reduced to metallic nickel, and concentrates in a matt formed of the undecomposed metallic sulphides and those sulphides which have been reduced from sulphates. After being concentrated in a cupola furnace, the matt is submitted to an oxidizing blast-smelting in order to extract the iron as perfectly as possible; and this is sometimes effected in a reverberatory furnace with the addition of quartz, heavy spar (or sulphate of soda), and coal. The coal transforms the heavy spar into sulphide of barium; this reacts upon the oxidized copper and nickel, and forms baryta, and this earth unites with the quartz and protoxide of iron, forming an easily fusible slag. Iron pyrites containing 44.52 per cent. of iron, 6.13 of nickel, 5.39 of copper, and 43.96 of sulphur, are roasted in mounds four or five days, and then smelted with coke in a channel furnace, some slag from a previous process, with limestone and quartz, being added if the ores do not contain silica, alumina, and lime enough to form a slag with the protoxide of iron. This produces about 20 per cent. of a raw matt containing 13 per cent. of nickel. This raw matt is resmelted with nickel slags and quartz, producing a concentration matt of 24 to 25 per cent. of nickel. This new matt then gets an oxidizing smelting to reduce its iron and its sulphur and bring the nickel up to 35 per cent.

Arsenical nickel ores are smelted without being dressed with fluor-spar, alumina, quartz-sand, and slag, and what is known as speiss—viz. a mixture of metallic arsenides—in which the nickel collects, owing to its greater affinity for arsenic than for sulphur. A speiss is sometimes obtained containing 60 per cent. of nickel with only half of 1 per cent. of iron and copper, respectively. Furnace ends and residues resulting from the oxidizing smelting of copper give a slag containing nickel to the amount of 2.5 per cent. This is smelted with 10 per cent. of iron pyrites and from 10 to 40 per cent. of arsenical pyrites, until a speiss containing 26 per cent. of nickel and a matt containing 6 per cent. are obtained. This speiss is roasted and smelted with arsenical pyrites, heavy spar, copper slag, and lead slag until a refined speiss of 35 per cent. of nickel is obtained.

Production of Nickel in the Dry Way.—The production of metallic nickel in the dry way—*i. e.* by smelting alone—is rarely attempted.

Production of Nickel in the Wet Way.—This process depends upon such a treatment of ores or ore-products as will give a nickel salt soluble in water, and from which the metal may be cheaply precipitated as an oxide. Ores, matt, and speiss are first roasted—in order, first, to put the iron into the state of an insoluble oxide; and, second, to make the copper, nickel, and cobalt soluble (*a*) in water, by transforming them into sulphate, or (*b*) in sulphuric and muriatic acids, by transforming them into oxides or basic salts. The following facts lie at the basis of the treatment of nickel-giving products. If a matt containing iron, copper, nickel, and cobalt be submitted to an oxidation-roasting at a gradually increasing temperature, with or without the addition of oil of vitriol, the sulphate formed will be decomposed in the following order: iron, copper, nickel, and cobalt. Most of the cobalt and nickel, with some copper, may be extracted from such a mass by water. Dilute acids attack the oxide of copper the most readily, oxide of nickel with more difficulty, while the oxide of iron is practically insoluble. However well the speiss may be roasted, it will always retain some arsenic; and this may be converted into arseniate of soda by roasting with saltpetre and soda and lixiviating the mass.

Precipitation of the Nickel.—An acid solution of nickel (and its allied metals) having been obtained, precipitation of the metal by some cheap reagent is the next step. Among these reagents are—(1) Carbonate of lime, which is used in the form of pulverized chalk, and which should be as free as possible from iron. From a solution containing oxides of iron, copper, nickel, and cobalt, carbonate of lime precipitates, at common temperatures, chiefly hydrated peroxide of iron, with some oxide of copper and a little hydrated oxide of cobalt. If arsenic be present, it goes down as arseniate and arsenite of iron. At 40° C. and above the carbonate of lime throws down the copper, some of the cobalt and nickel, and all the iron; so that if we use a solution of a sulphate, a nearly pure solution of nickel results, mixed with some gypsum. (2) Chloride of lime may be employed after the iron has been precipitated by carbonate of lime. It transforms the protoxide of cobalt to sesquioxide, and throws it down, any manganese possibly present going down as peroxide. (3) In the use of carbonate of lime in precipitating from a sulphuric acid solution, the nickel contains gypsum, which is hard to separate, lime almost inevitably accompanying the reduced metal. On this account carbonate of soda, though more expensive, is sometimes used, and with it we can make fractional precipitations, as with carbonate of lime, getting first a basic salt of iron, then a mixture of the oxides of iron and copper, then one of the oxides of copper and nickel, and lastly, oxide of nickel, with some oxide of cobalt. Arsenic goes down with the peroxide of iron, and no nickel is precipitated with the copper so long as there is 3 or 4 per cent. of copper in the nickel solution. (4) Hydrosulphuric acid is sometimes used to separate copper, lead, antimony, arsenic, and bismuth from their acid solutions; iron is used for precipitating copper; acid sulphate of potash is used for precipitating nickel from solutions containing cobalt; and nitrite of potash or soda for separating cobalt from nickel, a double nitrite of cobalt and potash being formed as a precipitate. Any approximately pure solution of nickel having been obtained, the hydrated oxide is precipitated by lime-water, filtered, pressed, dried, and heated. Its gypsum is extracted by a four days' treatment with weak muriatic acid. It is then ready for reduction to metal.

Metallic nickel is usually sold in the form of small cubes, and these cubes are obtained in the following manner: Hydrated oxide of nickel, obtained as above, is made into a paste with 5 per cent. of flour, some beet-root-syrup, and water. From this stiff mass cubes of one inch or less are cut, and quickly dried. The dried cubes are packed in crucibles or clay tubes with coal-dust, and the metal reduced at a comparatively low temperature, and then made to cake together by a very high one.

Pure nickel, or the metal obtained by galvanic deposition from a solution as pure as possible, is a silvery-white metal with a strong lustre, not tarnishing on exposure to the air. It can be polished so as to be deceptively like polished silver. It is very ductile, hard, and tenacious. A nickel wire of a certain diameter will sustain 1½ times the weight required to break an iron wire of the same size. The specific gravity of nickel varies, according to different observers, between 8.27 and 8.93. Its malleability is diminished by an admixture of carbon or manganese. It is attracted by the magnet, and may be rendered magnetic by the same means as iron, its magnetic power compared with that of iron being given as 35 : 55, or as 8 : 9, or as 2 : 3. Repeated ignition destroys its magnetic property, and it loses this power at a lower temperature than iron. Nickel is very difficult of fusion. Adams succeeded in fusing *pure* nickel in a sealed porcelain crucible lined with pure alumina and bedded in a Hessian crucible at a heat which fused platinum. Crookes and Rohrig put its melting-point at 1900°–2100° C. Nickel is soluble in dilute sulphuric and hydrochloric acids, but it dissolves in these slowly and with comparative difficulty. Nitric acid attacks and dissolves it readily, as does aqua regia. Strong nitric acid renders it passive. It combines directly with chlorine, bromine, iodine, sulphur, phosphorus, fluorine, and arsenic, forming soluble compounds. Pure nickel may be obtained by electrolysis (the presence of cobalt only to be guarded against in this case), or by solution in nitric acid in the presence of excess of metal, evaporation taking up the residue with water, separation of foreign metals by sulphuretted hydrogen, formation of insoluble oxalate of nickel, and calcining this out of the air in a double-lined crucible. Nickel so prepared may contain .1 per cent. of copper and .3 per cent. of silicium, giving 99.40 per cent. of pure metal. The atomic weight of nickel has been the subject of painful researches by various scientists, with results from 58.01 to 59.20. The lowest number—that obtained by Lee, viz. 58.01—agrees closely with Schneider's (58.04) and Sommarugo's (58.026) determinations, and may be accepted as nearly correct. The prevailing color of the hydrated salts of nickel, and of course of their solutions, is green; those containing an excess of ammonia are bluish or violet, while the anhydrous salts are yellowish. From their solutions the fixed alkalies precipitate a hydrate, and the alkaline carbonates a basic carbonate, both of a pale-green color. There are two oxides, the olive-green protoxide, obtained by heating the nitrate or the carbonate, and the black sesquioxide, obtained by heating the nitrate at a lower temperature.

Of the crystallized soluble salts of nickel the most familiar are the sulphate, nitrate, chloride, and the double sulphate of nickel and ammonia, this latter being now prepared and sold in large quantities for the purposes of nickel-plating. Nickel is a bivalent metal, quadrivalent in the sesquioxide, but acting in the double atom (Ni_2) as a sexivalent radical. Nickel is very closely allied to cobalt, but, while presenting many remarkable points of resemblance, is yet abundantly different. The two metals are sufficiently alike to form in modern chemistry a group by themselves, with a general resemblance to iron and manganese.

Uses.—Until within a few years the use of nickel was confined to the purposes of coinage and the making of certain alloys. In Jamaica, Belgium, Switzerland, and the U. S. small coins have been made with an alloy of nickel with zinc and copper, pure nickel being altogether too hard for this use. An alloy is made called *tiers argent*, which consists in 100 parts of—silver, 27.56; copper, 59.06; zinc, 9.57; nickel, 3.42; total, 99.61. The U. S. cent, authorized by the act of Feb. 21, 1857, consisted of 88 parts of copper and 12 of nickel. Since 1850, in Switzerland, small coins (*monnaie billon*) have been issued of the following composition in 1000 parts:

	Silver.	Copper.	Zinc.	Nickel.
20-Kappen piece.........	150	500	250	100
10- " "	100	550	250	100
5- " "	50	600	250	100

These coins do not turn red by wear, but become yellowish. In Belgium, 5, 10, and 20-centime pieces are made of an alloy of 25 parts of nickel and 75 of copper. Up to 1875 the U. S. mints had issued $5,000,000 worth of the 5-cent copper-nickel coins.

Nickel has been, and is now, largely used in the preparation of German silver or nickel silver. This may be looked upon as a brass to which one-sixth to one-third of nickel has been added. Tradition tells us that this alloy has been in use in China from a remote period; its use in Europe has become common within thirty years. The white copper, or *packfong*, of the Chinese contains 40.4 parts of copper, 31.6 of nickel, 25.4 of zinc, and 2.6 of iron. German silver should be, approximately, 1 part of nickel, 1 of zinc, and 2 of copper. For casting purposes a little lead is sometimes added. A cheaper kind contains 8 parts of copper, 2 of nickel, and 3.5 of zinc. If the amount of nickel fall below 2 parts in 11–12, the silver produced will be little better than brass; 8 parts of copper, 3 of nickel, and 3.5 of zinc make a beautiful alloy closely resembling silver. The preceding, with 4 parts of nickel, makes a very beautiful compound having a faint shade of blue. The Chinese *tutenag* has 8 parts of copper, 3 of nickel, and 6.5 of zinc. This alloy is fusible, hard, and not easily rolled. The color of good German silver is nearly silver-white, its fracture small-grained, specific gravity 8.4 to 8.7. It is as ductile as ordinary brass, but harder and capable of being polished. In making it, the three metals should be granulated and well distributed through the crucible, covered with charcoal, and well stirred while in fusion.

The following table shows the price of nickel, in large lots per pound in gold up to 1877, after which the quotations are in currency:

1870	$1.25	1877	$2.00 to $1.20
1871	1.50	1878	1.20 to 1.00
1872	2.25	1879	1.15 to 1.10
1873	3.25	1880	1.10
1874	2.80	1881	1.10
1875	3.00	1882	1.10
1876	2.60	1883	1.00

The chief use of nickel, developed within a few years, is for nickel-plating, or the electro deposition of nickel upon other metals. For many years the fact was well known that a brilliantly white deposit of metallic nickel could be obtained by the electrolysis of a solution of any one of many nickel salts, but no practical lesson was deduced from it, nor was the possibility of electro-*plating* with nickel (as distinguished from the mere obtaining a brilliant deposit of metal) demonstrated, until Dr. Isaac Adams, Jr., solved the problem and created, in fact, a new art. Former experimenters had indeed obtained a deposit of a white and brilliant metal, but had never been able—and perhaps had never tried—to produce this deposit continuously from a bath or solution which should maintain its strength and work practically year in and year out. Until Dr. Adams showed the way, no method was known—or only the most impracticable, and in workshops impossible—of supplying a nickel-plating solution regularly and continuously with the metal, regularly and continuously withdrawn from it. The use and value of nickel on account of its hardness, beauty, lustre, and the polish which it takes were rapidly recognized as soon as nickel-plated ware became common. Gas-fixtures, arms of railway-seats, chandeliers, bits, buckles, surgical instruments, skates, knives, forks, metal rollers for calico-printers, thermometer-scales, tea-sets, builders' hardware, lockets, and trinkets are a few of the common articles to which a coating of nickel is given.

In all electro-plating, or giving one metal a coating of another, the essentials of the process are a battery, a proper solution, a cathode—the object to be plated—and an anode, or plate of metal forming the positive pole of the battery. The solution having been prepared, the object to be plated is suspended in it, and opposite to it is hung the anode, and the two being connected respectively with the two poles of a galvanic battery, a deposition of metal upon the cathode takes place. This deposition goes on so long as the battery power is maintained and metal supplied as the anode dissolves off. This is a brief outline of the process of electro-plating; and what has been said applies in a general way to the metal nickel. But in practical working a great number of points arise which enhance the difficulty of plating with nickel, and render it a distinct art. These difficulties relate to the preparation of the proper solutions for electro-plating, to making them, and keeping them when made, free from any injurious admixture of foreign substances, etc. In fact, plating with nickel is, chemically speaking, a process of no little difficulty and delicacy. It is in this respect broadly distinguished from the ordinary processes of electro-plating with copper and silver. To make a plated metal of any value in the arts, it must be deposited upon suitable objects in what is known as the reguline state—*i. e.* that which exhibits fully the ordinary desirable qualities of the metal. The best practical solution for nickel-plating is a solution of the double sulphate of nickel and ammonia. If properly prepared and used, this solution has the property of giving a deposit with a smooth surface which can be polished with little labor, and—what is of consequence with a metal so hard as nickel—it gives a very thick deposit before it acquires a rough or matted surface. The solution should be of a salt as pure and neutral as possible, and kept free from substances which would impair its working properties, chief among which are nitric acid, the alkalies, and lime. Nitric acid and caustic alkali are used for cleaning goods about to be plated, and hence, without scrupulous care, a little nitric acid or alkali will find its way into the plating-vat. Nitric acid in very small quantities ruins the vat, the work coming out black and streaked. The presence of potash or soda is at once manifested by a deposit of green oxide or sub-oxide of nickel upon the article being plated. Copper, zinc, and arsenic are also detrimental, and must be excluded or their bad effects neutralized. Commercial nickel almost always contains the above-named metals, as well as some of the reagents employed in the complicated process of its manufacture, as sulphate of lime, sulphide of calcium, sulphides of sodium and potassium, common salt, and alumina. All these injurious substances must be removed in preparing a salt fit for plating purposes, and the introduction of any of them or their congeners into the solutions carefully guarded against.

While in electro-plating an anode of pure metal is convenient and useful, in working out the problem of nickel-plating Dr. Adams brought to light the curious fact that a plate of pure metallic nickel—used as an anode—does not satisfy the conditions requisite to successful plating. Such a plate does not dissolve regularly in the solution; or, in other words, it does not furnish from itself as much metal as is deposited upon the objects plating. The nickel salt in the solution has to furnish the metal, and consequently the solution becomes weaker, and finally runs out. If, on the other hand, a plate of nickel combined with carbon—a carbide of nickel—be employed, the metal will be fed into the solution on one side just as fast as it is deposited out on the other, and thus the great desideratum attained—viz. the possibility of continuous and uniform work. Such cast-nickel plates, or anodes, are now successfully made, and form an article of commerce; and it is by the use of them that we now have a process of nickel-plating which is continuous and uniform.

Among the recent applications of nickel-plating no one is of more direct and obvious utility than its use in the case of the rollers used in calico-printing. These engraved rollers are of copper, a comparatively soft metal, and have to be continually touched up and repaired, and when worn so as to produce imperfect impressions are turned down and re-engraved. A large print-works in Massachusetts owning 2351 copper rollers turned down for re-engraving 2768 in one year, showing that over 400 rollers were so treated twice. The giving to such rollers before use a good coating of nickel adds enormously to their working life and lessens the cost of printing, a nickel-plated roller doing three or four times the work done by a copper one.

Deville described cobalt and nickel as metals with useful physical properties but little known, such as malleability, ductility, and a tenacity surpassing that of iron. He showed that these metals could be worked at a forge with the same facility as iron; that they are susceptible of being employed in the same manner, and were less oxidable. Mr.

Joseph Wharton of Philadelphia, the chief producer of nickel and its salts in the U. S., not being content with the production of impure nickel, early commenced experimenting to determine whether nickel could not be produced in a pure and malleable condition susceptible of being worked in nearly the same manner as iron, and of being applied in the manufacture of various objects requiring strength of material and a material that cannot be easily oxidized. One of his earliest experiments was to take the somewhat spongy mass got by reduction of the oxide of nickel, and, after heating it to full redness, work it under a steam-hammer into a bar. In 1873, Mr. Wharton sent to the Vienna Exhibition a sample of nickel in the form of axles and axle-bearings, and at the Exhibition in Philadelphia in 1876 he exhibited a remarkable series of objects made of wrought nickel, such as bars, rods, a cube, a horseshoe magnet, and magnetic needles of forged nickel. Dr. Fleitmann of Iserlohn, Westphalia, Prussia, has improved and cheapened the operation of refining nickel and toughening it, and has reduced the liability to the presence of blow-holes in castings by adding to the molten charge in the pot, when ready to pour, a very small quantity of magnesium. Complete malleability of nickel was obtained at Wharton's works in Camden, N. J., before Fleitmann's invention or process, but this last is more rapid and better than the old method. The metal so treated becomes remarkably tough and malleable, and may be rolled into sheets and drawn into wire. Cast plates can be successfully rolled. The cast plates, such as are made for anodes, after reheating are rolled down to the desired thickness. It is found that it is a great improvement to the nickel anode plates to roll them down: they dissolve with greater uniformity in the bath. Nickel so treated with magnesium has been rolled into sheets as thin as paper. The largest sheet yet rolled at Camden was 72 inches long and 24 inches wide, of pure nickel. Dr. Fleitmann has also succeeded in welding sheet nickel upon iron and upon steel plates so as to coat them equally on each face with a layer of nickel. The quantity preferred by weight is $\frac{8}{10}$ iron and $\frac{2}{10}$ nickel, $\frac{1}{10}$ of nickel being placed on each surface. To secure union, the iron or steel must be perfectly flat and clean. A pile is made with outer facings of sheet iron, to protect the nickel from scaling. When the whole is heated to the proper degree, it is passed through the rolls. The two metals become so firmly united that they may afterward be rolled down, two or three together or separately, to the thinness desired. J. M. Merrick.

Revised by W. P. Blake.

Nickel-Plating. See Nickel.

Nic'obar Islands, a group of 20 islands (8 large and 12 small) in the Indian Ocean, N. W. of Sumatra. Their area is about 1300 square miles, with 6000 inhabitants belonging to the Malayan race, with only a low state of civilization. The islands are very fertile, producing cocoanuts, sugar, rice, tobacco, bamboo, and oranges in abundance, but are so unhealthful that all attempts to colonize them have failed. Since 1869 they have belonged to Great Britain.

Nicode'mus, a member of the Sanhedrim, mentioned thrice in the Gospel of John—iii. 1–21, as coming to Jesus by night; viii. 45, as demanding that Jesus should be heard before being judged; and xix. 38–42, as assisting Joseph of Arimathea in laying out the body of Christ.

Ni'colai (Christoph Friedrich), b. at Berlin Mar. 18, 1733; took charge in 1759 of his father's bookstore and publishing-office, which he conducted till his death, Jan. 8, 1811. He founded, with Moses Mendelssohn, *Bibliothek der schönen Wissenschaften* (1757); with Lessing, *Briefe, die neueste Literatur betreffend* (1759); and alone, *Allgemeinen deutschen Bibliothek* (1765). He wrote *Anecdoten von Friedrich II.* (1785), several humorous works and large romances, and a multitude of critical essays against Kant, Fichte, Goethe, Herder, and the romantic school.

Nicolai (Karl Otto Ehrenfried), b. at Königsberg June 9, 1810; studied music under great difficulties; lived after 1830 at Berlin as a music-teacher; became organist to the ambassadors' chapel at Rome in 1834, director of the opera at Vienna in 1839, and of the royal orchestra at Berlin in 1848, and d. there May 10, 1849. Of his numerous compositions, one has become somewhat popular, the opera *The Merry Wives of Windsor*.

Nic'olas (Sir Nicholas Harris), F. S. A., b. at East Looe, Cornwall, England, Mar. 10, 1799; entered the British navy at an early age; became a lieutenant 1815; studied law; was called to the bar 1825; devoted his attention chiefly to peerage-claims before the House of Lords, and became profoundly versed in every branch of antiquarian literature, especially history, genealogy, and heraldry; was joint editor of the *Retrospective Review* 1826 and of the *Excerpta Historica* 1831; made a knight of the Hanoverian Guelphic order 1831, chancellor of the Ionian order of St. Michael and St. George 1832, of which he became grand cross 1840. D. at Cape Curé, near Boulogne, France, Aug. 3, 1848. Among his works are *Synopsis of the Peerage of England* (1825), *History of the Battle of Agincourt* (1827), *The Chronology of History* (1835), *History of the Orders of Knighthood of the British Empire* (4 vols., 1841–42), *Despatches and Letters of Lord Nelson* (7 vols., 1844), *Memoirs of Sir Christopher Hatton* (1847). At the time of his death he was engaged in arranging for publication *The Letters and Journals of Sir Hudson Lowe*, which appeared under the editorship of William Forsyth Harris (3 vols., 1853).

Nicole' (Pierre), b. at Chartres, department of Eure-et-Loire, France, Oct. 19, 1625; studied theology at Paris; joined the community of Port Royal; fled in 1679 from the persecutions of the Jesuits to the Netherlands; returned in 1683 to Paris, and d. there Nov. 16, 1695. He translated Pascal's *Provincial Letters* into elegant Latin under the pseudonym of "William Mendrock," wrote *Essais de Morale et Instructions théologiques*, and had a share in the authorship of several of Arnauld's works.

Nicollet (Jean Nicolas), b. at Cluses, Savoy, France July 24, 1786; was a pupil of Laplace, secretary and librarian of the observatory at Paris in 1817; came to the U. S. 1832; explored the Southern States, especially the basins of the Red, Arkansas, Missouri, and upper Mississippi rivers; collected valuable materials illustrative of Indian history, customs, and languages, as well as notices of the geology and natural history of the regions visited; and was sent by the war department on a second exploration of the Territories for the purpose of preparing a map and presenting a general report, on which occasion Lt. John C. Fremont was his assistant. D. Washington, D. C., Sept. 11, 1843. Author of scientific treatises in French.

Nicomedi'a, the capital of ancient Bithynia, at the head of the Gulf of Astacenus, founded by Nicomedes I. (278–248 B. C.) in 264 B. C., after the destruction of Astacus (a little to the S. E. of it) by Lysimachus. From 292 to 330 A. D. it was the capital of the Eastern Roman empire, and contained many splendid buildings. It has suffered very severely from earthquakes, as in 358 and 362 A. D. Arrian was born, Hannibal died, and Diocletian abdicated here. Constantine died at his Villa Ancyron, close by. The modern Turkish village of *Ismid*, which occupies the old site, has a population of about 3000.

R. D. Hitchcock.

Nicop'oli, town of European Turkey, eyalet of Widdin, on the Danube, is beautifully situated, but its fortifications are decaying and its trade and manufactures are inconsiderable. Pop. 10,000.

Nicop'olis [Gr. Νικόπολις, "city of victory"], the name of ten ancient cities (one in Egypt, four in Asia, and five in Europe), the most important of which was the one in Epirus, founded by Augustus to commemorate his great naval victory at Actium, Sept. 2, 31 B. C. It soon became a large and splendid city, more, however, through imperial favor than by reason of its natural advantages. Already in the time of Julian (361–363 A. D.) it had declined, and was restored. Early in the sixth century it was plundered by the Goths (Procopius, *De Bello Gothico*, iv. 22), and restored again by Justinian (527–565 A. D.). After this it gradually decayed, and died a natural death. St. Paul wintered here (Tit. iii. 12), perhaps in the year 67–68 A. D. R. D. Hitchcock.

Nicosia. See Lefkosia.

Nicosi'a, town of Sicily, province of Catania, about 44 miles N. W. of Catania. This very old town is situated on two high hills in the midst of a most fertile district. It is an episcopal see—has a cathedral and four other large churches, in all of which are good pictures. It has also a considerable library, a small college, and some communal schools, but the state of education may be inferred from the fact that 94 per cent. of the inhabitants of this commune are unable to read. The town carries on an active trade in grain, wine, oil, and cattle, but there are no home manufactures. Nicosia was nearly destroyed by the Arabs, was restored by the Normans, suffered severely in the later civil wars, and was so wasted by the plague in 1624 that it has never recovered its prosperity. Pop. in 1881, 15,460.

Nicot' (Jean), b. in France in 1530; was sent as ambassador by Francis II. to Lisbon, where he procured seeds of the tobacco-plant from Florida, and introduced them into France, whence the botanical *Nicotiana* given to the tobacco-plant. D. at Paris May 5, 1600.

Nico'tera, town of Calabria, province of Catanzaro, near the Ionian Sea. It enjoys a climate of great perfection, and in fine nights the fires of Stromboli, 50 miles distant, are distinctly visible. The principal buildings are the cathedral and the episcopal palace. This town was wasted by the Saracens in the ninth century, by the French in the fifteenth, and partially destroyed by an earthquake in 1783. Pop. 6347.

Nicotine or **Nicotia.** See Tobacco.

Nie'buhr (Barthold Georg), b. at Copenhagen Aug. 27, 1776, was a son of Karstens Niebuhr (b. Mar. 17, 1733: d. Apr. 26, 1815), who from 1761 to 1767 accompanied a scientific expedition to Arabia and South-western Asia, sent out by the Danish king, Frederick V., and described his travels in *Beschreibung von Arabien* (1772) and *Reisebeschreibung von Arabien und andern umliegenden Ländern* (1774–78). The father held a government office in Meldorf, Holstein, and here the son was educated. He afterwards studied law and philosophy at Kiel and Göttingen; was appointed private secretary to Count Schimmelmann, Danish minister of finance in 1796, and next year secretary to the royal library in Copenhagen; visited England in 1798, and entered the civil service of the Danish government in 1799. But his enthusiasm for England and hatred to Napoleon made it very unpleasant for him in Copenhagen, and in 1806 he removed to Berlin, where from this year till 1809 he held various offices in the financial department of the Prussian government. He was an able business-man, and rendered good services, but he was strongly opposed to those almost violent measures of reform which the desperate situation of the Prussian state made necessary, and his temper was nervous and impatient. He fell out first with Stein, then with Hardenberg, and finally resigned his offices. Having been appointed historiographer to the king of Prussia, he delivered in 1810–11 a course of lectures on the history of Rome at the newly-established University of Berlin, and in this sphere his brilliant genius and immense learning at once found their proper application. From 1816 to 1822 he resided in Rome as Prussian ambassador to the papal court, though in reality wholly occupied by scientific studies; and in the latter year he removed to Bonn as professor at the university. Here he developed a great literary activity; founded *Rheinisches Museum* (1827), superintended the new edition of *Corpus Scriptorum Historiæ Byzantinæ*, published a number of minor philological and archæological essays, and continued his great work, *Römische Geschichte*. But under the violent impression which the French revolution of 1830 made on him he broke down mentally and physically, and d. Jan. 2, 1831. His *Römische Geschichte* (3 vols., 1811–32), translated into English, the two first volumes by J. C. Hare and Connop Thirlwall, the third by Dr. L. Schmitz, is, so far as it goes —namely, to the First Punic war—a complete reconstruction of the history of Rome. All those legends which since the days of Livy composed the first chapters of the Roman history, and which were generally accepted as history, he discarded after a thorough critical analysis as myths and fables; and from mostly new materials, won by independent researches, philological, archæological, juridical, etc., he built up the true course of the history of Rome. But his book was not only a reconstruction of the Roman history; it was a reconstruction of historical study in general. Some of his hypotheses have been rejected, such as that of the origin of the early Roman legends; others have been modified, such as that of the origin of the *plebs;* but the fundamental distinction between history and legend, and the method corresponding to this distinction, inaugurated a new epoch in the study of history, and his wonderful intuition into the correlation between the various elements of which a social organism is composed, as well as the astonishing power of imagination with which from a few scanty remnants he constructed the whole organism, will always bear witness to his eminent genius. His *Kleine historische und philologische Schriften* (2 vols.) were published at Bonn (1828–43), *Nachgelassene Schriften* at Hamburg (1842), *Lebensnachrichten* (2 vols.) at Hamburg (1838), three courses of lectures at Bonn; German, by Isler; English (8 vols.), by Dr. L. Schmitz. (See also F. Lieber, *Reminiscences of Niebuhr,* and Susanna Winkworth, *Life and Letters of B. G. Niebuhr.*) Clemens Petersen.

Nie'dermeyer (Louis), b. at Nyon, in Vaud, Switzerland, Apr. 27, 1802; studied music in Vienna under Moscheles and Forster, in Rome under Fioravanti, in Naples under Zingarelli; brought his first opera on the stage at Naples; went in 1822 to Paris, where he composed several operas with mediocre success; founded a school of religious music in 1853. D. Mar. 14, 1861. Of his compositions, the opera *Stradella* (1836) and a number of songs to texts by Lamartine, Hugo, Manzoni, and others, became celebrated. His best work is his *Mass,* performed by the Church Music Society in New York in 1872.

Niel (Adolphe), b. at Muret, department of Haute-Garonne, France, Oct. 4, 1802; was educated at the École Polytechnique of Paris and the Military Academy of Metz; distinguished himself in the expedition against Constantine 1836, and was made commander of the engineering corps in Algeria; took part in the expedition against Rome in 1849; conducted the siege of Bomarsund in 1854, and planned the operations which led to the fall of Sebastopol; distinguished himself in the Italian campaign of 1859, was made a marshal of France after the battle of Solferino, and minister in 1867. D. at Paris Aug. 13, 1869.

Niel'lo-work, a kind of ornamental work in which plates of gold or silver are first engraved by cutting ornamental figures upon them. The lines are then filled with a black alloy, and the whole is burnished. The art is scarcely practised at present. Some of the earliest and best niellos are Byzantine; the finest are Italian of the Cinque-cento period.

Nie'mann (August), b. in Hanover June 27, 1839; entered the Hanoverian army in 1857 as a lieutenant, and fought against Prussia in 1866; settled at Geneva as a teacher of history, geography, and languages after the annexation of Hanover to Prussia, but returned in 1868 to Germany as editor of the *Almanach de Gotha;* took part as a captain in the Franco-German war 1870–71, and published *Military Description of the French Campaign* (translated into English by Col. E. Newdigate, 1872), *Geschichte des 95 Infanterie-Regiments* (1874), *Militär Hand-lexikon* (1874), etc.

Niemce'wicz (Julian Ursin), b. at Skoki, in Lithuania, in 1757; received a military education, but left the service in 1788, and entered into Polish politics as a deputy from Lithuania; fought in 1794 at the side of Kosciusko; was carried, together with him, as a prisoner to St. Petersburg; accompanied him to the U. S.; lived for some time in Washington's house, and married an American lady. In 1807 he returned to Poland, and played a conspicuous and noble part in the politics of his native country till 1830. Shortly before the fall of Warsaw he went to Paris, where he resided till his death, May 21, 1841. In the Polish literature he became very celebrated as the author of *Historical Songs of the Poles* (1816), *Reign of Sigismund III., Lithuanian Letters,* a novel in letters, etc.

Nie'men [Ger. *Memel*], a river of Prussia, rises in Russia, becomes navigable at Grodno, and divides at Winge into the Russ and the Gilge, both of which fall into the Kurisches-Haff, respectively through seven and nine mouths. It is 640 miles long, navigable 400 miles from its mouth, and is of considerable commercial consequence.

Nieuwer Amstel, town of the Netherlands, in the province of North Holland, has 6171 inhabitants, and some manufactures on a small scale.

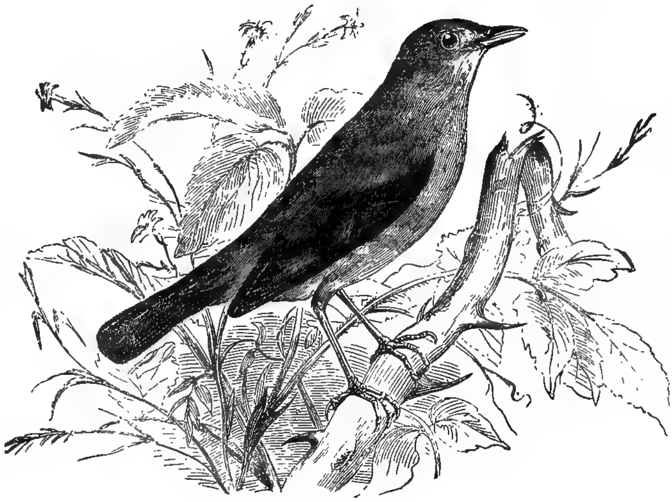
Nièvre', department of Central France, situated along the Loire and its two affluents, the Allier and Nièvre, and the Yonne, an affluent of the Seine. It is mountainous, and not very fertile. Wine is extensively cultivated, but wheat is not raised in sufficient quantity for home consumption. Timber and minerals are abundant. Iron, copper, lead, and silver are mined; coal is raised and marble is quarried. Area, 2595 square miles. Pop. in 1881, 347,576. Cap. Nevers.

Ni'ger, a great river of Western Africa, also called **Joliba** or **Quorra,** which different names are only different expressions of the same idea, "the river," applied to the stream in the different regions it traverses—Joliba to its upper and Quorra to its middle course. It rises in the Kong Mountains, in lat. 9° 25′ N. and lon. 9° 45′ W., and flows first in a north-eastern direction, passing Timbuctoo, and then in a south-eastern direction, until it enters the Gulf of Guinea through a large delta between the Bights of Benin and Biafra, after a course of about 2500 miles. Only parts of it have been thoroughly explored; in most places it flows through broad and fertile valleys, and presents low shores covered with shrubs or overgrown with reeds.

Night'-Hawk, a name applied in North America to the species of *Chordeiles,* a genus of the family Caprimulgidæ or goatsuckers. They are sometimes popularly but incorrectly confounded with the whip-poor-will. The eggs are laid upon the bare ground, without a nest. The birds are well known by their sharp cry and the loud booming sound produced at twilight by the rapid rush through the air, with the bill open to seize their insect prey. Several closely-allied species or varieties are found in the W. and S. W. of the U. S. These are *C. popetue* (the common Eastern species), *C. Henryi* (a rarity), and *C. Texensis.* The night-hawk or night-jar of England is the common Goatsucker (which see).

Night'-Heron, the *Nyctiardea Gardeni,* a common wading bird of the heron family, found in both the Old and New Worlds. The birds build their nests in groups or communities, called heronries. In the U. S. the night-heron is often called *qua* or *quawk*, from its hoarse nocturnal cry. The yellow-crowned night-heron of the Southern States is *Nyctherodius violaceus*. Still other species are described.

Night'ingale, the *Philomela luscinia*, the finest of European song-birds, common in favored localities in a large part of Asia and Europe. It belongs to the family Sylviadæ. It is a homely bird, not larger than the American bluebird. It feeds principally upon worms and insect larvæ. Its delightful song is heard chiefly in still nights of May and June, but also during the day. It is the bulbul of the poets, but in the East that name is now generally given to the *Pycnothous hæmorrhous*, a very different bird. The nightingale of the East Indies is the *Kittacincla macrura*, a bird resembling the true nightingale. It sings by night or in a darkened cage, and its song is regarded as equal to that of the true nightingale.



The Nightingale.

Nightingale (Florence), b. in May, 1820, at Florence, Italy, of wealthy English parents. Prompted by philanthropic instincts, she early turned her attention to the relief of humanity, and in 1851 went to the Kaiserswerth institution on the Rhine for practical instruction as to the best means of carrying on her work. During the Crimean war she was sent by the British war department, at the head of a band of select nurses, for the relief of the sufferings of the sick and wounded, and in this position displayed marvellous energy and ability; and the testimonial of £50,000 subscribed for her by a grateful public she devoted to the founding of a training-school for nurses. Her chief writings are—*Notes on Hospitals* (1859), *Notes on Nursing* (1860), *On the Sanitary State of the Army in India* (1863), *Notes on Lying-in Institutions* (1871), *Life or Death in India* (1873), etc.

Night'mare (*Ephialtes, Hypnophobia, Incubus, Succubus*), a terrific dream in which there appears to be a disagreeable object, as a person, animal, or goblin, present and often upon the breast of the sleeper, accompanied by the inability to cry out, move, or call for help. Some patients have merely a sense of terror, oppression, and inability to call, without any dream. It is often ascribable to heart-disease or asthma, more frequently to obstruction in the circulation caused by the pressure of food or flatulency in the alimentary canal, especially when the sleeper lies upon his back and the weight of the overloaded viscera falls upon the aorta. Many of the symptoms of nightmare may occur to nervous and anxious patients in a half-wakeful state just after retiring to bed. The careful voluntary suspension of the effort to think (a suspension often difficult to accomplish) will usually prevent these attacks, which seem to be due to the performance of the function of thinking at a time when the supply of blood to the brain is deficient. The ancients believed that devils and witches were present during an attack of nightmare. They affirmed that the evil spirits which placed themselves upon the patient were males, called *incubi*, while female spirits and witches, *succubi*, were thought to lie beneath the sleeping sufferer.

Night'shade, a popular name for many plants, mostly solanaceous and often poisonous. (See Belladonna, Circæa, Bittersweet.)

Nihilists. See Alexander II., Bakunin, and Hertzen (Alexander).

Nijmwegen. See Nymwegen.

Nikolaevsk, fortified town of E. Siberia, on the Amoor, lat. 53° 15′ N., lon. 140° 35′ E., founded 1851, has over 5000 inhabitants and is the seat of the civil administration.

Nikolaiev', or **Nikolaief,** town of European Russia, in the government of Kherson, at the confluence of the Bug and Ingul. It was founded in 1790, and grew rapidly on account of its large shipbuilding facilities. It is fortified, and has an excellent harbor, in which the Russian fleet of the Black Sea is stationed. It contains barracks, arsenals, magazines, a school of navigation, an observatory, and many other naval establishments, and in its spacious dockyards a large number of excellent ships is built every year. Pop. 82,805.

Nik'olsburg, or **Mik'ulov,** town of Austria, in Moravia, at the foot of the Polaver Hills, celebrated for their excellent red wines. It contains a magnificent old castle belonging to the prince of Dietrichstein, and has some manufactures of woollens, cotton, and silk. Pop. 7645.

Niko'pol, town of Southern Russia, in the government of Yekaterinoslav, on the Dnieper, about 200 miles from its mouth in the Black Sea. It consists mainly of foreign settlements, and forms the centre of a fertile and busy district. Pop. 9706.

Nile, The, one of the most celebrated rivers of the globe, and the most remarkable of the four great streams of Africa. It flows from the equatorial regions along and inside the E. axis of the continent of Africa, and after a course of nearly 4000 miles reaches the Mediterranean in 31° 30′ N. lat. by two principal mouths, forming a delta which begins near Cairo, 100 miles from the sea, and extends 150 miles along the shores. The upper half of the Nile drains vast tropical regions abundantly watered and receives many tributaries; the lower or N. half traverses the rainless portion of the great desert regions, where its valley, bordered by bare rocky bluffs, appears like a band of verdure in the midst of this desolate country.

The mystery of the sources of the Nile, which from antiquity to the present time was the greatest geographical problem, has been solved at last by the efforts of such explorers as Speke and Grant, Baker and Stanley. They were discovered in great lakes, on high plateaux, under the equator, at 3000 to 4000 feet above the sea. The largest and highest of these basins, 4058 feet in altitude, the Ukerewe, or Victoria Nyanza, a little less in extent than Lake Superior, gathers the waters from all the surrounding highlands. From the Unyamwesi plateau, on the S., flows the Shimiyu, the most remote source of the Nile; on the W. the Kagera, draining high mountain-land; on the E. descend the waters of the plateaux from which rise the snowy peaks of Kenia and Kilimanjaro. The waters issue from the N. end of the lake as a powerful and rapid stream —the true Nile—flowing down toward the N. W. into another great sheet of water, Lake Mwutan, Albert Nyanza, of 2500 feet elevation. Thence it runs with rapid course, and leaves the plateau regions to enter the great plains of central Soudan. Here it receives from the W. the waters of a vast network of rivers collected by the Bhar-el-Arab and the Bhar-el-Gazal, and those of the E. plateaux through the Sobat. After the junction of these rivers, under the name of Bhar-el-Abiad, or White Nile, it follows again a N. course through Nubia, between the table-lands of Kordofan and the plains of Sennaar to Khartoum, lat. 17°, where the Blue Nile, or Bhar-el-Azrek, brings to it the united waters of the Abyssinian plateau and its snowy mountains. Lower down, about N. lat. 17° 40′, another powerful stream, the Atbara, or Black Nile, pours in the waters of Northern Abyssinia. From this point to the Mediterranean, along its course of nearly 1500 miles, it receives not a single tributary of importance. Thence making a great bend, it forms a series of rapids, the so-called cataracts of the Nile, the last of which is at Assuan, at its entrance into Egypt.

Like all streams fed by the periodical rains of the tropics, the Nile has its regular season of freshets overflowing its broad valley, transforming Egypt into a widespreading lake from which the cities rise like islands. At Khartoum the river begins to rise early in April, but in Egypt generally on the 25th of June. The waters then gradually increase until the 27th of September. At Thebes the flood reaches 40 feet; at Cairo, 27; and at Rosetta, at the mouth of the river, 46 feet. After their retreat the waters leave behind them mud and moisture, in which seeds deposited produce a most luxuriant vegetation and a succession of rich crops. Egypt's proverbial fertility thus entirely depends upon this annual inundation of the Nile, which renews the manure of its soil and provides the necessary moisture in this rainless climate. A rise of only 20 feet at Cairo causes a scarcity; more than 27 feet is unfavorable. No wonder that the ancient Egyptians adored the Nile as a god. A. GUYOT.

Niles, city and R. R. centre, Berrien co., Mich. (see map of Michigan, ref. 8–H, for location of county), on Michigan Central R. R., 90 miles E. of Chicago, has a high school, a furniture-factory, a paper and a pulp mill, wagon and carriage factories, a pill-box factory, iron-foundries, flouring-mills, and ample water-power. Pop. in 1870, 4630: in 1880, 4197; in 1884, 4606.

Niles, R. R. centre, Trumbull co., O. (see map of Ohio, ref. 2–J, for location of county), on the Mahoning and Musquito rivers. Pop. in 1880, 3879.

Niles (HEZEKIAH), b. in Chester co., Pa., Oct. 10, 1777; learned the printing trade; became member of a publishing firm at Wilmington, Del., about 1800; edited a daily paper at Baltimore six years; founded at Baltimore in 1811 *Niles' Register*, a weekly paper, which he edited until Aug., 1836, and which was considered so valuable a source of information upon American history that the first thirty-two volumes were reprinted. He advocated the protective system, and wrote a work entitled *Principles and Acts of the Revolution* (1822). D. at Wilmington, Del., Apr. 2, 1839. The *Register* was continued by W. O. Niles and others until June 27, 1849, making 76 volumes.

Niles (JOHN MILTON), b. at Windsor, Conn., Aug. 20, 1787; became a lawyer and an active Democratic politician of extreme principles; founded the Hartford *Times*, for which he wrote during thirty years; was for several years a judge of the Hartford county court; appointed postmaster at Hartford by Gen. Jackson 1829; was U. S. Senator 1835–39 and 1843–49, and postmaster-general under Pres. Van Buren from May, 1840, to Mar. 6, 1841. Among his writings were a *Gazetteer of Connecticut and Rhode Island* (1819), *Lives of Perry, Lawrence, Pike, and Harrison* (1820), a *History of the Revolution in Mexico and South America, with a View of Texas* (1839), and *The Civil Officer;* published in 1842, a new edition of Archibald Robbins's *Journal of the Loss of the Brig Commerce upon the West Coast of Africa* (see RILEY, CAPT. JAMES); d. at Hartford May 31, 1856. Senator Niles bequeathed his valuable library to the Connecticut Historical Society, and left $20,000 to be held in trust for the poor of Hartford.

Niles (NATHANIEL), b. at South Kingston, R. I., Apr. 3, 1741; graduated at Princeton 1766; studied medicine, law, and theology, and was licensed to preach, but was never pastor of a church; settled at Norwich, Conn.; invented a process of making wire from bar iron by water-power, and connected it with a wool-card manufactory. After the Revolution he settled at West Fairlee, Orange co., Vt.; was Speaker of the lower house of the legislature 1784; several years judge of the supreme court, a member of Congress 1791–97, a censor for the revision of the State constitution, and six times Presidential elector; was author of addresses, religious treatises, and of the Sapphic ode, *The American Hero*, a popular war-song during the Revolutionary war. D. at West Fairlee Oct. 31, 1828.

Niles (SAMUEL), b. at Block Island, R. I., May 1, 1674; graduated at Harvard University 1699; preached at Kingston, R. I., 1702–10; was pastor of the Second church, Braintree, Mass., from May 23, 1711, to his death, May 1, 1762; author of several doctrinal treatises, of a poem, *God's Wonder-working Providence for New England in the Reduction of Louisburg* (1747), and of an unfinished *History of the French and Indian Wars*, printed in the *Mass. Hist. Coll.*, 3d series, vol. vi.

Nil-Ghau, or **Nyl-Ghau** [Hind. "blue cow:" *nīl* being "blue," and *ghau*, "cow"], a large antelope of the jungles of India, carrying the head some five feet high. It is of a blue-gray color when full grown. It is very wild, courageous, and resolute, and hunting it is dangerous to any but skilled hunters, who never assail it openly. It has never been thoroughly tamed. The flesh is very poor, but the hides have a limited use in the arts. The nil-ghau is the *Portax tragocamĕlus* of authors.

Nils'son (CHRISTINE), b. at Hussaby, in Southern Sweden, Aug. 3, 1843, of a peasant family, which, father and son, maintained itself by making music at peasant festivities in the neighborhood; attracted the attention of Count Tornĕrhjelm by her playing and singing in a public market-place, and went by his aid to Halmstad, Stockholm, and Paris, where she finished her musical education by three years' study under Wartel, and made her début with eminent success at the Théâtre Lyrique Oct. 24, 1864, in *La Traviata*. In 1867 she visited London for the first time, and in the following season she made a great sensation in Paris by her representation of Ophelia in Ambroise Thomas's *Hamlet*. In 1870 and 1871 she visited America for the first time; in 1874, St. Petersburg, exciting great enthusiasm everywhere.

Nim'bus, in religious art, the halo of light which surrounds the head of a sacred personage. If it envelop the whole body, it is called an aureole; if the head and shoulders, a glory.—NIMBUS, in meteorology, designates the rain-cloud.

Nîmes [anc. *Nemausus*], city of France, capital of the department of Gard, beautifully situated in a valley between hills covered with vineyards and orchards, is the seat of a bishop, has many excellent educational institutions, and its manufactures of cottons, lace, vinegar, brandy, and especially of silks, belong to the most important in France, and employ about 10,000 persons. The old portion of the city is poorly built, but in the three modern suburbs, which form the larger part of the town, there are several elegant quarters and beautiful promenades, and the architectural monuments which the city contains from the Roman period are of the highest interest. The Maison Carrée is a beautiful Corinthian temple, well preserved, thoroughly restored since 1789, and now used as a museum of paintings and antiquities. Les Arènes is the best preserved amphitheatre which exists, containing from thirty-two to thirty-five ranges of seats. In the early Middle Ages it was employed repeatedly as a stronghold; afterwards poor people used it as a sort of free tenement-house. When in 1809 it was cleared by order of the magistrates it was found to contain about 2000 inhabitants. Since 1858 it has been completely restored. Pont du Gard, the magnificent aqueduct, is in the vicinity of Nimes. The Romans occupied the city in 121 B. C., and during the first emperors it was a magnificent city. Subsequently it suffered much from the Visigoths, Saracens, and Normans, and in the fourteenth century it was nearly deserted. Under Francis I. it rose again, and although it suffered much by the Revocation of the Edict of Nantes and during the Revolution, it is now very prosperous. Pop. in 1881, 63,562.

Nim'rod, a son of Cush, a grandson of Ham, was "a mighty hunter before the Lord" (Gen. x. 8–12), and soon became a "mighty one in the earth." He founded an empire in Shinar, whose principal towns were Babel, Erech, Accad, and Calneh, and extended this empire along the Tigris over Assyria, where he built the towns of Nineveh, Rehoboth, Calah, and Resen. Although these events from the biblical record correspond with the salient points in the earliest stages of the Babylonian empire, it has as yet not been possible to identify Nimrod with any person known to us either from inscriptions or from classical writers. On the other side, however, the discrepancies are not so great as to make a reconciliation seem impossible. The most probable derivation of the name is that from *Nin Rod*, "Ninus the hunter," which would identify Nimrod with Ninus, the spouse of Semiramis. As a grandson of Ham he inherited all the hatred of the family and its passion for opposition. An old tradition tells us that he shot with arrows toward the sky when it thundered, as if he wanted to emulate the Thunderer himself. But the most conspicuous proof of his audacity was the building of the tower of Babel, that true prototype of the Egyptian pyramids, such as shown by its ruins at Birs Nimrud. But then came the judgment, and the family was driven out of the country. The tower was destroyed by lightning; tongues were confounded, so that people did not understand one another, and the Hamites were scattered in all directions. Only a small remnant remained in the country; these amalgamated with the advancing Shemites, the Cashdim, and formed the Chaldæan population. (For further details, see the article BABYLON.)

Nimroud, the modern Arabic name of the site of an ancient Assyrian city on the E. bank of the Tigris, about 20 miles below Mosul. The ruins of Nimroud are situated on the fork formed by the junction of the Zab with the Tigris, and consist of the remains of a city about 5 miles in circumference. The principal ruins lay at the S. W. of the city, on the palace platform, which is about 600 yards from N. to S. and 400 yards from E. to W. Here are situated the sites of the various palaces and temples of the city and the ruins of the ziggurrat or tower, now forming a cone 140 feet high. The whole city was enclosed by a wall with towers at intervals and gates; remains of these defences lie round nearly all the city. Excavations were made at Nimroud by Mr. Layard, Mr. Hormuzd Rassam, Mr. Loftus, and Mr. George Smith. These excavations revealed the existence of the following buildings: (1) A tower on the N. W. corner of the mound, faced with stone to the height of 20 feet, 167 feet 6 inches each way, built by Shalmaneser II. (B. C. 860–825). (2) Temples round the tower built by Assur-nazir-pal (B. C. 885–860). (3) The N. W. palace (S. of the tower), about 350 feet square, built by Assur-nazir-pal, repaired by Sargon (B. C. 722–705). (4) The centre palace (S. of the N. W. palace), built by Shalmaneser II. (B. C. 860–825), added to by Vul-nirari III. (B. C. 812–783), dismantled by Tiglath-Pileser II. (B. C. 745–727), who rebuilt it; destroyed by Esarhaddon (B. C. 681–668). (5) The S. W. palace (S. of the centre palace), built by Esarhaddon (B. C. 681–668) out of materials of the N. W. and centre palaces. (6) The S. E. palace (E. of the S. W. palace), built by Shalmaneser II. (B. C. 860–825). (7) Temple of Nebo (N. of the S. E. palace), built by Vul-nirari III. (B. C. 812–783), restored by Assur-ebil-ili (B. C. 625). These ruins represent the Assyrian city of Calah, mentioned in Gen. x.

According to the Assyrian inscriptions, the city was founded by Shalmaneser I. (B. C. 1320), but afterwards fell into decay, and was destroyed during subsequent troubles in Assyria. Assur-nazir-pal, king of Assyria, on ascending the throne (B. C. 885), resolved to rebuild the site and make it one of his capitals; from the time he commenced this work the city became the principal residence of the Assyrian kings, and retained this position about 170 years. Assur-nazir-pal made many successful wars against the Zamua S. E. of Assyria, Nairi on the upper Tigris, the Suhi (or Shuites) on the Khabour, and across the Euphrates to Lebanon, the Orontes, and the Mediterranean. Captives from the conquered countries were settled in Calah.

On the death of Assur-nazir-pal, his son, Shalmaneser II., succeeded (B. C. 860). He conquered the region of the Euphrates, and advancing into Syria (B. C. 854), met a confederacy of Syrian kings at Aroer on the Orontes. Among these monarchs were Ben-hadad of Damascus, Irhulena of Hamath, Ahab of Israel, and Baasha son of Rehob, of the Ammonites. These kings were defeated by the Assyrians. In B. C. 852–851, Shalmaneser took part in a civil war in Babylonia between two claimants for the crown; he defeated and killed one of these, and then took tribute from the Chaldeans. In B. C. 850, 849, and 846 he again defeated Ben-hadad. In B. C. 852 he attacked Hazael of Damascus, defeated him at Shenir in Lebanon, and besieged him in Damascus, afterwards taking tribute from Tyre, Zidon, and Jehu, son of Omri (supposed to be Jehu, king of Israel). In B. C. 839 he again attacked Hazael, and in B. C. 836 he warred with the Medes and Persians. Shalmaneser II. resided at Calah, and late in his reign (about B. C. 828) the cities of Nineveh and Assur, jealous of the rise of Calah, headed a revolt to set his son, Assur-dain-pal, on the throne. The revolt was suppressed by Samsi-vul, another son of Shalmaneser, who ascended the throne B. C. 825. He restored the Assyrian boundaries, and made expeditions against Media, Nairi, and Babylonia. Vul-nirari III., son of Samsi-vul IV., reigned B. C. 812; he made great conquests, and entered the city of Damascus in triumph, receiving tribute from all Palestine except Judah. In this reign the governor of Calah dedicated some statues to Nebo, giving Sammuramat (Semiramis) as the name of Vul-nirari's queen. Shalmaneser III. (B. C. 783) was engaged in wars with the Armenians. Assur-dan III. (B. C. 773) made few expeditions; in his time happened a great solar eclipse (B. C. 763). Under Assur-nirari II. (B. C. 755) the empire declined, and a revolt took place at Calah B. C. 746, after which Tiglath-Pileser ascended the throne (B. C. 745). In B. C. 745 he conquered part of Babylonia; in B. C. 744 he invaded Media and Persia; in B. C. 743 he defeated Saduri, king of Armenia, and then invaded Syria to B. C. 740; in B. C. 738 he invaded Hamath and defeated Azariah of Judah, taking tribute from Hiram of Tyre, Rezin of Damascus, and Menahem of Samaria; in B. C. 737 he invaded a second time Media and Persia; in B. C. 736, 735 he ravaged the northern nations, including Armenia, as far as Lake Van; in B. C. 736 he was called into Syria against a coalition headed by Rezin of Damascus (this was probably the war to assist Ahaz, king of Judah; see 2 Kings xvi.); he subdued various Philistine princes, defeated Rezin, and besieged him in Damascus, which city he captured B. C. 732. Next year he attacked Babylonia, subduing most of it, and unsuccessfully besieging Sapiya, the capital of the Chaldean king, Kinziru. In B. C. 729, 728 he engaged in great solemnities at Babylon. Among his later tributaries he counts Yahuhazi (Ahaz) of Judah, Hoshea of Samaria, Matgenus of Tyre, the kings of Gaza, Askelon, Ekron, Ashdod, Moab, Ammon, and Edom, and Samsi, queen of Arabia. Tiglath-Pileser died B. C. 727, and was succeeded by Shalmaneser IV. (B. C. 727–722), who was engaged in suppressing revolts in Palestine, and late in his reign laid siege to Samaria, which was taken by his successor, Sargon (B. C. 722). (See NINEVEH.) The seat of empire was now removed from Calah, and, although Esarhaddon built a palace here, it never again became the capital. The city was destroyed at the final conquest of Assyria by the Medes and Babylonians, but continued to exist as a village until recent times.*

GEORGE SMITH.

Nine-Pins, or **Ten-Pins,** a game called **Skittles** in Great Britain. It is played in a covered alley, called a skittle-ground or bowling-alley. Nine or ten wooden pins or skittles are set up at one end of the alley, and the player bowls at them with a ball of lignum-vitæ, standing fifty or sixty feet distant. Success in the game requires the knocking down of all the pins in one or more throws. The rules vary in different places. As skill in bowling does not depend simply upon the physical strength of the arm, it is in all countries where it is known considered a fine sport, besides being a very healthy exercise.

Nines, Properties of. The number 9 possesses some remarkable properties, one of which, and perhaps the most important one, we shall proceed to explain. If any number is divided by 9, the resulting remainder is called the excess of 9's; if the quotient is rejected, the remainder alone being retained, the operation is called casting out the 9's. A number expressed by 1, followed by any number of 0's, may be written—

$$100 \ldots 00 = 99 \ldots 99 + 1. \qquad (1)$$

If we multiply both members of (1) by the numbers 2, 3, etc., up to 9, we have—

$$\left.\begin{array}{l} 200 \ldots 00 = 2 \times 99 \ldots 99 + 2 \\ 300 \ldots 00 = 3 \times 99 \ldots 99 + 3 \\ 800 \ldots 00 = 8 \times 99 \ldots 99 + 8 \\ 900 \ldots 00 = 9 \times 99 \ldots 99 + 9 \end{array}\right\} \qquad (2)$$

The second member of each equation of group (2) is composed of two terms, the first of which is exactly divisible by 9, and the second is consequently the excess of 9's of the first member, except in the last equation, in which the excess is 0; that is, the excess of 9's in a number expressed by a digit followed by any number of 0's is denoted by that digit. Now, any number, as 3425, may be written under the form—

$$3000 + 400 + 20 + 5 = 3 \times 999 + 4 \times 99 + 2 \times 9 + 3 + 4 + 2 + 5,$$
$$\text{or} \qquad 3425 = 9 \times (333 + 44 + 2) + 3 + 4 + 2 + 5.$$

Since the first term of the second member is divisible by 9, the excess of 9's in the given number is equal to the excess of 9's in the sum of its digits. This principle, which is perfectly general, is the basis of several practical rules sometimes used in arithmetic for testing the accuracy of operations in addition, subtraction, multiplication, and division. (For the methods of applying the principle the reader is referred to Davies's *University Arithmetic*, pp. 37, 46, 59, and 72.)

W. G. PECK.

Ninet (JEAN). See APPENDIX.

Nin'eveh, the greatest city in Assyria, and for some time the capital of the country, was situated on the eastern bank of the Tigris at its junction with the stream of the Khosr. It is now represented by the mounds of Kouyunjik or Telarmush, Nebbi Yunas, and some surrounding remains. The circuit of the walls measures about 8 miles; on the side next the Tigris, opposite the modern town of Mosul, stand the palace-mounds, the principal of which is Kouyunjik. Excavations were made here by M. Botta, Mr. Layard, Mr. Hormuzd Rassam, Mr. Loftus, and Mr. George Smith. These operations brought to light the following buildings: (1) Three ruined temples, built and restored by many kings in different ages. (2) A palace founded by Shalmaneser I. (B. C. 1320), restored by several subsequent monarchs, destroyed by Sennacherib. (3) A palace founded by Vul-nirari III. (B. C. 812–783), restored by Sennacherib and Esarhaddon. (4) A palace built by Tiglath-Pileser II. (B. C. 745–727). (5) Temple of Nebo and Merodach, restored by Sargon (B. C. 722–705). (6) The S. W. palace, built by Sennacherib (B. C. 705–681). (7) The N. palace, built by Sennacherib, restored by Assur-bani-pal (B. C. 668–626). (8) The city walls, built by Sennacherib, restored by Assur-bani-pal.

Nineveh was one of the most ancient cities in Assyria, and was an important place in the nineteenth century B. C. According to Greek writers, Nineveh was founded by Ninus, whom they represent as the first king of Assyria. Nothing has been discovered of Ninus in the inscriptions; Samsi-vul was the first Assyrian monarch known to have built at Nineveh; he restored the temple of Ishtar. This temple was again restored by Assur-ubalid (B. C. 1400), a celebrated sovereign who gave his daughter in marriage to the king of Babylon. The Babylonians, disliking this alliance, killed Kara-hardas, grandson of Assur-ubalid, and set up Nazi-bugas as king. Bel-nirari, king of Assyria B. C. 1380, defeated the Babylonians and placed Kuri-galzu on the throne. Budil (B. C. 1360) conquered several tribes round Assyria. Vul-nirari I. (B. C. 1340) defeated the Babylonians and conquered the region of the Khabour. Shalmaneser I. (B. C. 1320) again restored the temple of Ishtar at Nineveh; he also built a palace there, and made Nineveh the capital of the empire. Shalmaneser conquered Nairi as far as the sources of the Tigris, and founded Calah, about 18 miles S. of Nineveh. Tugulti-ninip I. (B. C. 1300) made additions to the temple of Nineveh; he conquered Babylonia and added it to his empire. Bel-kudur-uzur (B. C. 1270) was killed in battle by the king of Babylon. Ninip-pal-uzur (B. C. 1240) repulsed the Babylonians and restored the empire. Assur-dan I. (B. C. 1210) invaded Babylonia. Mutaggil-nusku (B. C. 1180) restored the palace at Nineveh. Assur-risilim (B. C. 1150) defeated two attacks made by the king of Babylon; he restored the temple of Ishtar and rebuilt the palace at Nineveh. Tiglath-Pileser I. (B. C. 1120) carried the Assyrian arms from Babylon to the Mediterranean; he defeated Merodach-nadin-ahi, king of Babylon. Assur-bel-kala (B. C. 1100) made a treaty with the king of Babylon, but on a revolution taking place afterwards invaded that country. Samsi-vul III. (B. C. 1080) restored the temple of Ishtar at Nineveh. Assur-rabu-ibdir (B. C. 1000) was defeated by the Syrians and lost all the western provinces. Assur-dan II. (B. C. 940) restored the empire. With Vul-nirari II. (B. C. 913) commences the Assyrian official yearly chronology, called the "Eponym canon." Tugulti-ninip II. (B. C. 891) conquered the region at the head-waters of the Tigris; his son, Assur-nazir-pal (B. C. 885), removed the capital to Calah. (See NIMROUD.) Sargon, who reigned B. C. 722–705, recommenced the adorning of Nineveh at the beginning of his reign; he besieged and captured Samaria, carrying the Israelites into captivity. In B. C. 721 he defeated Humba-nigas, king of Elam, and Merodach Baladan of Babylon; in B. C. 720 he conquered Hamath, and defeated Sevechus, king of Egypt; in B. C. 717 he put an end to the Hittite kingdom of Carchemesh; in B. C. 719–718 and 716–712 he was engaged in long wars with Ursa of Armenia and various Median and northern kings; in B. C. 711 he suppressed the revolt of the Philistines, Jews, Edomites, and Moabites; in B. C. 710 he defeated Merodach Baladan of Babylon and Lutruk-nanhundi of Elam, conquering Babylonia. Through most of his reign he was building a new city called Dur-Sargina (now Khorsabad), N. E. of Nineveh. On the death of Sargon, his son Sennacherib succeeded (B. C. 705–681); he raised Nineveh to the highest pitch of splendor. In B. C. 704 he reconquered Babylon; in B. C. 702 he invaded Media; in B. C. 701 he attacked Lulia of Zidon, deposed him, marched along the coast of the Mediterranean, subdued the Philistines, defeated the Ethiopians and Egyptians, and overran Judah. Hezekiah, king of Judah, then submitted and gave tribute. In B. C. 700 he again subdued Babylonia, setting on the throne his son, Assur-nadin-sum. Subsequently he attacked Asia Minor, Elam, and Babylon, which he destroyed. Sennacherib was murdered by two of his sons B. C. 681, and after a civil war Esarhaddon ascended the throne; he rebuilt Babylon, subdued the Chaldeans, destroyed Zidon, defeated the Medes, and in B. C. 672 attacked Tirhakah, king of Ethiopia and Egypt, conquering all Egypt up to Thebes. Subsequently, Tirhakah regained Egypt, and Esarhaddon having associated his son, Assur-bani-pal, on the throne, died B. C. 668. Assur-bani-pal expelled Tirhakah from Egypt, restoring the twenty district kings appointed by his father. Egypt being again lost, he made a second expedition, and defeated and expelled Undamane, nephew of Tirhakah and son of Sabaco. He reduced Tyre by blockade, and took tribute from Gyges of Lydia and the rulers of Tubal, Cilicia, and other places in Asia Minor. Later, he defeated the king of Minni, and afterwards engaged in a long war with the Elamites. His brother, Saulmugina, king of Babylon, revolting and being supported by Elam, Syria, and Arabia, he conquered Babylon B. C. 648, wasted Elam, and invaded Arabia. Assur-bani-pal was the Sardanapalus of the Greeks; the most splendid sculptures and works of art at Nineveh were executed during his reign; he died B. C. 626. Two or three obscure monarchs followed—Bel-zakir-iskun, Assur-ebil-ili, and perhaps Esarhaddon II., the Saracus of the Greeks, in whose time a coalition was made against Assyria by the Medes under Cyaxares, the Babylonians under Nabopolassar, and the Egyptians under Necho. The Medes and Babylonians besieged Nineveh for two years, when a great inundation of the Tigris carried away part of the wall and the enemy marched in through the breach. The king of Nineveh in despair set fire to his palace and perished in the flames. The Assyrian empire was now destroyed, and Nineveh became a cluster of small villages, which dwindled until the place was ruined. GEORGE SMITH.

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* See *Ancient History from the Monuments—Assyria*, by George Smith, of the department of Oriental antiquities, British Museum.

Ningpo, city of China, in the province of Chi-Kiang, situated in lat. 29° 51′ N., lon. 121° 32′ E., on the Ningpo River, 12 miles from its mouth, in an exceedingly fertile and densely-peopled plain. It is surrounded with a wall nearly 6 miles in circumference and 25 feet high, is generally well built, and contains many handsome public buildings and temples, among which is a hexagonal tower of seven stories and 160 feet high, built of brick and provided with an interior spiral flight of steps leading to the summit. The manufactures of silk, cotton, woollens, and salt are extensive, and the traffic with the interior considerable; but, although Ningpo was one of the five ports opened to foreigners by the treaty of Aug. 26, 1842, the importations are inconsiderable, owing to the proximity of Shanghai. Both Protestants and Roman Catholics have mission-stations here which succeed very well. A missionary hospital was founded at Ningpo in 1843, and persons of all classes, not only from the city, but also from the surrounding country, resort to it for surgical assistance. Pop. about 500,000.

Ninigret, an Indian chieftain of the Narragansett tribe, sachem of Niantic and uncle of Miantonomoh, was neutral during the Pequot war of 1632, but aided the colonists in that of 1637. Having afterwards visited the Dutch at Manhattan and the Western Indians, he was suspected of plotting against the colonists, and war was declared against him by the commissioners of the united colonies 1653, but it was not immediately carried into effect. Meanwhile, Ninigret waged war upon the Indians of Long Island, and having refused to obey a summons to Hartford in 1654, Major Simon Willard was sent against him, and he was forced to flee. In 1660–62 he sold a large portion of his territory to the colonists, abstained from participation in King Philip's war 1675–76, and d. soon afterwards.

Ni'ño (PEDRO ALONZO), known as EL NEGRO ("the black"), b. in Andalusia, Spain, in 1468; a distinguished navigator, companion of Columbus in his third voyage, and afterwards conducted explorations of the coasts of South America. His voyage, however, was not originally undertaken for any scientific purpose, but simply for gain; and the more precise knowledge of the northern coast of South America which was derived from his trips was merely incidental. He brought back with him immense riches of gold and pearls, much of which was confiscated by the government. D. about 1505.

Ninon de l'Enclos. See L'ENCLOS.

Ni'obe [Νιόβη], in the old Greek legend, was the mother of six sons and six daughters. Feeling a sense of triumph over Leto, who had but two children, Apollo and Artemis, the gods slew all her offspring, and she was transformed by grief into a stone. Her myth is told in many ways, and is the subject of a celebrated group discovered at Rome in 1583, and now at Florence in the Uffizi Gallery. Some of the figures are extremely fine. The work as it now exists is considered a copy of an original by Scopas, or perhaps by Praxiteles, which once stood in the temple of Apollo Sosianus at Rome.

Niobra'ra, a missionary diocese of the Protestant Episcopal Church, bounded E. by the Missouri River, S. by the line between Dakota and Nebraska, W. by the 104th meridian of longitude, and N. by the 46th degree of N. lat. The episcopal residence is at Yankton Agency, Dak. Its first bishop, Dr. W. H. Hare, was consecrated 1873.

Niobrara, cap. of Knox co., Neb. (see map of Nebraska, ref. 8–F, for location of county), near the junction of the Missouri and Niobrara rivers, 40 miles S. W. of Yankton, Dak., has an academy, a grist and a saw mill, and a U. S. land-office. Principal employment, farming and stock-raising. Pop. in 1880, 475; in 1885, 325.

Niobrara River, or **L'Eau qui Court,** a tributary of the Missouri, rises in Laramie co., Wy., and flows 450 miles to the E., through Northern Nebraska, in its lower course separating Dakota from Nebraska. It is a shallow and very rapid stream. Its upper valley is treeless pasture-land. It next traverses the Great Sandhill region, believed to be almost valueless. It then flows through a rocky region with fertile, well-timbered ravines, and its lower valley is good farming land, with abundant trees.

Niort', cap. of the department of Deux-Sèvres, France, on the Sèvre-Niortaise, is a handsome town with beautiful promenades and many elegant buildings. Its tanneries, dyeworks, and manufactures of chamois, gloves, and shoes are important. The public gardens are very beautiful. Pop. in 1881, 22,254.

Nip'issings, an Algonkin tribe of Indians residing on the lake of the same name in Canada, engaged in the fur-trade with Cartier and the early French explorers, by whom they were regarded as sorcerers on account of their singular "feast of the dead" and the number of their "medicine-men," who, however, did not prevent the tribe from being nearly exterminated by diseases introduced by Europeans. They were driven by the Iroquois from their original seats to the region N. of Lake Superior, and were there visited by French missionaries. They subsequently returned eastward, and joined the Iroquois and Algonkins gathered by the Sulpician Fathers at the Lake of the Two Mountains, where the three united bands numbered 515 in 1873.

Nipon', or **Niphon',** the largest of the Japan Islands, bounded by the Japan Sea and the Pacific Ocean, and separated N. from Yesso by the Strait of Matsumai, and S. from Kiusiu by the Sea of Suonada. It is 900 miles long, its greatest breadth is 284 miles, and its area is estimated at 42,000 square miles. It is high, mountainous, with deeply-indented coasts, but very little known to Europeans. It contains the famous volcano Foosee (which see), and earthquakes are almost daily occurrences. Principal towns, Yedo and Miako. The Japanese themselves call the island Hondo; the European designation Nipon originated by a mistake. (See Japan.)

Nirvâ'na [Sansk. *nir*, "out," and *vâna*, "blown," literally meaning "extinction"], is the term employed by the Booddhist philosophers to signify the highest good attainable by mortals. Though usually regarded as synonymous with "annihilation," it is probable that the "extinction" proposed by Sakya Muni to his followers as the goal of their aspirations was not an absolute extinction of being, but a release from the "law of continual births" imprisoning all sentient beings, from the highest divinity to the lowest animalcule, in a circle of transmigrations, which is held to be the great evil of existence, and which can only be broken through by patient striving through many recurrent phases of being. Undoubtedly, certain schools of philosophy corrupted this doctrine into a teaching of positive annihilation as the supreme good, but many considerations concur to prove that such was not the doctrine of the founder of Booddhism nor of any of his authorized successors. The question of the real meaning of Nirvâna has been closely examined and critically discussed by many recent Orientalists, and the balance of authority has been inclined in favor of the view above stated.

Nisard' (Jean Marie Napoléon Désiré), b. at Chatillon, in the department of Côte-d'Or, France, Mar. 20, 1806; became in 1826 a contributor to the *Journal des Débats*, and after the revolution of July, 1830, to the *National*, whose department of literary criticism he edited. In 1835 he was made professor at the Normal School of Paris, and in 1844 at the Collége de France, and he held, besides, various government offices up to the revolution of Feb., 1848. After the *coup d'état* in 1852 he received various high positions in the department of public education, and in the same year he succeeded Villemain at the Sorbonne. His principal works are—*Les Poëtes latins de la Décadence* (1834), *Histoire de la Littérature française* (4 vols., 1844–61), two collections of *Études* (1858 and 1859, etc.), in which he defends the literary standpoint and artistic taste of the classical period of the French literature, and attacks the romantic school (*littérature facile*). He is a man of comprehensive knowledge, exquisite taste in details, and elegant style.

Nis'bet (Charles), D. D., b. at Haddington, Scotland, Jan. 21, 1736; graduated at Edinburgh University 1754; was for many years a distinguished clergyman at Montrose; came to the U. S. in 1785 as president of Dickinson College, Pa., and lectured at the same time on logic, mental philosophy, belles-lettres, and systematic theology. D. at Carlisle, Pa., Jan. 18, 1804. Dr. Nisbet was a man of excellent education and keen wit. His *Posthumous Works* were published in 1806, his *Memoirs* by Dr. Miller in 1840.

Nisbet (Eugenius Aristides), LL.D., b. near Union Point, Green co., Ga., Dec. 7, 1803; graduated in 1821 at the University of Georgia in Athens; studied law; was admitted to the bar before he was twenty-one years old, and represented his county in the house and senate of the State legislature for several years; from 1838 to 1841 was a member of the Federal Congress; in 1845 was appointed justice of the supreme court of the State. In politics was a strict constructionist, but supported Harrison in 1840 and Clay in 1844. In 1855 was a leader of the American party, and in 1860 supported the Bell-Everett ticket; in 1861 was a member of the State secession convention, of the Confederate provisional congress, and after the suspension of the writ of *habeas corpus* in the Confederate States was appointed commissioner under that act. In 1839 moved his residence to Macon, and here d. Mar. 18, 1871. A. H. Stephens.

Nisce'mi [anc. *Nixemum*], town of Sicily, province of Caltanissetta, pleasantly situated in a very fertile district, about 11 miles from the Tyrrhene Sea. Its old walls have been destroyed by successive assaults of Arabs, Normans, and Turks, but remains of ancient dwellings exist. Pop. 10,750.

Nishapoor', town of Persia, province of Khorassan, on the Seka, is a large city surrounded with walls and ditches, but poorly built and partly in ruins. The surrounding plain, however, situated at an elevation of 2500 feet, is densely peopled and well cultivated. Pop. of the town, about 8000.

Nisibis, a city of Mesopotamia, in the present vilayet of Diarbekir, is now in ruins, but in ancient times was of great importance both as a commercial place and as a military station. Especially during the wars between Rome, Armenia, Parthia, and Persia it was conspicuous.

Ni'si Pri'us [Lat., "unless before"], a term used in law to denote the trial of issues of fact in civil cases before a judge and jury. The rulings and opinions rendered by the judge in trials of this kind are termed *nisi-prius* decisions, in distinction from the decisions rendered in the determination of issues of law by the court sitting *in banco*, or in full bench, for the hearing of appeals. (See Courts.) The origin of this peculiar technical phrase is as follows: By the ancient English practice actions of various kinds were tried only in the superior courts sitting at Westminster, and it was therefore necessary for parties and counsel to resort thither from all parts of the realm to attend to the hearing of the causes in which they were interested. In order to remedy this inconvenience, it was provided by Magna Charta that actions of certain kinds should be triable in the county where the cause of action arose, before justices to be sent into each county once a year. Subsequently, this system of local trial was extended to other actions, till it became the uniform practice to try all common-law actions (as distinguished from suits in courts of equity) in the first instance before a judge and jury in the county where the cause of action arose. But the action was still nominally instituted, as before, in the superior court, and the jury were summoned by writ to appear there, "unless before" (*nisi prius*) the day appointed the justices came into the proper county to hold a session of court. These important Latin words in the writ then became a convenient designation for the system of trial. The phrase is also commonly employed in the U. S. to denote a similar mode of trial, though in some States the expression "trial at circuit" is used with synonymous meaning. *Nisi-prius* decisions are more commonly reported in England than in this country. As they are often rendered on the spur of the moment, and therefore without deliberate reflection, they are not generally deemed to have as high value and authority as decisions rendered by an appellate court. Their weight and importance of course vary greatly with the ability and reputation of the presiding judge. The most valuable English *nisi-prius* reports are those of Peake, Espinasse, Campbell, Carrington and Payne, and Foster and Finlason. There are also various treatises on nisi-prius law, as, *e. g.*, those of Archbold, Selwyn, Stephens, etc. George Chase. Revised by T. W. Dwight.

Nis'sa, or **Nish** (anc. *Naissus*), city of European Turkey, on the Nissava, an affluent of the Morava, 70 miles S. W. of Widdin, is fortified, contains 11 mosques, carries on a brisk trade in agricultural produce, and is celebrated for its hot mineral springs and as the birthplace of Constantine the Great. Pop. 16,000, of whom 6000 are Mussulmans.

Nithisdale (William **Maxwell**), Earl of, b. in Scotland about 1670; succeeded to the title 1685; married Lady Winifred Herbert, daughter of the earl of Powis; took part in the rebellion headed by the earl of Mar 1715; fell into the hands of the government at Preston: was committed to the Tower of London, and condemned to death; escaped from the Tower disguised in the clothes of the countess, who paid him a visit and remained in his stead; took refuge with the Venetian ambassador, and made his way to the Continent. D. at Rome in 1744. The countess d. in 1749.

Nitrate of Silver. See Nitric Acid.

Nitrates. See Nitric Acid; also Nitre.

Ni'tre [synonyms, *niter*, *saltpetre*, *nitrate of potash*; Gr. *νίτρον*, which, however, means, properly, carbonate of soda, whence *natron*; the Latin *nitrum* was used by Pliny to designate true saltpetre]. The word *saltpetre* means "salt of stone," and was doubtless derived from the fact that it sometimes forms an efflorescence on porous stones containing alkaline matters which are exposed to the agency of decomposing nitrogeniferous organic matters like urine, etc. (For nitre see *Nitrates*, under Nitric Acid.)

Henry Wurtz.

Ni′tric Acid [Fr. *acide nitrique, acide azotique;* Ger. *Salpetersäure;* synonym, *aqua fortis*]. The name is derived from *nitre,* the material whence it is obtained. Nitric acid, known to chemists of the present day as *nitric hydrate,* is a compound with water of a certain oxide of nitrogen, containing the maximum proportion of oxygen, and called *nitric anhydride,* N_2O_5. This substance was discovered in 1849 by H. St. Claire Deville, who produced it by the action of chlorine upon dry nitrate of silver:

$$Ag_2O,N_2O_5 + Cl_2 = N_2O_5 + 2AgCl + O.$$

It is crystalline, colorless, and quite unstable, so that it cannot be preserved. It sometimes explodes of its own accord. Common nitric acid, the hydrate (H_2O,N_2O_5), is stated by some to have been known to the Arabian chemists even anterior to the days of mediæval alchemy. Other historians, however, ascribe its discovery to the alchemist Raymond Lully in the thirteenth century. Cavendish first analyzed it in 1784. The alchemists appear to have procured it by the rude method of distilling saltpetre with clay at a temperature above the fusing-point of the saltpetre, the action being a formation of aluminate of potash and the evolution of a red fuming nitric acid, highly charged with nitrous acid. To Glauber is attributed the highly-important invention of our present method of making nitric acid by distilling saltpetre with sulphuric acid. Instead of common saltpetre, at the present day the so-called "Chili saltpetre" (nitrate of soda) is generally employed, being both cheaper and much richer in nitric acid than the nitrate of potash. Nitric acid, although made up of the most common and universally-diffused substances, the nitrogen, oxygen, and water of the air, is not, strictly speaking, as yet a product of human art. The nitrates found in nature, its only sources, are engendered by processes which, so far from being imitated by man, are not yet clearly understood, and remain still, in the present state of chemical science, subjects of investigation and of controversy. No practicable mode of obtaining nitric acid from its elements, which are literally as free as air, has yet been discovered or is even hinted at up to this day. (For the occurrence of nitric acid as *nitrates* in nature, see below; also under Nitre.) In decomposing nitrate of potash by distillation with sulphuric acid in earthenware or iron retorts it is found advantageous to use enough of the latter to form *bisulphate* of potash, it being thus possible to obtain the whole of the nitric acid at so low a temperature that little or none of it is decomposed into nitrous acid and free oxygen. More acid, of a lighter color and better quality, thus results. The reaction is as follows:

$$K_2O,N_2O_5 + 2(H_2O,SO_3) = H_2O,N_2O_5 + H_2O,K_2O,2SO_3.$$

When pure saltpetre is employed, pure nitric acid may thus be made fit for all uses. With Chili saltpetre, however, the complete decomposition takes place at a lower temperature, and hence but half the sulphuric acid is needed. Hence another reason for the employment of the sodic nitrate. As this, however, is liable to be contaminated with common salt, the nitric acid made from it will contain muriatic acid as an impurity, which unfits it for most chemical uses. The Chili saltpetre also contains *iodate of potash,* and the nitric acid made from it is hence contaminated with iodic acid. Pure nitric acid, fit for use in the laboratory, should be colorless, and after dilution with distilled water should give no opalescence with a solution of silver. It should always be kept in a dark closet, as light decomposes it, causing it to turn red from the formation of lower oxides of nitrogen. When as free as possible from water (containing, according to Carius, but 0.5 per cent.), its density, according to Kirwan, is 1.554. J. Kolb, however, obtained acid of a percentage 99.84 of nitric hydrate, and density = 1.559. When long boiled its density always reaches 1.443, a stronger acid growing weaker and a weaker acid stronger. This constitutes a definite hydrate, $H_2O,N_2O_5,3H_2O$, according to a determination of the present writer (confirming the old view, which Roscoe has controverted). The preceding figures are of recent and very careful determination by Kolb, as to the relations of density and composition in nitric acid. The figures here given are selected from a very much larger number.

Percentages of Pure Nitric Hydrate, corresponding to Densities given.

Densities, at melting ice.	Percentages.	Densities, at melting ice.	Percentages.
1.560	100.00	1.300	45.00
1.557	99.52	1.267	40.00
1.542	95.27	1.234	35.00
1.522	90.00	1.200	30.00
1.503	85.00	1.171	25.71
1.484	80.00	1.132	20.00
1.465	75.00	1.099	15.00
1.450	71.24	1.075	11.41
1.420	65.07	1.050	7.22
1.393	60.00	1.026	4.00
1.365	55.00	1.013	2.00
1.334	49.97		

Nitric hydrate, when strong, is a liquid intensely caustic and corrosive. It produces upon the skin, by the most transient contact, a bright yellow stain of the most indelible character, due to the formation of a curious and little-known compound called *xantho-proteic acid,* whose color is indestructible by any other known agent, short of actual solution or removal of the cuticle. Nitric acid is one of the most convenient and powerful agents of oxidation in the laboratory, having the power to oxidate many metallic sulphides, to dissolve silver, and to make, in admixture with muriatic acid, a liquid which will dissolve gold and platinum. When hot it destroys cellulose, sugar, starch, and other vegetable matters, with the formation chiefly, with some other minor products, of *oxalic acid.* When cold and concentrated, however, it acts upon cellulose to form nitro-cellulose or *gun-cotton,* and with glycerine it forms the still more valuable explosive *nitro-glycerine.* For preparing these explosive agents its energy is usually exalted by mixing with oil of vitriol, which, through its affinity for water, virtually concentrates the nitric acid to the condition of pure nitric hydrate.

Detection.—To detect nitric acid when present in considerable traces, probably the most convenient reagent is *sulphate of indigo,* which is bleached by it when hot. This test is somewhat delicate when used by tinging the liquid to be tested slightly, then adding suddenly a considerable volume of concentrated pure sulphuric acid. When present only in minute traces—as in an analysis of a natural water, for example—the nitric acid is first converted into ammonia and the Nessler test then applied. The water is first boiled with sodic carbonate to expel all ammonia already present, then digested at the ordinary temperature with pure caustic soda and shavings of metallic *aluminum,* which mixture reduces the N_2O_5 to $2NH_3$. The latter is then carefully distilled off and the Nessler test applied.

Nitrates.—The nitrates of *potash* (see Nitre), *soda, lime,* and *magnesia* occur as native minerals, that of soda being the most abundant and important. It is imported from Peru into North America and Europe in enormous quantities, being known by the misnomer of "Chili saltpetre." It is also called *cubic nitre.* Its locality is the province of Tarapaca in Peru. The country or table-land, which lies 3300 feet above the sea-level, has over some hundreds of square miles beds of this salt and of earthy deposits from which it is richly obtained by lixiviation. Its origin is still a matter of conjecture only. In other parts of the world the soil is found in many places to contain ordinary saltpetre and other nitrates in sufficient quantity to make its lixiviation profitable. Earth is found abundantly in some limestone caves, as in the Mammoth Cave in Kentucky, the Big Bone Cave in Tennessee, and multitudes of others, which yields on lixiviation nitrates, generally of lime. Few of the nitrates, except those of potash and soda, are of much practical importance. Nitrate of *silver,* or "*lunar caustic,*" is one of considerable value in the arts and in medicine; nitrate of *lead* is largely sold to dyers and calico-printers; nitrates of *baryta* and *strontia* are used in pyrotechny, nitrate of *bismuth* in medicine, and nitrate of *cobalt* in the laboratory. Henry Wurtz.

Ni′trite of Am′yl, an amber-colored, highly volatile liquid, smelling like ripe bananas, insoluble in water, but soluble in alcohol. It is obtained by the action of nitric acid on amylic alcohol or "fusel oil." Its formula is $C_5H_{11}NO_2$. Amyl nitrite was discovered in 1844, but was not used as a medicine till 1865, when it was brought to notice by Dr. B. W. Richardson of London. If two or three drops of amyl be poured on a handkerchief and the vapor inhaled, almost immediately the blood-vessels of the head, face, and neck are felt to throb rapidly and violently; the face becomes crimson and hot, and the head aches from the sensation of fulness. Simultaneously, there is felt an indescribable commotion within the chest, with a feeling of breathlessness and oppression, which the experimenter has no difficulty in referring to a violent and disorderly throbbing of the heart, of which he is painfully conscious. These effects come on within a few seconds after breathing the fumes of the amyl nitrite, and disappear entirely within a few minutes, unless an overdose be taken. Physiologically, the singular symptoms are largely referrible to paralysis of the unstriped muscular elements in many parts of the body. Hence, in spasmodic affections of these parts this substance has lately been tried medicinally, and as experience has proved, with the greatest benefit. In an-

gina pectoris, or "breast-pang," and in spasmodic asthma it often relieves with a suddenness and completeness almost magical. It is given by inhalation or internally.

EDWARD CURTIS.

Nitrites. See NITROUS ACID AND NITRITES.

Ni′tro-ben′zol, Nitro-benzene, or **Essence of Mirbane** ($C_6H_5NO_2$); discovered in 1834 by Mitscherlich; produced by treating benzol with strong nitric acid. On mixing the two liquids, they become warm, assume a brown color, and soon emit red fumes and boil. The color becomes finally orange. On adding water the nitro-benzol separates and settles to the bottom of the vessel. A mixture of sulphuric acid and nitrate of soda is preferred to nitric acid: $C_6H_6 + HNO_3 = C_6H_5NO_2 + H_2O$. The nitro-benzol is washed with water, a trace of free acid neutralized by a very dilute solution of soda, unchanged benzol distilled off by steam, and the liquid freed from moisture, which makes it turbid, by filtration over dry powdered chloride of sodium (common salt). It appears as a heavy yellow liquid, smelling like bitter almonds, whence it is often called improperly artificial oil of bitter almonds. It is extensively used as a perfume for soap. Its chief importance is due, however, to the fact that it is converted by reducing agents into aniline: $C_6H_5NO_2 + H_6 = C_6H_7N + 2H_2O$. (See ANILINE, ANILINE COLORS, and BENZOL; also *Am. Chemist*, i. 83.)

C. F. CHANDLER.

Ni′tro-cel′lulose, a general term for the product resulting from the treatment of cellulose, as cotton, wood-fibre, etc., with a mixture of strong nitric and sulphuric acids, whereby one or more atoms of hydrogen are replaced by an equal number of molecules of nitryl (NO_2). Several varieties are known. Hadow (*Chem. Soc. Qu. Jour.* vii. 201) gives the formulæ of three as follows:

$C_{18}H_{21}(NO_2)_9O_{15}$ or $C_6H_7(NO_2)_3O_5$,
$C_{18}H_{22}(NO_2)_8O_{15}$,
$C_{18}H_{23}(NO_2)_7O_{15}$, Gladstone's cotton xyloïdin.

The first is called trinitro-cellulose, and is chiefly used as an explosive. The gun-cotton for photographers' collodion consists of mixtures of the last two. (See articles COLLODION and PYROXYLINE; also EXPLOSIVES, by H. L. ABBOT, U. S. A.)

E. WALLER.

Ni′trogen [Gr. νίτρον, "nitre," and γεννάειν, to "engender." Synonyms, *azote*, a French name conferred by Lavoisier, derived from the Greek α priv. and ζωή, "life," because it is destitute of life-sustaining power when breathed; Ger. *Stickstoff*, "suffocating matter," a name similar in origin to *azote*]. This is one of the elements of matter, forming four-fifths, or, more closely, from 79.1 to 79.2 per cent., by volume, of the atmosphere or aërosphere of the earth. It is also found, in small but essential proportion, in the bodies of all living beings, animals and plants, and hence in all their remains, and in those constituents of the solid earth which are formed from their remains, such as *coal* and other apozoic mineral matter. In the earth and waters it occurs also, though in relatively very minute proportion, in the forms of nitrates and of ammonia.

Before 1772 air was considered homogeneous and elementary, being convertible by continued respiration wholly into *carbonic acid*, then called "fixed air" and by several other names. At that date, however—which was two years previous to the discovery of oxygen by Priestley—the English chemist Rutherford discovered that after separating from air that had been repeatedly breathed all its carbonic acid, a peculiar irrespirable gas was left. Hence, this chemist is recorded as the *discoverer of nitrogen*.

Preparation.—Nitrogen gas, nearly pure, may be prepared by separating from atmospheric air its other constituents, which are oxygen, carbonic acid, and water. Oxygen, constituting a little over one-fifth of the volume, is the largest, and of course the most troublesome, constituent to remove. By passing air over some metals at incandescence the oxygen may be abstracted. On a small scale, metallic *copper* in wire or turnings is used, but *iron* may also be used, and is much cheaper, but may give nitrogen contaminated with carbonic oxide. Small remaining traces of oxygen, together with carbonic acid, which is always present, are most certainly removed by passing through a potash or soda ley to which has been added some *pyrogallol*. If the nitrogen is required to be anhydrous, oil of vitriol or chloride of calcium must also be employed to make it so. These modes of obtaining nitrogen from its most abundant source, the atmosphere, are, however, the most troublesome and expensive modes of all. It is much easier and cheaper to obtain it from a nitrite, *nitrite of potash* being generally used. This is mixed in solution with sal-ammoniac and boiled, when pure nitrogen gas comes off:

$$2NH_4Cl + K_2O,N_2O_3 = 2KCl + 4H_2O + N_4.$$

Nitrite of ammonia, when heated, breaks up entirely into pure nitrogen and water:

$$(NH_4)_2O,N_2O_3 = N_4 + 4H_2O;$$

but this salt is more expensive. Common *nitrate of ammonia*, heated dry with sal-ammoniac, gives a mixture of nitrogen and chlorine gases, the latter of which may be removed by a caustic alkali; but this process is not to be recommended. The method with nitrite of potash and sal-ammoniac is the best.

Nitrogen when pure is a gas, colorless, inodorous, and tasteless, of density = .97 (air = 1). It is dissolved by 5000 times its volume of ice-cold *water*, and by 800 times its volume of ice-cold *alcohol*. Chemically, nitrogen has an exceptional inertness towards most other substances; but some metals, as *titanium, tungsten*, and a few others, combine powerfully with it, even with combustion. By the electric spark it may be made to combine with oxygen directly to form nitric acid; and Bunsen found that when 100 volumes of air were mixed with 226 volumes of the explosive mixture (in the proportion to form water, 2 : 1) of hydrogen and oxygen, and the whole exploded, 11.5 per cent. of the air at once disappeared, combining to form nitrogen acids. During electric storms nitric acid is believed to be formed in the air in small proportion. Nitrogen and carbon may be made to combine directly to form *cyanogen*, by heat in the presence of an alkaline substance. Baryta performs this function best, and it has even been proposed to use this method for the manufacture of ammonia, which is easily obtained from the cyanide of barium.

In nature, the most important function of nitrogen is merely negative or passive, as a *diluent* of the oxygen of the air to make it fit to sustain life. This, however, is by no means an unimportant function, for it is now well known that the limits of oxygenation of the atmosphere in either direction, to fit the extremely delicate relations of air to animal blood, are surprisingly narrow, and that the smallest variations in this respect, such as will even tax our present analytical skill to determine with precision, are not without grave influences upon bodily health and comfort. Nitrogen performs, however, other functions in living nature of the greatest importance. The so-called "plastic" constituents of animal bodies, which form their solid tissues, including what are called the *proteids* (see article ALBUMINOIDS, by PROF. CHANDLER), also the important substance *gelatine*, and others, contain nitrogen as an essential element, this being so characteristic a fact that these bodies are often classed together as the *nitrogenous* constituents of living bodies. In plants they occur also, as well as in animals, but in the former they are not entitled to the term "plastic." These nitrogenous constituents of organic beings agree in the peculiarity of being truly *amorphous* (or, as it was termed by Graham, *colloid*) bodies, rarely, or possibly never, assuming a *crystalline* character. In this respect we may also class with them the plastic constituents of plant-life, cellulose, starch, etc., which are not nitrogenous, but which are also amorphous or colloid in their nature. Nitrogen combines with hydrogen to form the important gas ammonia, and with oxygen to form a series of oxides, of which NITRIC and NITROUS ACIDS are described by us under other heads. NITROUS OXIDE, also called "laughing-gas," is another familiar compound of oxygen and nitrogen. (See that head.)

HENRY WURTZ.

Nitro-glycerine ($C_3H_2(NO_2)_3(OH)_3$). See EXPLOSIVES.

Ni′tro-Muriat′ic Acid [syn. *aqua regia*: Fr. *eau régale*; Ger. *Königswasser, Goldscheidewasser, Salpetersalzsäure*]. This name is applied to the product of mixing together strong nitric and muriatic acids. The name *aqua regia*, "royal water," refers to the power of such mixture to dissolve gold, the "king of metals"—a power which neither of the acids possesses alone. Aqua regia fumes in the air, has a deep yellow or red color, and evolves two gaseous substances when heated, which were identified and analyzed by Gay-Lussac, and are known as chloro-nitrous oxide ($NOCl$) and chloro-nitric acid ($NOCl_2$). Chlorine gas also appears, at least at certain stages of the operation. It appears to be regarded as yet as undecided whether the agent which converts gold, platinum, and other metals of this group into chlorides, and thus dissolves them, is the free chlorine only or the chloro-nitric acid ($NOCl_2$). *Aqua regia* is highly valuable in the arts and in the laboratory in operations with gold and platinum. It is also used in the destruction of organic bodies in the wet way, as when a mineral poison is to be isolated from a stomach or other viscus in toxicological cases, though more powerful agents are sometimes substituted in this case. A somewhat cheaper substitute for the ordinary *aqua regia* may be made by dissolving nitrate of soda in strong muriatic acid. H. WURTZ.

Ni′tro-Pruss′ides, a peculiar class of compounds discovered by Dr. Lyon Playfair, as formed by the action of nitric acid upon the "prussiates" of potash, red and yellow. They are generally viewed, by the prevailing school of chemists, as derived from the ferridcyanides, the general formula of which is $R_3,FeCy_6$, by replacing molecules of RCy by molecules of N_2O_2, deutoxide of nitrogen, the latter being looked upon as a compound radical, and called *nitrosyle;* though why such a compound radical should not replace the cyanogen itself, the other known compound radical, and why a molecule of basylic metal or radical should be required to go with it, does not appear. Special interest is conferred upon the nitro-prussides by the fact that they have for soluble sulphides a very delicate and characteristic reaction, producing a most beautiful violet tint, the cause of which is not clearly known. It furnishes, however, the most delicate test yet discovered for sulphur in minute traces. The *nitro-prusside of sodium*, the compound employed in the laboratory for this test, is prepared by treating 2 parts of yellow prussiate of potash with 5 of nitric acid and 5 of water, until ferrous solutions give no longer a blue precipitate. The liquid, cooled, filtered, neutralized with carbonate of soda, and filtered again, yields on evaporation mixed crystals of nitrates and of the ruby-colored nitro-prusside of sodium, which latter may be picked out by hand and recrystallized if wanted pure. H. WURTZ.

Nitro-toluol ($C_7H_7NO_2$), a body resembling nitro-benzol, prepared in the same manner from toluol; important as a source of toluidine. (See NITRO-BENZOL.) C. F. CHANDLER.

Ni′trous Ac′id and Ni′trites. According to the prevailing nomenclature, nitrous acid, properly so called—which would be the hydrate of nitrous anhydride, N_2O_3—is but doubtfully known, as N_2O_3 and water react to form nitric acid and nitric dioxide: $3N_2O_3 + H_2O = 2HNO_3 + 2N_2O_2$. N_2O_3, or nitrous anhydride, is a very curious compound. At ordinary temperatures it is gaseous and of a deep-red color, but at a temperature just about the Fahrenheit zero (— 18° C.) it condenses to a *blue* liquid. At temperatures below zero it will mix with water to a blue solution, which may contain the hydrate, but this has not yet been settled. It may be procured in a pure state by warming strong nitric acid with ordinary white arsenious acid, which converts the latter into arsenic acid, being itself reduced to nitrous anhydride gas. Nitrites of potash or soda, in solution, may be formed by passing this gas into solutions of caustic potash or soda. Common starch may be substituted for the arsenious acid when it is not necessary the nitrite should be perfectly pure. Such solutions of nitrites are used as sources of pure nitrogen gas, as explained under the head of NITROGEN. Impure nitrites may be obtained also by fusing the alkaline nitrates, with certain precautions, with metals, as copper and iron. Nitrites sometimes occur in natural waters, particularly in well-waters, doubtless as products of putrefactive processes; and it has been recently announced by an American chemist that they occur, in proportions by no means trifling, as normal ingredients of the circulating fluids of certain plants. H. WURTZ.

Ni′trous Ox′ide, Nitrogen Monoxide, or **Laughing-Gas,** a colorless, transparent, nearly odorless gas, having a sweet taste, and freely soluble in cold water. It is obtained from ammonium nitrate, which by being heated in a retort breaks up into water and nitrogen monoxide. This gas supports combustion nearly as energetically as pure oxygen, but its most interesting and important property is its anæsthetic effect on the animal system when breathed instead of ordinary atmospheric air. Being free from all irritant or offensive properties, it is as readily inhaled as air, but being incapable of decomposition in the body, it furnishes no oxygen for the needs of the blood. Inhaling the gas thus amounts to temporarily totally cutting off the usual supply of oxygen through the breath, while not interfering with the respiratory movements or the elimination of carbonic acid. The result is that the individual, without any distress or disagreeable sensation whatever, becomes speedily asphyxiated into complete unconsciousness. In this condition anæsthesia is perfect, and surgical operations can be performed without pain, as by the use of chloroform or ether. On withdrawing the gas and allowing air to be breathed, the blood becomes immediately re-arterialized. The recovery of consciousness is then as swift as its loss, and there are no unpleasant after effects. The advantages of nitrous oxide as an anæsthetic in surgery are its great swiftness of action and entire freedom from all unpleasant effects upon the patient. When pure and intelligently given, it is perfectly manageable, and therefore safe: but of course if the gas be continuously breathed too long, the asphyxia will end in death. When breathed diluted with air an exhilarating or intoxicating effect is produced, under the influence of which the experimenter is irresistibly impelled to do all kinds of silly and extravagant acts; hence the old name of "laughing-gas." Nitrogen monoxide can be liquefied and solidified by pressure, and in this state a large supply can be conveniently kept for use in a small iron cylinder. For use in surgery the gas is inhaled from a bag through a mouthpiece so made that the expired gases do not mix with the contents of the bag. EDWARD CURTIS.

Nitryl, or **Nitric Peroxide** (NO_2), a monatomic chlorous radical, analogous to chlorine, bromine, etc. It exists in nitric acid ($H - O - NO_2$), and is capable of replacing one or more atoms of hydrogen in various compounds, chiefly organic, atom for atom, as nitro-benzol ($C_6H_5NO_2$), trinitro-cellulose ($C_{18}H_{21}(NO_2)_9O_{15}$), picric acid ($C_6H_3(NO_2)_3O$), etc. C. F. CHANDLER.

Nitzsch (KARL IMMANUEL), b. at Borna, Saxony, Sept. 21, 1787; studied theology at Wittenberg, and was appointed professor at Bonn in 1822, and in 1847 at Berlin, where he d. Aug. 21, 1868. His principal works are—*System der christlichen Lehre* (1829), often reprinted (English translation, 1849), *Praktische Theologie* (3 vols., 1847–67), and various collections of sermons. He belonged to the same group of theologians as Schleiermacher, Neander, and Twesten.

Nivelles′, town of Belgium, in the province of South Brabant, on the junction of the Thines and Dodaine, has an interesting church of the eleventh century, and manufactures of linen and woollen fabrics and paper. It originated from an abbey founded there in 645 by St. Gertrude, a daughter of Pepin of Lauden. The crypt of the present church is a relic from the seventh century. Pop. 9050.

Nivernois′, an old province of France, corresponding exactly to the present department of NIÈVRE (which see).

Nix, or **Nix′ie** [Ger. *nix*], in the popular mythology of the Teutonic races, a water-spirit, usually malignant, and often assuming the human form, though able to take any other shape at will. Nixies were resorted to to determine the future, and their good-will might be obtained by gifts. From the same etymological root we have "Old Nick" as a name for the devil.

Nixon (Gen. JOHN), b. at Framingham, Mass., Mar. 4, 1725; served in the colonial forces at the capture of Louisburg 1745, and at the battles of Ticonderoga and Lake George: led a company of minutemen at Lexington, commanded a regiment and was severely wounded at Bunker Hill; was made brigadier-general Aug. 9, 1776; commanded the 1st Massachusetts brigade at Stillwater; resigned his commission from ill-health 1780: removed to Middlebury, Vt., 1803, and d. there Mar. 24, 1815.

Nixon (THOMAS), b. in South Carolina Oct. 22, 1793; d. in Mississippi Mar. 4, 1872; joined the Tennessee M. E. conference in 1812, and in 1816 was one of nine who composed the first conference in Mississippi; possessed a strong mind, and was a good theologian, though self-educated. He performed laborious services in Tennessee, Mississippi, Alabama, and Louisiana, and was a member of the Mississippi conference at the time of his death. T. O. SUMMERS.

Niz′am's Dominions, the largest native state of Hindostan, subsidiary to Great Britain, occupies the centre of the Deccan, from lat. 15° to 21° 30′ N., and from lon. 75° to 81° 30′ E., between the presidencies of Bombay and Madras. Area, 95,000 square miles. Pop. 10,666,080. The country is an elevated table-land, with a slightly undulating surface and an exceedingly fertile soil, watered by the Godavery and the Kistnah, with their numerous tributaries. The climate is not so excessively hot as in Bengal, and it is healthful except in places where marshes and jungles poison the air. The land is generally not well cultivated, though with moderate care it is capable of yielding annually two crops of rice, wheat, and maize. Sugar, cotton, indigo, fruits, oil-bearing plants, and mustard are grown. Large pasturages are found on which herds of cattle and sheep are reared. Coal and iron abound. Silk, brocade, and leather are the chief manufactures. Cap. Hyderabad.

Nizh′nee-Lomov′, town of Russia, in the government of Penza, on the Lomov, has several educational institutions and 8206 inhabitants.

Nizh′nee-Novgorod′, or **Nijnii-Novgorod,** government of Central Russia, along the Volga and its affluents, the Oka and the Vetlooga. Area, 19,796 square miles. Pop. 1,390,017. The surface is mostly level; the soil is not very fertile, but excellently cultivated: large quantities of grain, hemp, and flax are raised. In the northern part extensive forests are found, which have given rise to considerable shipbuilding and manufactures of all kinds of wooden implements. On the whole, the government is a manufacturing district. Almost every kind of industry is carried on in its populous and enterprising villages, and some of its manufactures—as, for instance, its Russian leather, soap, and iron works—are of superior quality.

Nizhnee-Novgorod, tp. of Russia, capital of above government, on the right bank of the Volga, at its confluence with the Oka. The town is divided into two parts, the principal one being situated on the steep promontory, triangular in shape, and 400 feet high, at the apex of which, on the highest point, stands the Kremlin or citadel, surrounded by a wall thirty feet in height. This portion of the town is mainly made up of three handsomely built streets; the low town consists of one long street along the Volga. The whole town is built of wood, and has few attractions. It is remarkable, however, for the great fairs held here in July and August of each year, on a triangular space formed by the junction of the left bank of the Oka with right bank of the Volga, and so low as to be often entirely inundated; but at the season when the fair is held the rivers are low. The ground is laid out for streets, and a system of permanent sewerage extending from river to river has been of late years established by the Russian government, which is in itself an object of interest. As the time for the fair approaches a great town springs up, with churches, theatres, hospitals, etc., all built of wood and in a substantial manner. Hundreds of thousands of people flock here on these occasions, the only means of access from the town being by a bridge of boats across the Oka. The waters are almost completely covered with boats engaged in conveying goods and people, and a large number of people occupy their boats as residences during the fair. In 1839 during the short season of the fair it is said that a business of upwards of £6,000,000 sterling was transacted. But the extension of railroads and perfection of other means of internal communication through Russia and contiguous portions of Asia, does away in a considerable degree with the motive for "fairs" of this kind, and this at Nizhnee is diminishing in importance. Pop. 12,441.

Nizh'nee-Tagilsk, or **Nijnii-Tagilsk,** town of Russia, government of Perm, is situated in the Ural Mountains, in a district exceedingly rich in iron, copper, lead, and platina, and contains a mining school, extensive forges, and manufactures of machinery. Pop. about 25,000.

Niz'za Monferra'to, town of Northern Italy, province of Alessandria. This was a strongly fortified place during the Middle Ages, and resisted successfully a forty days' siege on the part of Charles of Anjou, but it suffered cruelly afterwards, both from the Spanish and French armies. Pop. 5302.

No'ah, the patriarch who was saved by God from the Deluge on account of his piety, and thus became the second founder of the human race, was a son of Lamech, and the father of Shem, Ham, and Japheth. (See DELUGE.)

Noah (Major MORDECAI MANUEL), b. in Philadelphia, Pa., July 19, 1785; became a lawyer at Charleston, S. C.; engaged actively in politics as a Democrat; went as consul to Riga 1811, to Morocco and Algiers 1813–15; settled in New York, and was connected as editor or proprietor successively with seven newspapers, of which the most important were the *National Advocate* and the *Enquirer* (1826), afterwards merged in the *Courier and Enquirer*. Soon after his return from Morocco, Major Noah endeavored to form a Jewish colony upon Grand Island in the Niagara River, where they were to build a "New Jerusalem" under his administration as "judge in Israel," but few of the Hebrew race responded to the invitation. Noah was elected sheriff of New York, and subsequently appointed surveyor of the port and judge of the court of sessions. He published several successful dramas, a volume of *Travels* (1819), a translation of a spurious *Book of Jasher* (1840), a *Discourse on the Restoration of the Jews* (1845), *Gleanings from a Gathered Harvest* (1845), and other miscellaneous works, chiefly speeches. D. in New York City Mar. 22, 1851.

Noailles', de (LOUIS MARIE), VISCOUNT, b. in France Apr. 17, 1756, was second son of the Marshal de Mouchy and a brother-in-law of La Fayette, with whom he served in the American war of independence; was a good tactician; commanded the Soissonnais regiment at the siege of Yorktown, and was one of the commissioners to receive the capitulation of Cornwallis. He bore a patriotic part in the National Assembly of 1789, proposing that the nobility should voluntarily give up their privileges—a proposition which he maintained with great fervor, and which gave him great influence in the assembly; received an important command in the army, but resigned in May, 1792, in despair for the cause of liberty, and came to the U. S., while the viscountess, remaining in Paris, became a year later a victim to the Revolutionary tribunal. In 1803, Noailles re-entered the French army, went to St. Domingo, was mortally wounded in an engagement with an English vessel, and d. at Havana Jan. 9, 1804.

Nobil'ity, in its usual sense a state of social dignity and political privilege peculiar to certain families, and not transferable like property and the advantages arising therefrom. In ancient Egypt, as now in India, nobility was inherent in the highest castes, the sacerdotal and the military. In Greece warriors originally held the chief place: they were lords of the soil in their several states, and formed an order of hereditary nobility. In Rome the patricians formed for a long time an exclusive caste, allowing no intermarriage with inferiors, and possessing nearly all the political power. But after the plebeians had (B. C. 366) gained equal political rights, those among them who became curule magistrates were not only accounted noble themselves by virtue of their office, but also transmitted dignity to their descendants. Nobility in the old German tribes meant freedom and the ownership of land, and was not hereditary, so that the weak son of a powerful father, if unable to keep his estates, lost also the dignity which went with them. Gaul, conquered by the Franks, was by them divided into governments over which various officers were appointed—dukes (from Lat. *dux*, a "leader"), counts (from *comites*, "companions"), and marquises (guardians of the frontier "marches"). Both provinces and titles, at first given but for life, became in time hereditary, and the French nobility grew so powerful as to be able to set their nominal sovereigns at defiance. They made independent war, coined money, and were supreme judges in their own fiefs, even the lower nobles having power of life and death over their people. A baron's gallows was, however, distinguished by four posts, while a châtelain's had but three, and an inferior lord's only two. In England, where William the Conqueror made every vassal dependent on the king, no such irresponsible power was ever gained by the barons. Surnames and armorial bearings, adopted in the eleventh and twelfth centuries, and soon becoming general, increased the exclusiveness of the nobles, especially in France and Germany. In the latter country a child could inherit no fief of the empire unless both his parents were of pure blood; and in France, though the son by marriage of a noble father and a mother of ignoble birth might inherit property and receive knighthood, he could enter no order of chivalry. When the poverty of a noble forced him to sell his lands to a *roturier* (person of low rank, derived, according to Ducange, from Mid. Lat. *rupturarius*, "peasant"), the low-born purchaser had to give precedence to knights of ancient lineage, and was subject to taxes, from which they were exempt. The aristocracy had many privileges besides freedom from taxation; they alone were allowed to hunt; their goods could not be confiscated except for treason; the highest offices, civil and military, were reserved for them; if condemned to death, they were beheaded, not hanged; they only could be buried within the choir of a church. The granting of letters of nobility was a blow to aristocratic exclusiveness. This was first done in France by Philip the Bold, who in 1270 thus ennobled Raoul, his goldsmith. French sovereigns often replenished their treasury by compelling rich subjects to buy letters of nobility, as English kings obliged people to purchase knighthood. Under Louis XIV. and his two successors persons desiring a title purchased the place of royal secretary, a nominal office conferring nobility on its possessors, so that at one time the king had 206 secretaries; this custom is alluded to by Boileau (*Satire X.*). Louis XIV. created over 500 nobles, and so many persons usurped titles that a new verb, *s'enmarquiser* (to "make one's self a marquis"), was coined. The title of *duke* was, however, the only one giving political eminence. Nobility was abolished in France June 19, 1790, and the title of noble became a title to banishment or the guillotine. In 1806, Napoleon founded a new nobility, creating princes, dukes, counts, barons, and chevaliers. The imperial noblesse, generally a reward for services rendered to France, was the only kind acknowledged, and edicts were issued against usurpers of titles. At the Bourbon restoration the old noblesse was again recognized, and that of Napoleon's creation was suffered to remain. In 1848 nobility was abolished by the provisional government, to be once more restored by Napoleon III.

The Italian nobility lived generally in strong castles, and were feared by the people, who, when it was possible, excluded them from political power, as in Florence and Genoa, where high birth was a disqualification for government. At present, Italian nobles are of two kinds—those of ancient lineage, and others, who, having bought estates, take the titles belonging thereto. Titles descend to the eldest son only, but the younger children are called by courtesy *dei principi*, *dei duchi*, etc. Spanish nobility is very ancient: being *hijo d'algo* ("son of somebody") implies noble birth, and entitles a gentleman to be called *don*, which name, however, is, like our *esquire*, very generally given. The higher nobles are called grandees, and their estates and titles are entailed. Russian nobility was formerly patriarchal, but Peter the Great introduced the European system of titles. In England political nobility is said to be derived directly from the sovereign, who is therefore called the "fountain of honor." It comprises dukes, marquises, earls, viscounts, barons, and baronets. The title of duke was first used in England under Edward III., who created his eldest son duke of Cornwall, and was reserved for royal princes until the reign of Edward VI. That of marquis was given first by Richard II. That of earl, says Blackstone, "is so ancient that its original cannot clearly be traced out. This much seems tolerably certain, that among the Saxons they were called *ealdormen*, and also *shiremen*. On the irruption of the Danes they changed the name to *eorles*. After the Norman Conquest they were for some time called counts or *countees*, but they did not long retain that name, though their shires are called counties to this day." Viscounts were first created in England in 1440. The title of baron was in the Middle Ages given to all nobles, whence arose the strange custom of bestowing it on saints. There were barons by tenure, barons by writ, and barons by letters patent. Baronet, the lowest title of honor hereditary in England, was created by James I., ostensibly for the settlement of Ulster, really for raising money, it being sold for £1000, though only to persons of quality. (Sir J. Lawrence, *On the Nobility of the British Gentry;* C. F. Menestrier, *Les Diverses Espèces de la Noblesse* (Paris, 1683); *Le Blason de la Noblesse* (Paris, 1683).) JANET TUCKEY.

Noble (LOUIS LEGRAND), b. in Otsego co., N. Y., Sept. 26, 1811; removed in his twelfth year to Michigan; graduated at the New York Theological Seminary: was ordained in 1840 to the ministry of the Protestant Episcopal Church; officiated for some years in North Carolina and at Catskill, N. Y.; became in 1854 rector of a church at Chicago, Ill.; was settled at Fredonia, N. Y., 1856, at Jersey City 1858, and in 1874 became a professor at St. Stephen's College at Annandale, N. Y. He was literary executor of Thomas Cole, the painter, of whom he published a *Memoir*, with selections from his writings (1853), made an Arctic journey with Church in 1860, of which he wrote an account, and has published two volumes of *Poems*.

Noble (SAMUEL), b. in London Mar. 4, 1779, learnt the art of engraving, but left the profession in 1820 in order to become minister of the Swedenborgian congregation in London, where he died Aug. 27, 1853. He was one of the founders of the society for publishing the works of Swedenborg, translated into English Swedenborg's *Heaven and Hell*, and published two original books which attracted considerable attention, *Plenary Inspiration of the Scriptures Asserted* (1828) and *An Appeal in behalf of the Doctrines of the New Church* (1838).

No'blesville, R. R. junction, cap. of Hamilton co., Ind. (see map of Indiana, ref. 6–E, for location of county), on the White River. Pop. in 1870, 1435; in 1880, 2221.

Nobunaga, a Japanese chieftain who played a conspicuous part in the first days of the Christian mission in Japan. He was born in 1533, of a wealthy and distinguished family, and made himself the ruler of the country in 1573, governing in the name of the mikado. Shortly before, the first Christian missionaries, Portuguese Jesuits, had landed in Japan, and they found a powerful support in Nobunaga. The old indigenous faith of the Japanese, Shinto, had at that time degenerated into mere archæology and superstition, and the vitality which Buddhism developed was of a political rather than of a religious character. Its monasteries were fortresses and its monks, comprising a considerable percentage of the whole population, were soldiers ready to fight at any moment. Nobunaga hated the Buddhists for political reasons, and was consequently in favor with the Jesuits. He captured and destroyed several of the principal Buddhist monasteries and encouraged the Jesuits in every way possible. He was, however, not a Christian himself. In 1582 an embassy was sent to Philip II. and the pope, but in the same year the embassy returned, 1585, Nobunaga was assassinated.

Noce'ra Inferio're [*Nuceria Alfaterna*], town of Southern Italy, province of Salerno, situated in a district particularly suited to the raising of sheep and cattle. The cheese made here is excellent, and the woollen manufactures are extensive. Nocera was destroyed by Carthage for taking part with Rome, flourished again, and was again destroyed by the Normans, who drove the inhabitants into the neighboring hamlets, or *pagi*, and from this fact the town is now often called *Nocera dei Pagani*. It was here that Urban VI., besieged by Carlo di Durazzo (1385), vainly endeavored to drive off his assailant by hurling at him from the castle four times daily, and accompanied by the solemn tolling of the bells, the deadliest anathemas of the Church. Near this town has been disinterred a large building of the time of Constantine, evidently a manufactory of some sort, and below a portion of the pavement was found a collection of pagan statues, some of merit, probably concealed to await the expected restoration of the old religion. Pop. 13,149.

Noce'ra Um'bria [*Nuceria Camellaria*], town of Italy, province of Perugia, situated on a slope of the Apennines about 14 miles from Foligno. The streets of this old town are rough and steep, and the cathedral and episcopal palace occupy the highest point. The *bagni* or baths, famous in the Roman period as a cure for dyspepsia, are about 2 miles distant. Pop. 6277.

Noce'to, town of Italy, province of Parma, situated in a fertile region, with fine country-seats in the vicinity. Pop. 5980.

No'ci, town of Southern Italy, province of Bari delle Puglie, which takes its name from an immense walnut wood near it. The inhabitants are active and industrious. Pop. 7989.

Noctilion'idæ [from the generic name *Noctilio*], a family of insectivorous bats (Cheiroptera) without nasal appendages. The ears are moderate, and provided with a distinct tragus to each; the tail perforates the interfemoral membrane through its upper surface, or, when that is truncated, is produced beyond it; the intermaxillary lines are generally united (sometimes separated); the molars are large and have W-shaped ridges; the incisors are variable ($\frac{2}{1}$, $\frac{1}{1}$, $\frac{0}{2}$, or $\frac{1}{3} \times 2$); the middle finger has two phalanges; the stomach is sacciform and its extremities inclined toward each other. The species are mostly confined to the tropical regions of both hemispheres. According to Dobson (*Ann. and Mag. Nat. Hist.*, Nov., 1875), who names the family "Emballonurinæ," and unites it with the "Molossinæ" in a family, "Emballonuridæ," there are four primary groups: (1) Emballonuræ, with the genera *Juria*, *Saccopteryx*, *Rhynchanycteris*, and *Emballonura;* (2) Taphozoi, with the Eastern hemisphere genera *Colëura*, *Taphozous*, and *Diclidurus;* (3) Rhinopoma, with the Eastern genus *Rhinopoma;* and (4) Noctiliones, with the American genus *Noctilio*. Whether all these are naturally allied is, however, questionable. THEO. GILL.

Noctilucine, a name given by T. L. Phipson to an organic substance supposed to cause the production of light in phosphorescent fish, insects, and decaying matter. At ordinary temperatures it is semi-fluid and whitish in color. It contains nitrogen and water. It dries up readily, yielding amorphous films. Noctilucine is slightly soluble in water and insoluble in alcohol and ether. Sulphuric and nitric acids dissolve it with decomposition. When moist it absorbs oxygen and evolves carbon dioxide. In ozone it is more luminous than when in oxygen, the luminosity apparently being due to oxidation. The spectrum of the light emitted is nearly monochromatic. Noctilucine is secreted in a pure form by the luminous centipede, *Scolopendra electrica*. (*Chem. News*, xxvi. 130, No. 668; *Am. Chem.* iii. 244; *Comptes Rendus*, lxxv. No. 9; Watts's *Dict.*, 2d Supplement, p. 861.) E. WALLER.

Nod'dy, the *Megalopterus stolidus*, a sea-bird of the tern family, approaching the character of the gulls. It is found in nearly all parts of the world, often alights on ships, and lets itself be captured without resistance or attempt at escape. Its eggs are eaten in great numbers, and are very good.

Nodal Points or **Lines.** See VIBRATION.

Nodes [Lat. *nodus*, a "knot;" Fr. *nœud*], the points in which the path of any planetary or cometary body intersects the plane of the ecliptic; also the points in which the orbit of any satellite intersects the plane of the orbit of its primary. Nodes are distinguished as *ascending* and *descending*. The ascending node is that through which the body passes from the S. to the N. side of the plane of reference; the descending, that through which it passes from N. to S. The first is denoted by the sign ☊, the second by the sign ☋. From the definition it is evident that the earth's orbit has no nodes. The nodes of every other member of the solar system undergo gradual displacement in the heavens, making, in a period of time longer or shorter, a complete revolution. The period for the moon is short, being but about $18\frac{2}{3}$ years, but for the planets it reaches many thousands of years, being nearly 130,000 for Mercury and 36,000 for Uranus. The direction of nodal movement is generally retrograde, or from E. to W.

F. A. P. BARNARD.

Nodier' (CHARLES), b. at Besançon Apr. 29, 1780; studied at Strasbourg, and led subsequently an errant and adventurous life, first as an ardent republican, then as a zealous royalist, writing sentimental novels, as *Stella* (1802), after the model of Werther, and satires against Bonaparte, as *La Napoléone* (1802), and editing *Telegraph Illyrien* in 1814 under the auspices of Junot and Fouché;

became contributor to the *Journal des Débats* in 1815; librarian to the library of the arsenal of Paris in 1824, and d. in that city Jan. 26, 1844. He was a very prolific writer, and touched almost every field of literature from lexicography to satire. Some of his works have an interest still: *Dictionnaire des Onomatopées françaises* (1808), *Histoire des Sociétés secrètes de l'Armée* (1815).

Noé (Amedée de). See Cham.

No'el (Hon. and Rev. Baptist Wriothesley), **M. A.**, a brother of the first earl of Gainsborough, b. July 10, 1799, at Leightmont, Scotland; graduated at Trinity College, Cambridge, 1826; became one of the queen's chaplains, and in 1848 left the Established Church and became a Baptist minister. He was an eloquent preacher; published a number of volumes of sermons, besides many other works, chiefly religious (*Notes of a Tour in Switzerland*, *Essay on Christian Baptism*, 1849; *Letters on the Church of Rome*, 1851; *A Selection of Psalms and Hymns*, 1852, enlarged 1853; *Hymns about Jesus*, mostly original, 1869), and was distinguished for philanthropic labors among the poor of London. D. Jan. 20, 1873.

Noë'tians, followers of Noëtus, a Patripassian who flourished probably about 200 A. D. (instead of 230, the date formerly given). All we know of him is derived from Hippolytus (d. 236), Epiphanius (d. 403), and Theodoret (d. 457, 8), and they do not quite agree in their statements, Hippolytus and Theodoret saying he was born at Smyrna, and Epiphanius calling him an Ephesian. Perhaps he was born at Smyrna and lived at Ephesus. He was excommunicated for his heresy, which Hippolytus connects with the pantheism of Heraclitus. Through his disciples, Epigonus and Cleomenes, the Roman bishops Zephyrinus (202–218 A. D.) and Callistus (218–223 A. D.) were carried over into the same heresy. (See Patripassians.)

R. D. Hitchcock.

Nogent-le-Rotrou', town of France, department of Eure-et-Loir, on the Huine, manufactures serges, candles, spirits, umbrellas, etc., and has 7778 inhabitants.

Nogent-Saint-Laurens (Edme Jean Joseph Jules Henri), b. at Orange, in the department of Vaucluse, France, Dec. 27, 1814, studied law at Aix and Grenoble, and was admitted to the bar in 1838 in Paris, where he soon attracted attention, especially by his defence of Col. Laborne, an accomplice of Louis Napoleon in the affair of Boulogne. In 1848 he kept aloof from politics, but after the establishment of the empire he soon became a man of great influence. After 1870 he retired into private life. D. in Paris Jan. 30, 1882. He published several treatises on railway legislation and theatre legislation.

Noicatta'ro, town of Southern Italy, province of Bari delle Puglie, situated about 9 miles S. E. of Bari. The inhabitants are chiefly occupied in growing cotton. Pop. 7270.

Noir (Victor), a French journalist whose true name was **Juan Salmon**, b. at Attigny, in the department of Ardennes, July 27, 1848, was educated as a mechanic, but afterwards became connected with *La Marseillaise*. Sent by a friend and fellow-journalist, Paschel Grousset, to Prince Pierre Bonaparte to demand reparation for some disparaging remarks the prince had made in a Corsican newspaper on Grousset, an altercation took place, and the prince, who has given many deadly proofs of his uncontrollable temper, shot Victor Noir dead on the spot. The prince was acquitted of murder and only sentenced to pay 25,000 francs to the family of the journalist, but Noir's funeral called forth a dangerous demonstration.

Noko'mis, Montgomery co., Ill. (see map of Illinois, ref. 7–D, for location of county), on the Indianapolis and St. Louis R. R., has large flouring-mills and several grain-elevators. Principal business, farming and fruit-raising. Pop. in 1870, 893; in 1880, 1062.

No'la, town of Southern Italy, province of Caserta, about 14 miles N. E. of Naples. The Castello Cicala and the ex-convent of the Capuchins on a hill above the town give it a picturesque aspect, but the interior has a desolate appearance. Of the sixteen churches, the old Italian Gothic cathedral is the only one of interest. This cathedral, built in great part of the marbles taken from an amphitheatre, contains some objects of artistic merit, and the Italian government has appropriated a considerable sum to rebuild the lofty tower, accidentally burned in 1860. Nola was one of the most ancient and renowned cities of Campania, being of older origin than Rome itself. The Samnites first conquered the Pelasgian settlers, were in turn driven out by the Romans, but recovered it during the Social wars, and the inhabitants burned it rather than yield to Sulla; Spartacus occupied it afterwards. In the time of Vespasian it was called *Augusta Felix*, and this was its most flourishing period. It was strongly walled, had twelve gates, magnificent temples, and two large amphitheatres, between which rose the temple of Augustus, said to have been erected on the site of the house in which that emperor died. In 1664 the Carafa and Orsini completed the destruction of the amphitheatres to build their own palaces, one at Nola, the other at Naples. Objects of Italo-Greek and Roman art, especially vases, are still disinterred in great numbers in and near this town. Pop. 11,395.

Nöl'deke (Theodor), b. at Harburg, Germany, Mar. 2, 1836; graduated at Göttingen 1861; devoted himself to Oriental and biblical studies, in which he soon achieved great prominence; was professor of the University of Kiel from 1864 to 1872, when he was engaged as one of the faculty of the new German university at Strasbourg, and has become known to English readers through frequent critical articles on Oriental subjects contributed to the London *Academy*. Author of numerous and important German works, among which are *History of the Koran* (1860), *Life of Mohammed* (1863), *Poetry of the Ancient Arabs* (1864), *Old Testament Literature* (1868), *Grammar of Modern Syriac* (1868), *Researches in the Criticism of the Old Testament* (1869), and *The Inscription of Mesha, King of Moab* (1870).

Nol'lekens (Joseph), R. A., b. in London, England, Aug. 11, 1737, son of a painter from Antwerp; became a pupil of the sculptor Schumaker; afterwards studied at Rome, where he remained ten years; was very successful in executing bas-reliefs, groups of figures, and busts; settled at London 1770; made busts of George III., Fox, Pitt, Warren Hastings, Johnson, Garrick, and the principal celebrities of the time, which were generally considered excellent likenesses; executed numerous commissions for public monuments and statues, as well as mythological groups; married a lady of rank, and accumulated a handsome fortune. D. at London Apr. 23, 1823.

Nol'le Pros'equi [Lat. "to be unwilling to prosecute"], a declaration or undertaking by the plaintiff or prosecuting officer in an action or prosecution at law that he will discontinue further proceedings in the cause against the defendant. It is entered upon the records of the court, and puts an end to the particular proceeding or litigation in the course of which it is introduced, but does not prevent a new suit or prosecution for the same cause at a subsequent time. It was formerly a common practice to enter a *nolle prosequi* both in civil and in criminal cases, but in civil actions other modes of effecting a discontinuance of the proceeding are now more generally adopted. In criminal prosecutions, however, the former practice still remains commonly in force. It usually lies in the discretion of the prosecuting officer to enter a *nol. pros.* (as the phrase is commonly abbreviated), but it is sometimes provided that he must obtain the leave of the court before such a course can be taken. The causes which most frequently induce such action are, that there is an insufficiency of evidence to procure the defendant's conviction, or that the testimony of one of several defendants who have been indicted is desired to be introduced against the others. Such a step might also be taken because, on account of the state of public opinion at a particular time, it was improbable that a jury could be obtained which would be likely to convict the prisoner, or because the trial would be detrimental to the public interests. The *nolle prosequi* does not operate as an acquittal, but only as an indefinite suspension of the proceedings, and the prosecution may be again instituted against the defendant when the prosecuting officer deems it desirable.

George Chase. Revised by T. W. Dwight.

Nom'bre de Di'os, town of the Mexican confederation, state of Durango, on the Rio del Tunal, in a fertile valley rich in cattle and maize. Pop. about 7000.

Nome'idæ [from *Nomeus*, the chief genus], a family of teleocephalous fishes related to the mackerels. The body is oblong, compressed, and covered with cycloid scales; the lateral line continuous and unarmed; the head compressed; the opercula unarmed; the nostrils double; the mouth with a lateral cleft, upper jaw scarcely protractile; teeth small and conical, on the palate as well as jaws; branchial apertures extensive; branchiostegal rays five or six; dorsal more or less divided, and with the spinous portion shorter than the soft. The skeleton has numerous vertebræ (in *Nomeus* 16 + 25); the stomach very numerous pyloric appendages. This family has been constituted for the reception of several genera, at one time referred to the Scombridæ—viz. *Nomeus*, *Gasterochisma*, *Cubiceps*, *Neptomenus*, and *Platystethus*. The species are all marine, and found in tropical or warm temperate seas. The last two are represented in the Australian and Polynesian waters. Theodore Gill.

Nomenclat'ure, in Chemistry. The history and discussion of chemical nomenclature would be virtually the history of the science itself, and the utmost that space in this case will justify is a brief glimpse of the systems at present in use, with some few critical observations upon their merits and demerits.

Although great numbers of new classes of compounds have required the invention of new names and new classes of names, more especially in the department of organic chemistry, yet there has been no really revolutionary change in chemical nomenclature since 1787, when the general principles of the present system were chiefly enounced—according to popular report by Lavoisier, but in reality by a coalition of French chemists, including Lavoisier, De Morveau, Berthollet, and Fourcroy, and among whom it appears doubtful whether Guyton de Morveau does not deserve the first mention, rather than Lavoisier. The inevitable division of compounds into the three great natural groups of *acids, bases,* and *salts,* and the distinction between different orders of oxides and acids of the same base by the terminations *-ous* and *-ic,* with the corresponding terminology of the salts of these two orders of acids in *-ite* and *-ate,* originated at that time, and still remain. The system of *prefixes* derived from Latin and Greek numerals, exemplified in the terms *protoxide, protochloride, deutoxide, bichloride, sesquioxide, perchloride,* was a very important improvement introduced in 1804 by Dr. Thomas Thomson; and is of such moment that the name of this chemist should certainly be placed next to those of De Morveau and Lavoisier as a useful inventor in this field.

A few further modifications of the original system have crept into use—whether *all* of them improvements or not may be well doubted. Thus, the application of the terminations *-ous* and *-ic* to cases of binary compounds of electro-negative elements other than oxygen—as, for example, *ferrous* and *ferric chlorides, mercurous* and *mercurous iodides,* and so on—is an innovation which is commendable from its great convenience in many cases. The extension of the termination *-ide,* first confined to binary compounds of oxygen and the halogen elements, also to the sulphur group, making the terms *sulphide, selenide, telluride,* does not seem objectionable; but when the same plan is extended to all binary compounds whatever, and we are forced to sanction a terminology which confounds together utterly dissimilar groups, with the terms *hydride* and *carbide, nitride, phosphide, arsenide, antimonide,* and *bismuthide,* remonstrance should certainly be made, and some attempt to return, at least for the triadic group, to the older and far preferable terms *nitruret, phosphuret, arseniet, antimoniet,* and *bismuthet.* Another probably useful recent innovation is the confinement of the term *acid* altogether to hydrogenated compounds; but this great improvement has been accompanied by the introduction, for the anhydrous oxygen acids, of the word *anhydride,* which certainly appears far from unobjectionable. If there must be an equivalent term, *anhydrate* would appear preferable—*anhydride* having no analogy to support it. Another innovation consists in disusing altogether, in naming salts, the familiar names of their basic oxides, as potash, lime, soda, and so on, and using the name of the metal; thus, sulphate of calcium for sulphate of lime, phosphate of sodium for phosphate of soda, and the like. The reasons assigned are attainment of uniformity with terms like sulphate of iron, phosphate of copper, etc., and the awkwardness that would arise from any attempt at such uniformity in the opposite way by using expressions like sulphate of protoxide of iron and phosphate of protoxide of copper. Most of these latter cases, however, are provided for simply by another very common innovation, which seems to be gaining ground greatly at the present day, and which is but an extension of the device before referred to of indicating the degree of saturation with chlorous elements in binary compounds by the terminations *-ous* and *-ic.* According to this, we now say "ferrous sulphate" and "cupric phosphate;" and the same plan may be extended with perfect uniformity to salts of potash, soda, lime, etc. Thus, we may say "calcic sulphate" and "sodic phosphate," and so on.

One more quite recent innovation has been made which seems of the highest value, and deserving, in a general way certainly, of the most unqualified commendation. This consists in the use of the Latin or Greek prefixes as applied to both the acidic and basic elements or constituents, not only of haloid compounds, but of oxygen salts and a number of other classes of compounds, the result often being quite compact and convenient names, which may be made to convey the maximum of information about the constitution of the compound in the fewest possible words. By this system we may have, for example, such cases as the following:

Mn_2O_3	Dimanganese trioxide.
Cl_2O_3	Dichlorine trioxide.
Pb_3O_4, minium	Tri-lead tetroxide.
Cb_2O_5	Dicolumbium pentoxide.
$POCl_3$	Phosphorus oxy-trichloride.
Si_2OCl_6	Disilicon oxy-hexachloride.
FeK_3Cy_6, red prussiate of potash	Iron tripotassium hexacyanide.
TiK_2F_6	Titanium dipotassium hexafluoride.
$2SO_3.H_2O$, Nordhausen acid	Disulphuric monohydrate.
$Co_2O_3.2H_2O$	Sesquicobaltic dihydrate.
$2Fe_2O_3.3H_2O$, limonite	Diferric trihydrate.
$3Na_2O.7WO_3$	Trisodic heptatungstate.
$4ZnO.SO_3.4H_2O$	Tetrahydrate of tetrazincic monosulphate.
$(NH_4)_2O.2H_2O.P_2O_5$	Ammonium dihydrogen phosphate.
$3Al_2O_3.2P_2O_5.12H_2O$, wavellite	Dodecahydrate of trialuminic diphosphate.
$3MgO.2SiO_2.2H_2O$, serpentine	Dihydrated trimagnesic disilicate.
$2ZnO.SiO_2.H_2O$, calamine	Monohydrated dizincic silicate.

Nomenclature in Organic Chemistry.—This is a branch of science which is constantly expanding and changing, and hence an account given of the modes of nomenclature at present in vogue might a few years hence be altogether out of date. Especially may it be asserted that the system of nomenclature founded upon the so-called compound hydrocarbon radicals, *methyl, ethyl, propyl, butyl, amyl,* and the rest, which but a few years since was regarded as definitely established for all time, is now fast becoming obsolete, and will soon fade out of memory almost altogether. It is even now a question whether it would not be best in the naming of the series of common alcohols, for example, to drop the common names *methylic, ethylic, propylic, butylic,* and *amylic,* and substitute terms derived from the Greek numerals, and based upon the number of carbon equivalents, such as *monohol, deutohol, tritohol, tetrohol, pentohol, octohol,* etc. In the mean time, it is quite advisable and unobjectionable to designate every such series by the unmistakable terms *one-carbon alcohol, two-carbon alcohol, three-carbon alcohol,* and so on. In the case of the ethers, of the fatty series, we may also call methylic ether, *two-carbon ether,* common ether *four-carbon ether,* and so on. In every homologous series (see HOMOLOGY) the same general plan is admissible, and has already been adopted in many cases, as in the case of the paraffines or marsh-gas homologues, where all except the three lower members, *marsh-gas* itself, *ethane* and *propane,* have received names based upon the Latin numerals for the carbon equivalents, as *quartane, quintane, sextane,* and so on; and no reason exists why the first three should not be designated likewise, particularly if the *Greek* numerals were used instead of the Latin, as being much better adapted to this use. The tabulation of hydrocarbons given now in many of the textbooks from Hoffmann, in which the vertical columns are series of homologues and the horizontal lines series of isologues, and which he proposed to make the basis of a system of nomenclature in organic chemistry, if translated from Hoffmann's Latin into more euphonious Greek names, would be—

Monane (marsh-gas).	Monene.				
CH_4 ……	CH_2				
Deutane.	Deutene.	Deutine.			
C_2H_6 ……	C_2H_4 ……	C_2H_2			
Tritane.	Tritene.	Tritine.	Tritone		
C_3H_8 ……	C_3H_6 ……	C_3H_4 ……	C_3H_2		
Tetrane.	Tetrene.	Tetrine.	Tetrone.	Tetrune.	
C_4H_{10} ……	C_4H_8 ……	C_4H_6 ……	C_4H_4 ……	C_4H_2	
Pentane.	Pentene.	Pentine.	Pentone.	Pentune.	
C_5H_{12} ……	C_5H_{10} ……	C_5H_8 ……	C_5H_6 ……	C_5H_4 …	C_5H_2
Hexane.	Hexene.	Hexine.	Hexone.	Hexune.	
C_6H_{14} ……	C_6H_{12} ……	C_6H_{10} ……	C_6H_8 ……	C_6H_6 …	C_6H_4

Hoffmann's plan of nomenclature assumed all these hydrocarbons as compound radicals, each one constituting the basis of great numbers of series of compounds, according to the other elements or groups of elements associated with it. To follow the subject would require too much space.

Many other systems of nomenclature of narrower scope have been proposed, one of the most curious of which is that of Kolbe for the alcohols, which is founded partly upon the old compound radical theory, and considers wood-spirit, which Kolbe calls "carbinol," to be marsh-gas, in which the hypothetical radical hydroxyl (HO) has replaced one atom of hydrogen. Common or ethylic alcohol then becomes "methyl-carbinol," or a product of a second replacement of another hydrogen-atom by methyl. Therefore, *ethylic* alcohol by this view contains no ethyl, but does contain methyl. There would be no advantage, in the opinion of the writer, in occupying space further in this work in explaining the present methods of nomenclature in organic chemistry, which are confessedly founded on generalizations of a fragmentary nature, and which must soon, in the natural advancement of the science, be displaced by some system founded upon a nearer and more comprehensive view of the true molecular constitution of carbon and hydrogen compounds. Henry Wurtz.

Nom′inalists, those Schoolmen who held the doctrine that universals (general notions, such as those of man, animal) have no real existences corresponding to them, but are mere names or words (*flatus vocis*). Nominalism is distinguished from Conceptualism (which see), the doctrine which holds that universals are not mere words, but have a subjective existence as ideas in the mind. Both agree in denying objective, independent existence to them (universals), and in this respect they stand opposed to Realism (which see), the doctrine which attributes to them (universals) the only real being, and makes particular individuals (things) to be derivative and dependent (upon universals —*i. e.* processes, forces). The chief Nominalists were Roscellinus and William of Occam. In modern times their doctrine has been adopted by Thomas Hobbes and John Stuart Mill. Abelard was a Conceptualist or moderate Nominalist, and in this class we are to place John Locke, Thomas Reid, Dugald Stewart, Dr. Thomas Brown, Sir William Hamilton, and other modern psychologists. (For the origin and significance of the scholastic disputes regarding Nominalism and Realism see Philosophy, History of.) William T. Harris.

Nomina′tion, the technical term for an incomplete act of designation to office, the ratification of which depends upon another person or body of persons. The President of the U. S. *nominates* to the Senate the incumbents of high Federal offices, and makes out the *appointment* only after approval. The head of an executive department *nominates* to the President those whom he desires as his subordinates, and a national, State, county, or town convention of a political party *nominates* its candidates for office in anticipation of the elections.

Nonan′tola, town of Italy, province of Modena, about 6 miles N. E. of the city of Modena. This town, now one of the richest in the province, lies in what was a low marsh until the beginning of the ninth century, when an abbey was erected here, which, favored by princes, soon became one of the most renowned of the age. (See Tiraboschi.) From 1441 it belonged to the house of Este. Pop. 5696.

Non-commis′sioned Of′ficers are soldiers inferior in rank to the commissioned officers. In the navy they are called warrant officers. The regimental staff is attended by a sergeant-major, quartermaster-sergeant, and hospital steward. The general staff has ordnance sergeants. The company has one first sergeant, four sergeants, and eight corporals.

Nonconform′ists, or **Dissent′ers,** a name applied to those not connected with the Church of England. It is said that there are between thirty and forty denominations in England. The larger and more important may be traced back to the Presbyterians, Brownists, Anabaptists, and Romanists of the sixteenth century, or to the Methodists, who arose a little more than 100 years ago. The Presbyterians were the descendants or disciples of the Protestants who fled to the Continent in the reign of Mary, and returned in that of Elizabeth imbued with the teachings which they had learned in Holland or Geneva. They did not, however, separate from the Church until 1661, but for several generations tried to establish within it the form of government which had been set up by Calvin in Geneva and Knox in Scotland. They were so far successful that Presbyterianism actually became the established religion for a short time under the Commonwealth. The Brownists (afterwards called Independents or Congregationalists) derived their name from their founder, Robert Brown, rector of a church in Northamptonshire. Their doctrine was much the same as that of the Presbyterians, but they differed in their idea of church government. Their leading tenet was the independence of every congregation. They formed a large sect in the time of Queen Elizabeth. During the civil war the Presbyterians and Independents had filled many of the parishes, in many cases dislodging the regular incumbents. After the restoration of Charles II. attempts were made to include, or, in the language of the times, to "comprehend," them within the Church. These attempts failing, about 2000 of their ministers were ejected or withdrew in 1662 from the livings which they held, and the connection of these bodies with the Church was finally terminated. The Independents are now a large body, including, it is said, about 750,000 of the population. They are also extremely numerous in New England, where, however, like the English and Swiss Presbyterians, many of them are adopting Unitarian doctrines. The Anabaptists had their origin in Germany about 1523, and were first found in England in the beginning of the next century. They derived their name from their practice of rebaptizing those who had been baptized in infancy. They have broken up into numerous sects, of which the largest, the "Calvinistic Baptists," have about 2000 meeting-houses in England, and the rest about half as many more. The Romanists, or Roman Catholics, separated from the Church of England in 1570. Their principles are much the same as those of the Church of England before its reformation, except that they prefer submission to a foreign pontiff to communion with the ancient Church of their country. The Quakers, or Friends, were founded by George Fox about 1644. He was himself an uneducated man, but full of zeal and energy. His "Society" soon fell under the guidance of such men as William Penn and Barclay of Urie, who gave it a temporary prominence. Its aim was to develop the spirituality of the Church; the means which it employed were the abandonment of all external ritual. A society so constituted might gain an immediate but hardly an extended influence, and though a respectable it never became a very numerous body. The Wesleyans, or Methodists, had their origin in an attempt of John and Charles Wesley to induce a better observance of religious duty within the Church. During the lifetime of their more celebrated leader, John Wesley, they continued in the communion of the Church, though they had "meeting-houses" for prayer and preaching. After his death they formed a separate denomination, which has broken up into many fragments. The theology of the original, or "Wesleyan Methodists," nearly approaches that of the Low Church school, except that the former reject the Calvinistic doctrine of predestination. Besides these historical denominations, there are in England many minor sects, such as Irvingites, Swedenborgians, Moravians, and some ancient foreign congregations of French Huguenots and others. The stringent penal laws by which (from a real or imaginary political necessity) the Nonconformists were formerly restrained have been one by one repealed, and they are now in the full enjoyment of civil and religious liberty. The number of dissenters in England, including all who do not belong to the Established Church, is probably a little less than 10,000,000. B. R. Betts.

Nonju′rors, those members of the Church of England who refused to take the oath of allegiance to William and Mary. When it was tendered to Sancroft, archbishop of Canterbury, he, with several of the bishops and about 400 priests, declined to take it, upon the ground that they were already bound by their oath of allegiance to King James II. In consequence of their refusal they were deprived by act of Parliament in 1691 of their ecclesiastical preferments. The deprived bishops were Sancroft, Turner, Frampton, White, Ken, and Lloyd. Many of the laity, regarding the deprivations as unlawful, adhered to these prelates and formed a religious communion, which they called the faithful remnant of the Church of England. The earlier Nonjurors were not Jacobites. On the contrary, many of them had opposed the violent measures of King James, and most of them were disposed to submit peaceably to the new settlement of the succession. They were willing to live as orderly citizens, but not to bind themselves by new oaths during the life of King James, nor to recognize the claims of Parliament to deprive bishops of their sees. Some of the chief men in the kingdom in influence and learning were among the Nonjurors. The motives of the first Nonjurors appear to have been strictly religious: those of their successors were political. After the death of James II. and of Lloyd and Ken, the last of the deprived bishops, many of them returned to the Established Church, while the rest, looking forward to the possible restoration of the exiled royal family, determined to keep up an episcopal succession. Dissensions, however, arose among them, and they were divided into two communions. Gordon, the last bishop of the original line, died in 1779, and Boothe, the last bishop of the Nonjurors of the Separation, in 1805. Nonjuring congregations continued to exist a little longer; and it is said that a nonjuring clergyman was living as lately as 1815. The regular body adhered strictly to the doctrine and discipline of the Church of England, but the separation introduced many changes. A book of *Devotions for Primitive Catholicks*, compiled by Dr. William Deacon, one of their bishops, was used for some time in the congregations of the latter body. It differs widely from the Book of Common Prayer. The Nonjurors, being to a great extent cut off from active life, devoted themselves to literature. The celebrated historian, Collier, was one of their bishops. Leslie, the controversialist, and Robert Nelson, the well-known commentator on the feasts and fasts, belonged to their communion. Among the more celebrated of their writings were Deacon's *Devotions*, already mentioned, a treatise on the *Intermediate State*, by Archibald Campbell, a Scottish bishop resident in London, and a learned and elaborate folio called *The Hereditary Right of the Crown of England*. This is believed to have been written by Harbin, a nonjuring clergyman, during the reign of Queen

Anne, at a time when the restoration of the Stuarts was thought to be possible. Hilkiah Beaford, however, another nonjuror, assumed the responsibility of it, and was fined and imprisoned for publishing a seditious libel. A history of the Nonjurors was published in 1845 by the Rev. Thomas Lathbury. B. R. BETTS.

Non'nus, a Greek poet of the fifth century after Christ, b. at Panopolis in Egypt. The details of his life are unknown, but two of his works are still extant—namely, a huge epic, Διονυσιακά, in 48 books, edited by Graefe (Leipsic, 1819–26, 2 vols.), and by Köchly (Leipsic, 1859), and a transcription of St. John in Greek hexameters, edited by Passow (Leipsic, 1834), and by Marcellus (Paris, 1861).

Non-Residence. See CITIZEN.

Non'suit. A "judgment of nonsuit" in law is a judgment allowing or compelling the plaintiff to discontinue or abandon the further prosecution of the action which he has instituted, and is granted generally on the ground of a default or insufficiency of evidence to maintain his case. A form of judgment having the same effect is also granted at common law when the plaintiff neglects to proceed with the trial of the cause after issue has been joined; this is called a "judgment as in case of nonsuit." A nonsuit may be either voluntary or involuntary. It is voluntary when the plaintiff at his own election and by his own act causes a discontinuance or dismissal of the action; it is involuntary or compulsory when the dismissal is ordered by the court in the exercise of an independent discretion or upon motion of the defendant. When the plaintiff finds that his evidence is insufficient to support the action, he may elect to be nonsuited, in order that he may not be deprived, by reason of the rendition of a verdict, of the power of suing the defendant upon the same cause of action when better evidence is procurable; for a nonsuit, being merely a default, is no bar to another action on the same ground. The plaintiff may submit to a nonsuit by failing to appear for the trial of the cause or by absenting himself when the verdict of the jury is about to be rendered. As the judgment of nonsuit in such a case is the result of his voluntary act, he cannot appeal on this ground and obtain a reversal of the judgment. According to the English practice until recently, a compulsory nonsuit, on the ground of the insufficiency of the evidence, could not be ordered by the court against the plaintiff, but he might insist that the case should go to the jury, and thus run the risk of securing a verdict in his favor. It was usual, however, for the plaintiff in such a case to submit to a nonsuit, with leave to make a motion to the full court to set the judgment aside. But by a late statute it is provided that "the court or a judge may before, or at, or after the hearing or trial, upon such terms as to costs, and as to any other action, and otherwise, as may seem fit, order the action to be discontinued, and that if the plaintiff does not appear when the action is called for trial, the defendant shall be entitled to judgment dismissing the action." It is also provided that any judgment of nonsuit, unless the court otherwise directs, shall have the same effect as a judgment upon the merits for the defendant, except in cases of mistake, surprise, or accident, when it may be set aside. (*Supreme Court of Judicature Act,* amended 38 and 39 Vict. ch. 77, 1875.) The former English practice still prevails in the U. S. courts of this country and in several of the States, and no nonsuit can be ordered without the consent of the plaintiff. But in other States the plaintiff can be compelled to be nonsuited if the evidence offered by him appears to the court clearly insufficient to maintain his action. Thus, in New York it is held to be the duty of the court to direct a nonsuit if the evidence will not authorize the jury to find a verdict for the plaintiff, or if the court would set it aside, if so found, as contrary to evidence. If such a judgment be improperly granted, the plaintiff may move to have it set aside. In case of a nonsuit the plaintiff pays the defendant's costs. In New York and in those States which have adopted its code of civil procedure a nonsuit is also called a "dismissal of the complaint."

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Non'yl (C_9H_{19}), improperly called Pelargonyl, which is properly $C_9H_{17}O$, an acid radical. Nonyl is the ninth term of the series of alcohol radicals (C_nH_{2n-1}). It has not yet been isolated. Hydride of nonyl (C_9H_{20}) is one of the constituents of petroleum; it boils between (134°–137°C.). C. F. CHANDLER.

Nonylene (C_9H_{18}), **Pelargonene,** or **Elaene,** the ninth term of the olefines. It is found, with hydride of nonyl, among the products of the destructive distillation of amylic alcohol with chloride of zinc. It is a colorless liquid, lighter than water. C. F. CHANDLER.

Noor-ed-Deen' Mahmood, or **Malek al Adel,** b. at Damascus Feb. 21, 1116; succeeded in 1145 his father, who had established an independent Mohammedan empire in Northern Syria. Noor-ed-Deen defeated Count Joscelin of Edessa, then Louis VII. of France, who commanded in the second crusade, then the princes of Tripolis and Antioch, and after ten years' war against the Christians he was in possession of the whole of Syria. Although defeated in 1159 by Baldwin III., king of Jerusalem, near the Lake of Gennesareth, he soon resumed the offensive, and invaded Palestine again. His attention was averted, however, from Palestine to Egypt, where internal dissensions offered him a good opportunity; and before his death, which took place at Damascus May 15, 1174, Egypt was conquered by his general, Saladin. Noor-ed-Deen was a man not only of great talent, but also of noble character, and he was as much admired by his Christian adversaries as he was loved by his Moslem subjects.

Noot'ka Dog, a large dog found among the Indians of Vancouver's Island, British Columbia. Its long woolly hair is spun and woven into cloth by the natives, and the introduction of the breed for industrial purposes into other countries has been proposed.

Nootkas, or **Ahts,** a family of Indian tribes inhabiting Vancouver Island and the shores of the sound of the same name, embracing the Ahts proper, who live on the W. side of the island and number 3500; the equally numerous Quakewlth, subdivided into many tribes, living on both sides of the island and on the mainland; and the Cowichans, on the E. of the island, numbering 7000. The latter have been partially civilized by both Protestant and Roman Catholic missions.

Noph (Isa. xix. 13; Jer. ii. 16), or **Moph** (Hos. ix. 6), is the biblical name of the celebrated old Egyptian city of Memphis. The Egyptian name of the city was *Menneter,* which in popular pronunciation became *Menofi.* From this latter were derived the Greek *Memphis,* the Coptic *Menfe,* the Arab *Menf,* and the Hebrew *Moph.* The Septuagint—which, of course, is a good authority in all Egyptian affairs—further confirms the identity of the two cities. (See MEMPHIS).

Nor'cia [anc. *Nursia*], a walled town of Italy, province of Perugia, situated in a highly-cultivated region about 28 miles from Spoleto. The inhabitants, owing to the abundance of oaks in the vicinity, give themselves mostly to the raising of swine, and in the provinces of Rome and Tuscany a swineherd is often called a *Norcian.* This town is also famous for the size and quality of the truffles grown here, some weighing as much as two pounds apiece. The Nursians were allies of the Sabines, but in the times of Scipio and Augustus they were reckoned among the bravest of the Roman soldiers. This town belonged for a while to the duchy of Spoleto, but in 1100 it declared itself a republic, and for centuries maintained its independence, though in the end forced to submit to Rome. Norcia was the birthplace of the wives of several of the emperors and of many other distinguished Romans. Pop. 8687.

Nord, the most northerly department of France, bounded N. E. by Belgium and N. W. by the Straits of Dover. Area, 2170 square miles. Pop. 1,603,259. The ground is generally low and the surface flat, with the exception of the south-eastern part, where some hills and low mountains occur which are rich in coal and iron. The soil is fertile and excellently cultivated, yielding large crops of wheat, hemp, flax, beet-root, tobacco, and fruits. The Aa and the Scheldt, with their numerous tributaries, all navigable, pass through the country, which, moreover, is traversed by several canals. Manufacturing of linen, cambric, lace, beet-root-sugar, and iron is extensively carried on, and the inhabitants enjoy the reputation of being the most intelligent and industrious part of the French people.

Nor'den, town of Prussia, in Hanover, on a small inlet of the sea, has breweries, distilleries, boatbuilding slips, manufactures of yarn and tobacco, and trade in horses and cattle. Pop. 6617.

Nor'denskjöld (ADOLF ERIK), b. at Helsingfors, Finland, Nov. 18, 1832, descended from a Swedish family whose members through several generations had distinguished themselves as scientists. He studied geology, mineralogy, and natural history in the university of his native town, and very early received appointment in the mining department. But he could not avoid incurring the suspicion of the Russian government, and was finally compelled to leave the country. He settled in Sweden, and was appointed superintendent of the mineralogical museum of Stockholm in 1858; accompanied Torell on his Arctic expeditions in 1859 and 1861; led similar expeditions himself in 1864, 1868, and 1872, and made a scientific journey to Greenland in 1870. The results of his researches were published in geographical and mineralogical monographs, and especially in his *Redogörelse for en Expedition till Grönland* (1871). Meanwhile, his attention had been turned to Siberian explorations, and in 1875 he sailed through the Karian sea to the mouth of the Yenisei, ascended the river in a small boat, and returned home overland. The next year he repeated the voyage, but came back from the Yenisei by sea. His experiences having given him a reasonable hope of accomplishing the N. E. passage, he started in July, 1878, in the Vega, supported partly by the Swedish government and partly by two private merchants, Mr. Dickson of Göthaborg and Mr. Sebiriakoff of St. Petersburg. Thus the Vega became the first vessel which doubled the northernmost point of the Old World, Cape Tchelyuskin. She wintered in Behring Straits, and reached Japan on Sept. 2, 1879; and the North-East Passage was found. On his return home Nordenskjöld was created a baron and loaded with honors. The full report of his voyage was published in Swedish, English, German, and French in 1884.

Nord'hausen, town of Prussia, province of Saxony, at the foot of the Harz Mountains, on the Zorge. It has large distilleries, manufactures of wax, soap, linen, and leather, and an active trade. Pop. 26,198.

Nordhausen Sulphuric Acid. See Sulphuric Acid.

Nordheimer (Isaac), b. at Memelsdorf, Germany, 1809, was appointed professor of Oriental languages in the University of New York, and was also a teacher in Hebrew in the Union Theological Seminary from 1838 to 1841. He published *Hebrew Grammar* (New York, 1838–41, 2 vols.), and, in conjunction with Dr. S. H. Turner, a *Hebrew and Chaldee Concordance* (1842). D. in New York Nov. 3, 1842.

Nord'hoff (Charles), b. at Erwitte, in Westphalia, Prussia, Aug. 31, 1830; brought to the U. S. at the age of four; at the age of fourteen went to sea, and was a sailor for nine years. Between 1861 and 1871 he was editorially connected with the New York *Evening Post*, subsequently served as a correspondent of the New York *Tribune*, and became an editor of the New York *Herald*. He has written and published *Man-of-War Life*, *The Merchant Vessel*, and *Whaling and Fishing* (Cincinnati, 1855–56), *Cape Cod's all along Shore*, a collection of stories (New York, 1868), *California for Health, Pleasure, and Residence* (New York, 1872), *Northern California, Oregon, and the Sandwich Islands* (New York, 1873), *The Communistic Societies of the United States* (New York, 1874), and *Politics for Young Americans* (1875). J. B. Bishop.

Nörd'lingen, town of Bavaria, on the Eger, has a fine old church with many interesting paintings, several good educational institutions, manufactures of linen fabrics and carpets, and a lively trade in cattle, geese, and feathers. It was the scene of a great battle in the Thirty Years' war. Pop. 7837.

Nor'folk, county of England, bordering on the North Sea, and comprising an area of 2116 square miles, with a population of 444,749. The surface is level or slightly undulating; the soil consists mostly of a sandy loam, and is watered by the Ouse and the Yare. Barley is the chief agricultural product, and cattle and poultry, especially geese and turkeys, are extensively reared for the London market. Cap. Norwich.

Norfolk, R. R. centre, Madison co., Neb. (see map of Nebraska, ref. 9–F, for location of county). Pop. in 1880, 547; in 1885, 1949.

Norfolk, city, R. R. centre, and cap. of Norfolk co., Va. (see map of Virginia, ref. 7–I, for location of county), on the Elizabeth River, an arm of Chesapeake Bay, about 18 miles from Fortress Monroe, has a fine harbor, safe, commodious, and of sufficient depth to admit the largest vessels. Four railroads, 2 canals, and numerous lines of steamers to Europe and different ports in the U. S. tend to make Norfolk a commercial city of no mean importance. It is the largest naval station in the U. S.: it has an excellent free-school system, churches of all denominations, 4 daily, 3 tri-weekly, and 5 weekly newspapers, 2 national and 10 smaller banks, 2 theatres, several halls, a paid fire-department with 3 steam-engines, which are used only in the suburbs, owing to the Holly water-supply existing in the city, a well-organized police force, finely-paved streets, and a horse railway. Norfolk does a cotton business of nearly a million bales a year, an export trade of three or four millions in peanuts, truck, oysters, fish, and has numerous fertilizing and canning establishments, a cotton and knitting factory, and 5 of the largest cotton compresses. Norfolk is an important coaling-station, and is looked upon as the Atlantic terminus of the great Southern transcontinental line of railroads. The climate is genial, and the health-list will compare favorably with that of any place S. of Mason and Dixon's line. Pop. in 1880, 2196; 1883, 26,324. John R. Hathaway, Ed. "Day Book."

Norfolk, Dukes of (1483), earls of Arundel (1139), of Surrey (1483), and of Norfolk (1644), a family of the English nobility which enjoys the distinction of hereditary earl-marshal, premier duke, and premier earl of England. The earldom of the East-Angles was conferred by Henry I. (1135) upon Hugh Bigod, who lost that title by rebellion against Stephen and Henry II., but was reconciled to the latter monarch and made earl of Norfolk 1167. His grandson, Roger, was made earl-marshal on the failure of the male line of the earls of Pembroke 1225, but both titles became extinct on the death of his nephew, of the same name, 1307. After having been held by Thomas of Brotherton, brother of Edward II. (1313–38), and by Thomas Mowbray (1386–1413), both titles were granted by Richard III., June 28, 1483, to John Howard, lord admiral of England, France, and Aquitane, a distinguished statesman and military leader, who was killed at the battle of Bosworth Field, Aug. 22, 1485, and attainted shortly afterwards.—His son, Thomas Howard, who had been ennobled (as earl of Surrey) at the same time as his father, whose attainder he also shared, was restored to his original title 1488; distinguished himself in war and diplomacy; was made earl-marshal 1510, and second duke of Norfolk Feb. 1, 1514, as a reward for having gained the battle of Flodden Field, and d. at Framlingham May 21, 1524.—His son, Thomas Howard, third duke, in many respects the most noted member of the family, b. about 1474, took a very prominent part in public affairs; repeatedly commanded armies of invasion against Scotland; presided over the court which sentenced Queen Anne Boleyn to death, May 19, 1536; suppressed the rebellion known as the "Pilgrimage of Grace" 1537; was thrown into the Tower Dec., 1546, sentenced to death and attainted Jan. 27, 1547, but escaped through the opportune death of Henry VIII. on the following day; had his title restored by Queen Mary, and d. Aug. 25, 1554. The cause of his fall might doubtless be traced to the previous misconduct and disgraceful death of his niece, Catharine Howard, third queen of Henry.—His brother, Lord Edward Howard, had been lord high admiral of England, and was killed in an attempt to destroy the French fleet 1513; while his eldest son, Henry Howard, celebrated as a poet under the title of earl of Surrey, aspired to the hand of the Princess Mary, and was beheaded on Tower Hill Jan. 19, 1547.—Surrey's son, Thomas Howard, b. about 1536, became fourth duke; intrigued for the hand of Mary, queen of Scots, and was beheaded at London June 2, 1572.—His grandson, Thomas Howard, b. 1592, was restored in blood by act of Parliament as earl of Arundel and of Surrey 1603; was distinguished in the service of Charles I.; was restored to the earldom of Norfolk 1644, and is known to history under the title of Arundel, through the great collection of Grecian marbles made in his name. Porter C. Bliss.

Nor'icum, province of the Roman empire, extending between the Danube and the Save, and bounded E. by Pannonia and W. by Vindelicia and Rhætia. It corresponded nearly to the modern provinces of Upper and Lower Austria and Styria. It was conquered under Augustus, at which time it contained only one large city, Noreia (*Neumarkt*). The Romans formed several prosperous colonies, of which the most remarkable were Juvavia (*Salzburg*), Lentia (*Lintz*), and Lauriacum (*Lorch*). It was afterwards divided into two provinces.

Nor'mal [Lat. *norma*], in mathematics. A normal to a plane curve is a straight line in that plane perpendicular to a tangent at the point of contact. The equation of the normal is

$$y - y' = -\frac{dx'}{dy'}(x - x'),$$

in which y' and x' are the co-ordinates of the point of contact or point of *normalcy*. When the length of a normal is spoken of, we generally mean the distance from the point of normalcy to the point in which the normal cuts the axis of x. In this case the formula for the length is

$$\text{N} = y'\sqrt{1 + p'^2},$$

in which y' is the ordinate of the point of contact, and p' the corresponding value of the first differential coefficient of the ordinate. The distance from the point of contact to the centre of the corresponding osculatory circle is sometimes taken as the length of the normal, in which case this length is given by the formula

$$\text{N} = \frac{(1 + p'^2)^{\frac{3}{2}}}{p''},$$

p' having the same signification as before, and p'' being the corresponding value of the second differential coefficient of the ordinate.

A normal to a curve of double curvature is a straight line lying in the osculatory plane and perpendicular to the tangent at the point of contact. In this case the length of the normal is the same as the length of the radius of the osculatory circle to the curve at the point of contact. A plane is said to be normal to a curve at any point when it is perpendicular to the tangent at that point. A normal line to a surface is a straight line perpendicular to a tangent plane to the surface at the point of contact. Any plane through a normal line to a surface is a *normal plane*.

W. G. Peck.

Normal, city, McLean co., Ill. (see map of Illinois, ref. 5-E, for location of county), at the junction of the Chicago Alton and St. Louis and the Illinois Central R. Rs., 2 miles N. of Bloomington, is the seat of the State Normal University and the Soldiers' Orphans' Home, and has also several excellent schools and a street railway to Bloomington. Pop. in 1870, 1116; in 1880, 2470.

Normal School [Lat. *normalis*, from *norma*, "rule," "pattern"], an institution for the training of teachers, a teachers' seminary; originally, a pattern or model school, an elementary institution in which the best methods of instruction and discipline were practised, and to which candidates for the office of teacher resorted for the purpose of learning by *observation* the most approved modes of conducting the education of children and youth. Such were the schools of Neander, established at Ilefeld, Germany, about the year 1570, as also those of the Abbé de La Salle, canon of the cathedral at Rheims, France, in 1681. These schools, with numerous others of a similar character successively established prior to the eighteenth century, were not simply institutions for the education of children, but were so conducted as to test and exemplify principles and methods of instruction, which were perpetuated and disseminated by means of books in which they were embodied, or of pupils and disciples who transplanted them to other places. They served the purpose of preparing the way for the more complete and efficient institutions of the same designation at a later day.

According to the present acceptation of the term "normal school," as used in many European countries, it denotes an establishment composed of young men or women who have passed through an elementary or even superior school, and who are preparing to be teachers by making additional attainments and acquiring a knowledge of the human mind, of the principles of education as a science, and its methods as an art. The normal schools of the present day generally include the model or pattern school of earlier times. They thus combine theory with practice, these "model," "experimental," or "practice" schools, as they are variously called, being established in connection with them in order to test practically the professional character of their students and the modes of instruction inculcated.

The normal schools of the U. S. usually comprehend—*first*, the model or pattern school of the former period; *secondly*, the professional characteristics of the European establishments of the present day, so far as circumstances will permit; and, *thirdly*, the academical features of the ordinary school. They are compelled, by reason of the superficial instruction imparted in too many of the elementary schools, to assume, to a considerable extent, the work of the latter. They are forced to exhaust much of their strength in imparting a knowledge of subjects which should be thoroughly mastered elsewhere. In the Prussian normal schools a high standard of literary qualifications is required of a candidate as a condition of admission. In most cases the examinations for admission are practically competitive, since the schools are small, the applicants numerous, and the number received rarely exceeding seventy. Nor is this all. Preparatory schools exist in which not only is the requisite amount and quality of scholarship imparted to the student, but his peculiar adaptation to the calling of a teacher is thoroughly tested before he is permitted to become a candidate for the teachers' seminary. These advantages enable the normal schools of that country to give a much stronger professional cast to their training, and to dwell more extensively upon the science of education and the art of teaching which constitute their special field of labor. The embarrassments which the American normal schools at present experience will, however, eventually disappear. By elevating the standard of instruction in the lower schools they are gradually correcting the evils arising from the deficient preparation of their students. They are rapidly increasing also, and are introducing better methods of teaching into the public schools of the country, while the latter are reciprocating by sending to the normal schools candidates with superior attainments and more elevated aims.

The teachers' seminary founded by the Abbé de La Salle at Rheims was afterwards, in 1684, placed in charge of a benevolent organization known as the "Brothers of the Christian Schools." In 1697, Augustus Herman Franke, a German philanthropist, established, in connection with his orphan school at Halle in Hanover, a teachers' class, composed of pupils who assisted him at stated times, and twelve of whom, in 1704, he constituted his *Seminarium Preceptorium* or "teachers' seminary." This was the first German normal school. After being trained for two years in the principles and practice of teaching, these twelve pupils, with their successors in the seminary, went forth as missionaries of the new gospel of education, until the leading minds of all the German states were at length thoroughly aroused to the importance of the work thus feebly begun. In 1735 a seminary for teachers was established on a more liberal scale at Stettin in Pomerania, and in 1748 still another at Berlin by Frederick the Great, who by 1752 had become so deeply impressed with the importance of such institutions that by a royal decree of that date he directed that thenceforth all vacancies occurring in the schools established on the crown-lands should be filled by teachers selected from the pupils of this seminary. He also provided an annual stipend for twelve of the most worthy graduates to aid in their support until employed as teachers in the school. This institution, ably managed by Hecker, a former pupil of Franke, did a great work in the infancy of the normal-school movement, and by its success, with that of its predecessors, contributed to the eventual establishment of others of the same class, not only in Germany, but in other countries, Austria following in 1767, Switzerland in 1805, France in 1808, Holland in 1816, the U. S. in 1839, England in 1840, Belgium in 1843, Canada in 1846, and the Argentine Confederation, South America, during the year 1871.

The subjoined statement exhibits the number now in existence in the several countries named, according to the most reliable data at present attainable: Prussia and the German states, 116; Austria, 11; Switzerland, 31; France, 141; Holland, 2; Denmark, 8; Sweden, 5; Russia, 1; Italy, 53; Spain, 32; Greece, 1; England and Wales, 23; Scotland, 2; Ireland, 1; Dominion of Canada, 6; Argentine Confederation, 2; total in foreign countries, 435.

The following table gives, chronologically, the location and number of State, county, and city normal schools in each of the U. S., so far as they have been established therein, with the date of their organization and the current annual appropriations for their support, so far as the facts can be reliably ascertained.

Name of institution.	Location.	Date of organization.	Amount of appropriation.
Alabama:			
State Normal School	Florence	1873	$7,500
Normal School for Col'd T'ch's.	Huntsville	1875	2,000
Lincoln Normal University	Marion	1873	4,000
Tuskegee Normal School	Tuskegee	1881	2,000
Arkansas:			
Normal Dep. Industrial Univ.	Fayetteville	1872	
Branch " " "	Pine Bluff	1875	15,000
California:			
State Normal School	Los Angeles	1882	50,000
Normal Dep. Girls' High Sch.	San Francisco	1876	
California State Normal Sch'l.	San José	1862	30,000
Colorado:			
Normal Dep. State University.	Boulder.		
Connecticut:			
State Normal School	New Britain	1850	12,000
Florida:			
State Normal School	Gainesville	1880	
Illinois:			
Southern Illinois Nor. Univ.	Carbondale	1874	20,290
Illinois State Normal Univ.	Normal	1857	25,974
Cook Co. Nor. and Train. Sch.	Normalville	1867	15,000
Indiana:			
Training School Dep. Pub. Sch.	Fort Wayne	1867	
Normal School	Indianapolis	1866	
State Normal School	Terre Haute	1870	20,000
Iowa:			
State Normal School	Cedar Falls	1876	8,850
Girls' Normal School	Davenport	1863	
Chair Didactics, Iowa Univ.	Iowa City	1873	
Kansas:			
State Normal School	Emporia	1865	8,952
Normal Dep. Univ. of Kansas.	Lawrence	1876	1,500
Kentucky:			
Normal Dep. Agricultural Coll.	Lexington.		
Maine:			
Eastern State Normal School	Castine	1867	6,000
State Normal and Train. Sch.	Farmington	1864	6,000
Madawaska Training School	Fort Kent	1879	1,000
State Normal and Train. Sch.	Gorham	1879	6,333
City Normal Training Class	Portland	1878	1,500
Maryland:			
State Normal School	Baltimore	1866	10,000
Normal School for Col'd T'ch's.	"	1864	2,000
Massachusetts:			
State Normal Art School	Boston	1873	17,500
City Normal School	"	1852	

Name of institution.	Location.	Date of organization.	Amount of appropriation.
Massachusetts (continued):			
State Normal School	Bridgewater	1840	$13,800
City Training School	Cambridge	1870	3,380
State Normal School	Framingham	1839	11,200
Training School (City)	Gloucester	1879	3,000
State Normal School	Salem	1854	15,094
“ “ “	Westfield	1839	10,850
“ “ “	Worcester	1874	11,075
Michigan:			
Dep. Sci. and Art Teach. St. Un.	Ann Arbor	1879	
State Normal School	Ypsilanti	1852	19,500
Minnesota:			
State Normal School	Mankato	1868	15,000
“ “ “	St. Cloud	1869	15,000
“ “ “	Winona	1860	17,000
“ “ “	Moorhead	1885	
City Training School	St. Paul	1883	
Mississippi:			
State Normal School	Holly Springs	1870	3,000
Tougaloo University	Tougaloo	1869	3,000
Missouri:			
State Normal School	Cape Girardeau	1878	10,000
Normal College University Mo.	Columbia	1849	
Lincoln Institute	Jefferson City	1866	10,000
State Normal School	Warrensburg	1871	10,000
“ “ “	Kirksville	1867	10,000
City “ “	St. Louis	1857	
Nebraska:			
Chair Didactics, State Univ	Lincoln	1881	
State Normal School	Peru	1867	11,250
New Hampshire:			
Training School (City)	Manchester	1869	
State Normal School	Plymouth	1871	6,750
New Jersey:			
State Normal School	Trenton	1855	20,000
City “ “	Newark	1879	
New York:			
State Normal and Train. Sch	Albany	1844	18,000
“ “ “ “	Brockport	1867	18,000
“ “ “ “	Fredonia	1868	18,000
“ “ “ “	Geneseo	1871	18,000
“ “ “ “	Oswego	1861	18,000
“ “ “ “	Potsdam	1869	18,000
City Normal College	New York	1870	
“ Training School	Syracuse	1880	
North Carolina:			
University Normal School	Chapel Hill	1877	2,000
State Normal School	Elizabeth City	1881	720
Colored “ “	Fayetteville	1877	2,000
Normal School	Franklin	1881	500
State Colored Normal School	Franklinton	1881	700
“ Normal School	Newberne	1881	500
“ “ “	Newton	1881	500
“ Colored Normal School	Plymouth	1881	500
“ “ “ “	Salisbury	1881	500
“ “ “ “	Wilson	1881	500
Ohio:			
City Normal School	Cincinnati	1868	7,480
“ “ “	Cleveland	1874	
“ “ “	Dayton	1869	
“ “ “	Geneva	1868	1,112
Oregon:			
State Normal School	Monmouth	1882	
College and Normal School	Ashland	1879	
Pennsylvania:			
State Normal School	Bloomsburg	1869	1,605
South-western State Nor. Sch	California	1874	2,500
State Normal School	Edinboro'	1857	5,000
“ “ “	Indiana	1875	9,000
Keystone State Normal School.	Kutztown	1866	2,500
Central “ “ “	Lock Haven	1877	5,000
Penn. “ “ “	Mansfield	1862	8,700
“ “ “ “	Millersville.	1855	5,000
City Normal School	Philadelphia	1848	25,000
State “ “	Shippensburg	1873	9,749
“ “ “	Westchester	1871	5,000
Rhode Island:			
State Normal School	Providence	1871	10,500
Tennessee:			
State Normal College	Nashville	1875	7,500
Texas:			
Sam Houston Normal Inst	Huntsville	1879	18,000
Vermont:			
State Normal School	Castleton.	1867	1,936
“ “ “	Johnson	1867	1,784
“ “ “	Randolph	1867	2,146
Virginia:			
Normal and Agricultural Inst.	Hampton	1868	10,329
“ “ Collegiate Inst	Petersburg.		
Normal School	Richmond	1867	320
West Virginia:			
State Normal School	Concord	1875	1,450
“ “ “	Fairmont	1869	2,000
“ “ “	Glenville	1873	1,333
“ “ “	Huntington	1867	1,333
Normal Dep. Shep. College	Shepherdstown.	1873	1,300
State Normal School	West Liberty	1871	868
Wisconsin:			
City Normal School	Milwaukee	1872	4,688
State “ “	“	1885	
“ “ “	Oshkosh	1871	17,720
“ “ “	Platteville	1866	22,703
“ “ “	Whitewater	1868	18,682
“ “ “	River Falls	1875	14,756
Dakota Ter.:			
Normal School	Springfield	1881	
District of Columbia:			
Miner Normal School	Washington.		
Utah:			
Normal Department Univ	Salt Lake	1875	$2,500
Washington Ter.:			
Normal Department Univ	Seattle.		

According to this table, there are 120 public normal schools in the U. S., to which add 435, the number in foreign countries, and we have a total of 555, so far as is known, that are supported wholly or in part at public expense. Besides the foregoing, there are not far from 114 private institutions bearing the name, most of which are in the Northern States. Perhaps a majority are "normal departments" rather than fully organized schools.

While in Prussia, Saxony, Switzerland, and some other European countries a further increase in the number of normal schools is scarcely demanded by the interests of elementary education, since those already established are quite competent to supply teachers for all the vacancies occurring in the schools of this grade, in the U. S., on the contrary, the movement must be regarded as but just in its infancy. Says Dr. Hoyt, U. S. commissioner to the Paris Universal Exposition of 1867, in his report to the secretary of state: "The movement is a progressive one, every day awakening fresh enthusiasm and gaining new strength. It is an essential part of the scheme of universal education, and is bound to go on until every State in the Union is provided with well-endowed, ably-officered, and thoroughly-managed normal schools, sufficient in number to educate all the teachers required for their numerous public schools."

The conditions of admission to our American normal schools do not greatly vary in the different States, and may be thus summarily stated: (1) The candidate to be not less than sixteen years of age; (2) to possess sound health and a good moral character; (3) to be able to pass a satisfactory examination in reading, spelling, writing, arithmetic, and the elements of English grammar; (4) to sign a declaration of intention to teach for a certain specified time, generally two years, in the common schools of the State. The courses of study are principally limited to the branches required to be taught in the public schools, together with a thorough theoretical and practical preparation for the special duties of the teacher. In some cases the classics and modern languages are admitted into the course. The best schools have provided an elementary (two years) and a higher course (two years), in order to meet the wants of the several grades of the public-school system. (Further information upon this important subject may be sought in the works of Henry Barnard, LL.D., entitled, *Education in Europe* and *Normal Schools*, or in the valuable report of Dr. J. W. Hoyt, U. S. commissioner to the Paris Universal Exposition.) WILLIAM F. PHELPS.

Nor′manby (CONSTANTINE HENRY **Phipps**), MARQUIS OF, eldest son of Henry Phipps, first Earl Mulgrave, b. at Mulgrave Castle, Yorkshire, May 15, 1797; educated at Harrow and Cambridge; entered Parliament 1818; advocated Roman Catholic emancipation and Parliamentary reform; succeeded his father as Earl Mulgrave Apr., 1831; was governor of Jamaica 1832–33, where he carried into effect the recent legislation for the abolition of slavery, and succeeded in quietly suppressing a dangerous military revolt; became lord privy seal 1833, lord lieutenant of Ireland 1835–39; created marquis of Normanby June 25, 1838; was for a short time secretary of state for the colonies 1839; home secretary 1839–41; ambassador at Paris 1846–52; made a knight of the Garter 1851; was envoy to Florence 1854–58; became a privy councillor, and a constant opponent of the foreign policy of Lord Palmerston, and d. at Kensington July 28, 1863. He was author of some political pamphlets, of several youthful novels, *Matilda*, *Yes and No*, etc., and of *A Year of Revolution, from a Journal kept at Paris in the Year 1848* (1857), in which he severely criticised the French republic of 1848, and thereby elicited Louis Blanc's *Historical Revelations, inscribed to Lord Normanby* (1858).

Nor′mandy, an old province of France, bordering on the English Channel, and comprising an area of 10,534 square miles, is now divided into the departments of Seine-Inférieure, Eure, Orne, Calvados, and Manche. The ground is naturally fertile, and the inhabitants are descendants of the old NORMANS (which see). When, in 1066, their duke, William II., conquered England, Normandy entered into a close political relation to that country, which continued, generally as a formal union, until, in 1204, Philip Augustus conquered the province and made it a part of France. After the battle of Agincourt, in 1415, the English once more held it, but only till 1449, when Charles VIII. finally united it to France.

Norman French is a dialect of old French which has exercised great influence upon English, and which became the Anglo-Norman of England. The Conquest dates from the year 1066, and the subsequent fusion of Norman with the existing Ænglisc (English, Anglo-Saxon) has produced a language which deserves to become the universal medium of communication in learning, literature, and commerce.[*] The presence of Norman opened the way to French and Latin, and there are now 5000 words common to French and English, most of which, under a slight disguise, are recognizable as Latin also; consequently, English has advantages over languages the vocabularies of which were not Latinized at the revival of learning. And yet there is an English scholar (W. Barnes, B. D.) who would turn the language back to a spurious and factitious antiquity by using words like "fore-note" ("note" being Latin) for *preface*, "outdrive" for *expel*, "clipping" for *consonant*, and "voicing" for the equally Latin *vowel* (where "clinker" was at hand in imitation of the Dutch), and he intimates that "talecraft" might be used for *arithmetic*, "swarthen" for *eclipse*, "raft" for *excite*, and "jenny" for *machine*, but no equivalents are offered for *mechanic, mechanism, machinist, machinery*, etc.

There is much in English for which literary French cannot account, and for which we must go to Norman. Here we have little or no nasality, and the Italian and Norman *tsh, dzh* (as in *chair, judge*) add an agreeable variety to French *ch, j* (*sh, zh*) of *chaise, juge*. In numerous cases the Anglish *c* (*cay*, with the single Latin power of *k*) fell into Norman *ch* (*tsh*); at a later period French *ch* (*sh*) came in, and as the Latin *cay*-sound continued to exist, English acquired the triple phonetism heard in *cavalry* with Latin *cay*, *chivalry* with Norman *tsh*, and *chevalier* with the French *sh*-sound; and in such cases the historic and proper difference of pronunciation shows that *chandler, champion, chivalry, chair* came into English much earlier than *chandelier, champaign, chevalier, chaise*.

The British sovereigns have had the custom of opening Parliament in a speech purporting to be Norman. A good dictionary of the language is wanted. Kelham's (1779) is of little value, and Métivier's *Dictionnaire Franco-Normand* (London, 1870) is restricted to the living dialect of Guernsey. S. S. Haldeman.

Normans. I. *The Northmen.*—Toward the end of the eighth century Western Europe began to be scourged by the inroads of Scandinavian pirates, known to the inhabitants of the British isles as "East-men" and "Danes"—to those of the Continent as "North-men." These Northmen were of Germanic stock, a vigorous, seafaring race, not yet christianized, peopling the coasts of the Baltic and of the two peninsulas which form the Norway and Sweden and the Denmark of to-day. Need and the national thirst for adventure and for strife drove forth from the thickening population down upon the sunnier, richer, weaker South swarms of Vikings—*i. e.* warriors—who scoured the coasts of England, Germany, and France, pressed with their small, sharp, open vessels up the narrowest streams, burned, slew, and plundered, and sailed away laden with booty and with slaves. About the middle of the ninth century these raids began to assume an altogether new character and importance. The consolidation of the three great Scandinavian kingdoms broke the power of the petty kinglets and independent nobles, and drove many a Jarl forth with his followers to seek a freer life in some new home. Northmen threw themselves in larger bands upon England, which the Wessex kings had not yet fairly centralized; upon the Frankish kingdoms, fast falling asunder under the later Karlings; harried the country, besieged and sacked the cities, wintered at the mouths of the rivers, and by the end of the century had wrested from Alfred half his kingdom, and had begun to plant colonies upon the coasts of France. Northmen ravaged Spain and the shores of the Mediterranean, fell upon Western Italy, penetrated Greece and Asia Minor, and there met others of their countrymen who had pressed down through Russia. For in the Russia of that day, under the name of Varangians, Northmen had become the ruling class, a military aristocracy; while those who made their way still farther S. had formed the famous Varangian body-guard of the Byzantine emperors, which maintained its existence and its distinctive character for five centuries. During the latter half of the ninth century, also, Scandinavians, sailing westward, found and settled Iceland, where the old free Germanic community-life held for nearly 400 years; whence Greenland was visited and colonized; whence, also, it seems, navigators made their way farther down the North American coast to a "Vinland" where settlements were attempted, and to a still more southerly "Hvitramanaland."

With the establishment, early in the tenth century, of settlements upon the Continent, with the occupation Scandinavian energy now found at home in wars between the three new kingdoms, and with the gradual triumph of Christianity in the North, Europe gained, at last, comparative rest. England's period of misery and humiliation under Ethelred the Unready (979–1016), ended by the establishment of a Danish dynasty (1017–42), marks the last great outburst of the pent-up heathenism.

II. *Normandy.*—Of all the settlements of the Northmen, one alone was destined to play a really important part in history. By the treaty of Claire-sur-Epte (912) Charles the Simple enfeoffed a Viking, Rolf or Rollo, with the lands upon either side of the Seine of which he and his followers were in actual possession, the new duke of the Northmen, in return, recognizing the Karolingian king as his overlord and receiving baptism. It seemed hardly possible but that this latest Teutonic settlement would prove a powerful diversion in favor of the waning authority of the Frankish kings of Laôn against the increasing influence of the French duchy of Paris, which had first risen to importance as a mark against the Northmen, and at whose expense the "Terra Northmannorum" was now created. Duke Rolf, indeed, remained loyal to his Karolingian lord, and, fighting in his cause, won for himself the Bessin. But William "Longsword" (927–943), who added to his domains the Cotentin, was largely French in feeling, and his allegiance to the Karlings was a wavering one. The third duke, Richard "the Fearless" (943–996), became the "man" of Hugh the Great of Paris, and, later, of his son "Capet," to whose establishment upon the throne he lent decisive aid. It was thus the settlement of these northern pirates, says Freeman, which finally made Gaul French in the modern sense. It was at the same time the alliance with Romanic France which brought the Northmen fully under the influence of French language, law, and custom, which made them "*Normans*," the foremost apostles alike of French chivalry and of Latin Christianity. Under Richard "the Good" (996–1026) Norman arms began to be borne beyond the borders of the Norman duchy. Robert of Toesny warred against the infidel in Spain; Rainulf began his career of conquest in Apulia. To the brothers Richard III. (1026–28) and Robert "the Devil" (1028–35) succeeded the "Bastard of Falaise," William the Conqueror. The duchy of Normandy—which before his conquest of England (1066) he had widened by the winning of Maine (1063)—he left at his death (1087) to his first-born Robert, from whom it was wrested (1106) by his brother, Henry I. of England, and held thenceforth by the English kings until its seizure by the French crown in 1203.

III. *The Normans in the Sicilies.*—The Sicilies at the beginning of the eleventh century were divided and disputed between Longobards, Greeks, and Saracens. A band of Norman knights, entering Apulia upon a pilgrimage, lent their aid to the former, the Latin Christians, in an attempt to expel the Greeks. This enterprise miscarried, but the reckless courage and strict discipline of the Normans brought their further assistance into great demand, and won them soon no little fame and influence. In 1030 they built the city of Aversa; eight years later their leader Rainulf received from Conrad II. of Germany the title of count. Such beginnings drew from overcrowded Normandy fresh swarms of adventurers, with whose aid the Greek viceroy won from the Moslems (1038) the greater part of the island of Sicily. Swindled in the sharing of the booty, the Normans attacked the Greek possessions in Southern Italy with such success that their leader, William "Iron-arm," son of Tancred d'Hauteville, soon styled himself count of Apulia; in which title we find his brother and successor, Drogo, confirmed by the German emperor, Henry III. With the third Apulian count, Humphrey, Pope Leo IX. came into strife over Benevent. Defeated and captured in the battle of Civitate (1053), the pontiff was fain to strike a peace upon the condition of Norman vassalage to the Holy See. Still another son of Tancred, the famous Robert Guiscard, succeeded his brother Humphrey (1056). "By the grace of God and of St. Peter, duke of Apulia and Calabria," he spent the first twenty years of his long rule in making good his title over Greek, Longobard, and Norman. Meanwhile, his younger brother, Roger, passing with a few hundred knights into Sicily, won a series of brilliant victories, and finally, with Robert's aid, made himself master of the island. In 1081, Robert invaded Greece and defeated the East Roman emperor at Durazzo. Already, Byzantium trembled, when disturbances in Apulia and the repeated summons of the pope, in hot strife with Henry V., drew the Guiscard back to Italy. Bursting into the Campagna with 6000 horse and

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[*] See an interesting article in the *Smithsonian Annual Report* for 1874, *On a Dominant Language for Science*, by M. de Candolle of Geneva.

30,000 foot, he pressed back the German emperor, delivered Gregory (besieged in St. Angelo), and sacked Rome (1084). Dying the next year, he left the ducal title to his second son, Roger. His first-born, Boemund, won great fame in the first crusade and established an independent principality in Antioch. In 1127 the Guiscard line became extinct, and Roger, second count of Sicily, united the conquests of the house of Tancred, reigning as king of Sicily and Naples; as also his son and grandson after him, William I. (1154–66) and William II. (1166–89). From the raising of the siege of St. Angelo, through all the conflicts between the papacy and the German imperium, the former found in the Sicilies, under the Norman supremacy, its firmest support. But in 1186, through the marriage of Henry VI. of Germany with Constance, aunt and heiress of the childless William II., the succession to the Sicilian throne passed over to the imperial house of Hohenstaufen. Upon William's death (1189) the pope and the Norman nobility set up the illegitimate Tancred, but in 1194, invading the Sicilies with a German army, Henry crushed out all opposition. His son by Constance, Frederick II., afterward united and ruled both realms. Under the Norman kings and the half-Norman Frederick the Sicilies furnished the one example of the time of full religious toleration. Greek and Saracen dwelt together in the enjoyment of civil equality and freedom of faith. The art and the learning of both races found generous encouragement. The island sprang into new life and bloom. Sicily and Spain, the points at which the Eastern civilization touched the Western most closely, became the centres from which the culture of the Saracen and the reawakening of scientific study spread throughout Europe. In 1266, Charles of Anjou, in league with the papacy, defeated and slew King Manfred, Frederick's son, and made himself master of the Sicilies. After the overthrow of their supremacy, the Normans, as in France and in England, became blended with the races they had ruled.

IV. "*The Norman Conquest of England* is the great turning-point in the history of the English nation"—a nation whose development had thus far been purely Germanic, but in which the old German community-constitution had fallen into decay even more speedily than upon the Continent. As "folk-land" passed into "book-land"—private estates of more and more unequal extent—landless freemen and little freeholders, unable longer to discharge their old duties in army and in court, lost their old rights and were slowly forced into a sort of feudal dependence upon a warlike, land-and-office-holding nobility, the "thaneship." Society shaped itself into rough class-distinctions. The state tended steadily toward oligarchy. The arrest of this process was the problem to be solved by the English kingship: the thorough redistribution of state burdens according to actual ability to bear the same was the one possible solution; and to that the Church, allied by rich endowments with the landed interest, made successful resistance. The Danish invasions and conquest revealed and hastened the social and political disintegration. With the degradation of the common freemen, with the decay of the folk-court and the folk-army, with the triumph of a factious Church-and-lay-aristocracy over a weakening dynasty, sank the national feeling and the national power. The accession of the half-Norman "Confessor" was the beginning of the Conquest. Norman adventurers filled and ruled court, Church, and state. At length, however, the English party won the upper hand, and upon the death of the childless king (Jan. 5, 1066) placed upon the throne their leader, Earl Harold Godwinsson. William of Normandy at once protested, declaring himself Edward's legal successor. He based his title upon hereditary right, through his paternal aunt's marriage, upon an alleged promise of the Confessor, and upon a solemn oath of fealty which Harold was asserted to have sworn. Gaining the sanction of the pope, and drawing recruits from every quarter by promises of booty, the duke made ready to enforce his claims. On Sept. 28 the Norman troops disembarked at Pevensey, encountering no resistance. An almost simultaneous Norwegian invasion of Yorkshire had stripped the Channel coast of its defenders. Fresh from the hard-won victory of Stamfordbridge, Harold met the duke on Oct. 14 upon the slope of Senlac, near Hastings, with his veteran house-carls and the ill-armed levies of the Southern Saxon earldoms. His defeat and death decided the fate of England. William was crowned in Westminster the following Christmas. Four more years of conquest, revolt, reconquest, and devastation with fire and sword established fully his supremacy.

Held in armed occupation by conquerors alien in blood, speech, and law, England underwent a complete social revolution, out of which grew changes of the greatest moment in every department of the state-life—above all, in the character of the kingship. Claiming to reign as the Confessor's heir, William pledged the retention of the laws of Edward—*i. e.* of Anglo-Saxon forms and precedents. Thus only could he hold in check his own victorious army. But this very fiction of legality paved the way for the greatest immediate changes demanded by the fact of conquest. Branding Harold's reign as usurpation, all support thereof and all later resistance and revolt as treason, it gave the Crown legal pretext for wide-reaching—in the end practically universal—confiscation of land, whose reassignment, upon military tenure, made state and kingship for the first time thoroughly feudal. The *Domesday Book*, William's famous property-survey, divides the land into 60,215 "knight-fees"—28,015 of which are in the hands of the Church—each being pledged to knight (or equivalent foot) service and to all the precedented feudal taxes and tributes, liable also to escheat and forfeiture. These feoffs or fees are held from the Crown (1) by a score or so of great secular vassals, magnates of Normandy, leaders of the conquering army, invested with large but scattered "complexes;" (2) by several hundred lesser chief-tenants or crown-vassals, nearly all Normans; and (3) by the higher clergy, Norman and Saxon. From these, again, hold by re-enfeoffment 7871 after-vassals—half Saxon thanes, left in possession under Norman overlords, half Norman soldiers, sharing with their leaders the lands they had helped to win. These, too, are sworn "men of the king," levied and led, not by their lords, but by the royal viscounts, constables, and marshals. Instead of the earlier, irregular folk-service, stood now a strong feudal militia, paid with land and under the full control of the monarch from whom they held their pay, making England's rulers for the first time full lords of the island, and England, from the side of power, at least, a thoroughly united state.

Into the forms of legal administration drew at first less change. The thanes still sat, dispensing justice, amid the remnant of the common freemen, in the courts of the county, still held manorial jurisdiction over their serfs and villans, and often over neighboring little freeholders. But among these "law-giving thanes" were now some thousands of foreign soldiers; and in the old folk-courts, instead of the Saxon sheriff, presided the revenue-farming, army-and-police-administering royal viscount. Norman arrogance and native jealousy, confusion of language, contradictions, above all, of Saxon and feudal law and process, made the whole system an engine of injustice and oppression. In the conflict of two constitutions the folk ceases to be the bearer of the legal consciousness; the creation by uniform precedent of new law comes only from the single central will. In England, therefore, centuries earlier than upon the Continent, was established, under the later Norman and Norman-Plantagenet monarchs, the determination of law at the court of the king, and its administration throughout the land by royal judges. With the folk, however, remained the settling of the question of fact; and out of this right, with the decay of the rough mediæval systems of compurgation, duel, and ordeal, grew the jury trial. To the police power of the Norman kings, also, race-hate and resultant lawlessness gave an extraordinary development. Summary "amercements"—in particular, for breach of the king's peace and contempt of royal authority, valid against the mightiest in the land, laid repeatedly upon whole hundreds and counties—widened themselves into a means for enforcing all administrative processes, for guiding the whole mechanism of the absolute state. In the amercements, again, as in every department of the administration, the fiscal spirit of the Norman régime comes prominently forward. Every financial claim of the Anglo-Saxon crown, every revenue of the Norman feudal supremacy, every new right that could be drawn from the centralization of the military, judicial, and police power, was utilized to its utmost capacity. A thoroughly organized system of "farming," guided and held to strict account by a central exchequer, became the foundation of the first enduring official regulations of the Anglo-Norman régime.

To the English Church, upon whose support depended at first the permanence of the conquest, and to Rome, in return for the recognition of his title, the Conqueror made certain concessions. The Church gained even richer endowment than in the Anglo-Saxon time, received separate ecclesiastical jurisdiction, and was brought into closer conformity with Romish usage. On the other hand, royal supremacy over Rome itself on English soil was held fast, and the clergy were fully subjected to all feudal burdens and to the power of the throne. The first three Norman kings reigned full lords of the Church.

Out of the antagonism of two races, by which both were weakened—out of the clashing of English law and of feudal precedent, in which each suffered partial destruction—the Crown thus won a practically unlimited authority in army, court, and Church. From a duchy, where his power was checked by a strong court-baron, William came into a kingdom, whose "Witenagemote" had reduced the kingship to a shadow; and yet neither in his reign nor in those of his immediate successors is there any trace of a legislating and tax-voting "Parliament." A few score Norman magnates, ignorant of English law, robbed, by the uprooting of all old bonds, of that firm fealty of the under-vassal in which they had been wont to find their power, standing among several hundred lesser crown-tenants, from whom no legal line divided them, but in whom they could recognize no actual equality,—these could form neither law-giving Witenagemote nor Norman court-baron—could hardly find, for generations, a tie of class-unity for any purpose whatever. Thrice yearly William's vassals drew together in splendid pageantry for military review. Then were edicts often made public, with, perhaps, the never-withheld "consent of my barons." So, while the power of the thaneship had wrecked the Anglo-Saxon state, while the dynasties of the Continent struggled for centuries to win back to the Crown and to the Tiers État the rights of which the nobility had robbed both, the Norman kings, subjecting all classes alike to the authority and to the burdens of the state, gave to England a wholly other development. Unable to make separate head against the overwhelming power of the king, the English nobility came forward in corporate capacity, in co-operation with English knight and burgess, in sympathy with the whole people, not to win privilege for a class, but right for all—not to shake off the supremacy of the state, but to gain first for themselves, and so, ultimately, for the people, a share in the legal exercise of that supremacy. They became the leaders of the nation in that long constitutionalizing struggle in which Magna Charta marks the first great victory. The new bond of common resistance to common oppression, together with the separation of England and Normandy, hastened in turn the disappearance of race-hate and race-distinctions. In the gradual blending of the two nationalities the older elements won again the mastery. But the rule of the Norman has left deep traces in the altered traits, the mingled speech, the revolutionized social and state life of the more enduring race in which he himself was merged. E. Munroe Smith.

Nor′næ [Icelandic, *Nornir*], in Scandinavian mythology, the goddesses of fate, sitting under the world tree Yggdrasil, whose roots they sprinkle with water from Urdar wells that it may not wither. Their number was originally three—Urðr (Past), Verðandi (Present), and Skuld (Future), but later it increased indefinitely. They seem to have been confounded with the Valkyries, Elves, *Fylgjur*, and *Völur*, and to have assumed by degrees the character of abstract ideas; each man had his own norn.

Nor′ristown, R. R. centre, cap. of Montgomery co., Pa. (see map of Pennsylvania, ref. 6–J, for location of county), about 16 miles from Philadelphia, has a good school system, an opera-house, blast-furnaces and rolling-mills, several large iron-working establishments, and a number of cotton and woollen mills. It is in a rich farming and mineral district. Pop. in 1870, 10,753; in 1880, 13,063.

Norr′kjöping, town of Sweden, in lat. 59° N., near the Baltic, at the Motala, which here is crossed by several substantial bridges and lined with commodious quays and spacious docks. It has important shipbuilding and sugar-refining establishments, a salmon fishery, and manufactures of starch, paper, leather, linen and woollen goods, etc. Pop. 26,735.

North (Christopher). See Wilson, John.

North (Edward), L. H. D., b. at Berlin, Conn., Mar. 9, 1820; graduated with the highest honors at Hamilton College 1841; was elected professor of ancient languages in that institution 1843; has occupied the chair of Greek since 1863, and has been absent from his post only two terms during more than thirty years of professional service, this absence having been occasioned by a visit to Greece in the winter of 1871–72. Prof. North was chosen president of the New York State Teachers' Association; was chairman of the executive committee of the University Convocation of the State of New York; has been for thirty years chairman and necrologist of the alumni association of Hamilton College; has edited during nearly the same period the triennial catalogue; is now (1876) engaged upon a biographical catalogue of the Hamilton alumni; is senior editor of the *School Bulletin*, published at Syracuse, N. Y.; has been for many years an occasional contributor to the *North American Review* and other standard periodicals; is favorably known as a lecturer on literary themes, and noted for his devotion to the interests of the cause of education, and to those of Hamilton College in particular, as evinced by the above notice of his past and present educational labors, which were recognized in 1869 by the University of the State of New York by conferring upon him the honorary degree of "Doctor of Literature" (L. H. D.), the first ever granted in America. Porter C. Bliss.

North (Francis), Baron Guilford, son of the fourth Baron North, b. in England Oct. 22, 1637; studied at Cambridge and at the Middle Temple; was called to the bar 1661; was retained by the Crown in important cases; was knighted and became solicitor-general 1671; appointed attorney-general 1673, chief-justice of the common pleas 1675, privy councillor 1679, lord keeper of the great seal 1682; created Baron Guilford Sept., 1683, and d. Sept, 5, 1685.—Of his brothers, Sir Dudley, b. May 16, 1641, was a wealthy Turkey merchant and M. P., author of some treatises upon political economy, and d. Dec. 31, 1691.—John, b. in London Sept. 4, 1645, became a fellow of Cambridge, professor of Greek, master of Trinity College, doctor of divinity, and editor of Plato's *Dialogues;* d. at Cambridge Apr., 1683.—Roger, b. Sept. 3, 1651, became attorney-general under James II., was author of biographies of the above three brothers (1740–42) and of several treatises on law, politics, and music; d. Mar. 1, 1734.

North (Frederic), earl of Guilford, best known as Lord North, eldest son of Francis, the first earl, b. in England Apr. 13, 1733; educated at Eton and at Trinity College, Oxford; entered the House of Commons as a Tory at an early age; became a lord of the treasury 1763, in which year he was the mover of the expulsion of John Wilkes; supported the American Stamp Act 1765; became joint paymaster of the forces 1766; became chancellor of the exchequer and leader of the House of Commons on the death of Charles Townshend 1767; first lord of the treasury and prime minister 1770; proposed the colonial tea-duty 1773, and the Boston Port Bill Mar., 1774; retired from office Mar., 20, 1782, on the adoption of a policy of peace with the U. S.; became joint secretary of state with Fox in the "coalition ministry" 1783; became blind 1787; succeeded to the earldom 1790, and d. Aug. 5, 1792.

North (Simeon), D. D., LL.D., b. at Berlin, Conn., Sept. 7, 1802; graduated at Yale College 1825; was a tutor there 1827–29; professor of languages at Hamilton College 1829–39, and president of that institution 1839–57, after which he resided at Clinton till he died. D. Feb. 9, 1884. During his presidency, and largely through his agency, the chairs of moral philosophy and rhetoric and of law were established, the cabinet of natural history was founded, the laboratory was built, and North College was completed and occupied. His published works consist chiefly of sermons and discussions on special occasions.

North (Gen. William), b. at Fort Frederick, Pemaquid, Me., in 1755; entered the Revolutionary army 1775; became aide to Baron Steuben 1779, aiding him to introduce discipline in the army, and so won the heart of the baron that the latter on his death in 1794 left half his estate to Gen. North, who was conspicuous as a Federal politician, Speaker of the New York assembly, and U. S. Senator 1798. D. New York Jan. 3, 1836.

North Adams, R. R. centre, Berkshire co., Mass. (see map of Massachusetts, ref. 2–C, for location of county), is the W. terminus of the Hoosac Tunnel and has extensive manufactures. Pop. of tp. in 1880, 10,191; in 1885, 12,540.

North America. See America.

Northamp′ton, or **Northamptonshire,** an inland county of England, comprises an area of 985 square miles, with a pop. of 272,555. The surface is finely diversified with richly wooded hills and well watered valleys, and the soil, mostly consisting of a black mould or a brown loam, is very fertile. Wheat and beans are the common crops; breeding of horses and feeding of cattle and sheep are extensively carried on.

Northampton, town of England, the capital of the county of Northampton, on the Nene. Its manufactures of hosiery and lace have declined, but those of leather, boots, and shoes are very important; also its breweries, iron-foundries, and corn-mills. Pop. in 1881, 51,880.

Northampton, R. R. centre, cap. of Hampshire co., Mass. (see map of Massachusetts, ref. 3–E, for location of county), 17 miles N. of Springfield, on the Connecticut River and the New Haven and Northampton R. Rs. It has excellent waterworks, a female seminary, a high school, a public library, a fire department, and a horse-railway to Florence. Its manufactures include sewing-machines, baskets, pocket-books, cutlery, hoes, silk, paper, buttons, brushes, woollen and cotton goods, etc. The State lunatic asylum is located here. It has the Smith Charities, a benevolent institution, the Smith College, among the foremost of its kind established for women, and the Clarke Institute, for deaf mutes. Pop. of tp. in 1870, 10,160; in 1880, 12,172; in 1885, 12,896.

Northampton (Spencer Joshua Alwyne **Compton**), second Marquis and tenth Earl of, b. in England Jan. 2. 1790; educated at Trinity College, Cambridge; entered Parliament 1812; succeeded to the marquisate May, 1828; invariably voted in the House of Lords for all liberal measures, but otherwise took no part in politics; was chosen successor of the duke of Sussex as president of the Royal Society 1838; signalized his occupancy of that post by a zealous performance of its duties and by brilliant reunions of scientific and literary men at his mansion in Piccadilly; retired from the presidency 1849; d. Jan. 17, 1851.

North Attleborough, on R. R., Bristol co., Mass. (see map of Massachusetts, ref. 4–I, for location of county), is a part of Attleborough township, and has large manufactures of jewelry, etc. Pop. of tp. in 1870, 6769; in 1880, 11,111; in 1885, 13,175.

North Bend, Hamilton co., O. (see map of Ohio, ref. 7–B, for location of county), on the Ohio River, and on the Ohio and Mississippi and the Cincinnati Indianapolis St. Louis and Chicago R. Rs. This was the residence of Gen. William Henry Harrison, President of the U. S., whose tomb, built of brick, simple in design, and placed upon a knoll a short distance from the bank of the river, is visible for miles up and down the Ohio.

North Bend, Neb. See Appendix.

North′brook (Francis Thornhill **Baring**), first Baron, b. at Winchester, England, in 1796, eldest son of Sir Thomas Baring, Bart., and grandson of Francis Baring, founder of the banking-house of Baring Brothers; was educated at Winchester School and Christ Church, Oxford; was called to the bar 1823; entered Parliament as borough member for Portsmouth 1826; continued to represent that city thirty-nine years, in constant allegiance to the Whig party; was a lord of the treasury under Earl Grey (1830), joint secretary of the treasury under Lord Melbourne, chancellor of the exchequer 1839–41, first lord of the admiralty 1849; retired 1852; was raised to the peerage as Baron Northbrook of Stratton Dec., 1865. D. Sept. 6, 1866.

Northbrook (Thomas George **Baring**), eldest son of the first baron, b. at Stratton Park, near Winchester, in 1826; graduated at Christ Church, Oxford, 1846; was successively private secretary to Mr. Labouchere at the board of trade, to Sir George Grey at the home office, to Sir Charles Wood at the India board and at the admiralty; entered Parliament in the liberal interest 1857; was a lord of the admiralty 1857–58, under-secretary of state for India June, 1859–Jan., 1861, for war from the latter date to June, 1866, and again on the accession of Mr. Gladstone, Dec., 1868, till Feb., 1872, when he was appointed viceroy and governor-general of India, having succeeded to the barony in Sept., 1866. In 1876 he resigned and was created a viscount; in 1880 he was appointed first lord of the admiralty in Gladstone's cabinet.

North Brookfield, on R. R., Worcester co., Mass. (see map of Massachusetts, ref. 3–F, for location of county). Pop. in 1880, 3427.

North Cape. See Cape North.

North Caroli′na, one of the Southern Atlantic States, and one of the original thirteen (see map of N. C. and S. C., in article South Carolina), is bounded N. by Virginia, W. by Tennessee, S. by South Carolina and Georgia, and E. by the Atlantic; embraced between 33° 49′ 45″ and 36° 33′ N. lat., and 75° 25′ and 84° 30′ W. lon.; greatest width from N. to S., 180 miles; greatest length from E. to W., 480 miles; area, 52,250 square miles, or 33,440,000 acres.

GREAT SEAL OF THE STATE OF NORTH CAROLINA
CONSTITUTION

Seal of North Carolina.

North Carolina, by census of 1880, ranked 15 among the States in population, 18 in value of agricultural products, and 29 in value of manufactures.

Face of the Country, Soil, etc.—A fringe of narrow, low sand-islands, or "banks," stretches southward along the whole seaboard, with three dangerous promontories jutting into the Atlantic—Cape Hatteras, Cape Lookout, and Cape Fear. Separating these "banks" from the main is a chain of sounds affording sheltered interior water-communication with occasional outlets to the sea. The State falls into three natural subdivisions—the eastern, the middle, and the western. Eastern North Carolina, deeply indented at the coast-line, is low and level—a broad expanse of from 40 to 60 miles toward the interior of pine-forests, intersected by cypress morasses, embracing an area of 3,000,000 acres. The middle division extends back to the mountains—a broad area of undulating country, either cultivated or covered with deciduous trees, affording well-watered, rich, arable land, the region of corn, cotton, and tobacco, and of wheat toward the mountains. Western North Carolina embraces the mountains and high table-land. The Appalachian Mountains here reach their greatest elevation, several of the peaks being the loftiest E. of the Mississippi River. The range nearest the coast is known as the Blue Ridge, while the other is designated in different sections as the Black, Smoky, Iron, and Unaka Mountains. The lowest points or gaps in the Black Mountains are nearly as elevated as Mount Washington, while Mount Mitchell is 400 feet higher, or 6707 feet above the sea; five other peaks of the same range are also higher than Mount Washington. All these mountains, fertile to their summits, are clothed with magnificent forests. The table-land between the ridges is broken into a series of separate well-watered valleys of great fertility. It is one of the most salubrious and picturesque sections of the U. S.

Rivers, Lakes, etc.—North Carolina is well watered, but owing to shifting sand-bars at their mouths, and rapids and waterfalls in their descent from the hills to the lowlands, few of her rivers are navigable except for small craft. The Cape Fear River is the largest in the State—250 miles in length, navigable 34 miles, and for sloops and small boats 86 miles farther; the Roanoke is 150 miles long, navigable for 30 miles, and for small steamers 90 miles farther; the Neuse and Tar rivers are each navigable for small steamboats 100 miles or more; the Chowan has about 75 miles of similar navigation; the Yadkin, Catawba, and French Broad, traversing South Carolina on their way to the Atlantic, are not navigable in North Carolina. Large tracts of the lowlands are covered with swamps, and most of them enclose lakes of greater or less extent.

Mineral Resources.—These are enormous. The richest gold-mine known in the U. S. before the acquisition of California was in Rowan co. In 1799 a nugget found in Cabarrus co. weighed 78 pounds. For years a number of gold-veins and *placers*, or gravel deposits, were extensively worked over a large territory on both sides of the Blue Ridge. Silver, lead, and zinc occur in association, notably in Davidson co. Silver-ores intermixed with lead or copper are found in Burke, Caldwell, Gaston, Wilkes, and other interior counties. Copper-ores, chiefly pyrites, are spread over a wide field. Mica of a very superior quality is mined among the coarse-grained granites of Cleveland, Mitchell, and Yancey cos. Diamonds of fine water, of from one half to two carats, have been found in Franklin, Lincoln, Mecklenburg, and Rutherford cos., and fine detached crystals of zircon, garnets, and graphite occur in the gneissoid rocks. North Carolina is a chief source of supply of granular or crystalline corundum or emery. Arsenic, antimony, bismuth, cobalt, and nickel are also met with. But the chief mineral wealth of the State is in its coal and iron. The coal, mostly bituminous, of the Triassic (not Carboniferous) formation, is of the same age as that near Richmond, Va. There are two fields—that of Dan River, in Stokes and Rockingham cos., with an area of 30 square miles, and that of Deep River, in Chatham and Moore cos., with an area of 40 square miles, of which each square mile is estimated to contain 6,000,000 tons of coal of the best quality. These coal-measures consist of strata of slate, calcareous shales alternating with beds of argillaceous carbonate of iron and seams of coal, the whole enclosed between two beds of red sandstone. The slate associated with it yields from 30 to 40 gallons of crude petroleum per ton.

The *climate* varies with the physical diversities of the country. In the mountains buckwheat flourishes, while oranges grow at Wilmington. The temperature of the lowlands is hot and humid, but in the interior the air is singularly pure, dry, and elastic. The heat of the summer day is succeeded by cool, refreshing evenings and nights; the winters are mild and genial. The average rainfall is about 45 inches.

Vegetation.—Relatively, the forests are in their primitive condition. The vegetable growth ranges from the balsam, from 4000 to 6500 feet above tide-water, to the tropical palm on the lower Cape Fear River, with the cypress, juniper, white and red cedars, evergreen oaks, and the long-leaf pine in the coast zone, the swamp-lands of which abound with undergrowth of cane, affording succulent food for cattle in winter; grape-vines and other trailing plants and a parasitic moss drape the trees of that region. In the interior there are white and yellow pines, black, chestnut, red, Spanish, and white oaks, ash, birch, chestnut, dogwood, elm, black and white gum, hickory, laurel, locust, maple (sugar), black, red, and white mulberry, sycamore, and other deciduous trees and shrubs. The State is prolific of indigenous grapes, and three of the native species in highest repute in the U. S.—the Catawba, Isabella, and Scuppernong—had their origin in North Carolina. Several varieties of the honeysuckle, the fragrant yellow jessamine, and the scarlet trumpet-vine are among the varied flora, while the mountains are full of medicinal plants, particularly ginseng and gentian.

Zoology.—The swamps afford haunts for bears, the otter, beaver, and muskrat; the extensive forests and mountains have preserved the wolf, deer, opossum, squirrel, raccoon, gray, black, and red fox, with several species of rabbits. The sounds, swamps, and streams of the coast-belt abound in turtles, terrapins, and water-snakes, with large flocks of swans, geese, brant, a great variety of ducks, the pelican, and other aquatic birds, as well as immense numbers of valuable fish, such as Spanish mackerel, shad, sheepshead, blue, red, and black fish, bass, flounders, soles, mullet, and herring. Serpents, such as the rattlesnake, king, green, chicken and cow snakes, with the viper and others, are numerous. The bald and gray eagle, fish-hawks, and several species of falcons, the buzzard, raven, crow, and blackbird, pheasant and quail, woodcock, snipe, plover, curlew, dove, pigeon, whippoorwill, lark, mocking-bird and other genera and species of birds are widely spread.

Agricultural Productions.—By the census of 1880 the cereal crops of North Carolina aggregated Indian corn, 28,019,839 bushels; wheat, 3,397,393 bushels; oats, 3,838,068 bushels; rye, 285,160 bushels; buckwheat, 44,668 bushels. The wool-clip of 1880 yielded 917,756 pounds. Of tobacco there were raised 26,986,213 pounds; in this staple North Carolina ranks sixth among the States. The yield of cotton in 1880 was 389,598 bales, or 92,530 tons. Of rice there were raised, in 1879, 5,609,191 pounds. Turpentine and peanuts are extensively produced for export.

*Farm Animals.**—By census of 1880, North Carolina had 133,686 horses, 81,871 mules, 657,426 cattle, 461,638 sheep, 1,453,541 swine.

Manufactures.—North Carolina is not largely a manufacturing State, its main interest being agriculture. Formerly its mines of iron-ore were considerably worked, but, not proving very profitable, were allowed to rest. The total production of iron and steel manufactures by the census of 1880 was only $41,085. There were several cotton-factories, numbering 1960 looms, 102,767 spindles, employing 3428 hands, and using 27,508 bales of cotton. Lumber is a considerable article of manufacture.

Railroads.—There were in operation, Jan. 1, 1882, in North Carolina, 1619 miles of railway, costing $30,185,049, with net earnings of $1,253,530, and paying interest and dividends to the amount of $840,489. The Carolina Central, the Wilmington and Weldon, and the Western North Carolina R. Rs. are the more prominent of these for length and traffic.

Finances.—The assessed valuation of property in 1881 was: real estate, $102,348,216; personal, $67,568,691: total, $169,916,907. Rate of State tax, 32½ cents on $100, yielding $120,000 in 1880; total raised by taxation, State, county, and town, $1,916,132. Amount of State debt, Oct. 1, 1881: principal, $16,690,045; interest unpaid, $10,160,183; total, $27,122,228. The debt, however, has been "scaled" by the legislature at from 15 to 40 per cent. of its face value (except about $13,000,000 of State bonds, unprovided for in this compromise of the debt), reducing the amount of acknowledged State debt to $5,706,716. The aggregate indebtedness, State and local, is returned at $8,194,606.

Commerce.—The direct foreign trade of North Carolina is pretty large, consisting principally of cotton exported. The imports at her three ports of entry (Beaufort, New Berne, and Wilmington) amounted to $157,431 in 1881, and the exports to $5,603,852. The interior commerce is considerable, both by R. R. and rivers. The shipping of North Carolina in 1881 aggregated 289 sailing and 41 steam vessels, measuring 12,669 tons.

Banks, etc.—There were in operation, Oct. 1, 1881, in North Carolina, 15 national banks, with capital of $2,501,000: circulation, $1,676,930; U. S. bonds to secure circulation, $1,868,000; deposits, $3,244,682. There

COUNTIES.	† Ref.	Pop. 1870.	Pop. 1880.	COUNTY TOWNS.	Pop. 1880.
Alamance	2-G	11,874	14,613	Graham	379
Alexander	2-D	6,868	8,355	Taylorsville	180
Alleghany	2-D	3,691	5,486	Sparta.	
Anson	4-F	12,428	17,994	Wadesborough	800
Ashe	2-D	9,573	14,437	Jefferson	196
Beaufort	3-J	13,011	17,474	Washington	2,462
Bertie	2-J	12,950	16,399	Windsor	461
Bladen	4-H	12,831	16,158	Elizabethtown	212
Brunswick	5-H	7,754	9,389	Smithville	1,008
Buncombe	3-C	15,412	21,909	Asheville	2,616
Burke	3-D	9,777	12,809	Morganton	861
Cabarrus	3-E	11,954	14,964	Concord	1,264
Caldwell	2-D	8,476	10,291	Lenoir	422
Camden	2-K	5,361	6,274	Camden C. H.§	1,987
Carteret	4-J	9,010	9,784	Beaufort	2,009
Caswell	2-G	16,081	17,825	Yanceyville	337
Catawba	3-D	10,984	14,946	Newton	583
Chatham	3-G	19,723	23,453	Pittsborough.	
Cherokee	3-A	8,080	8,182	Murphy	170
Chowan	2-J	6,450	7,900	Edenton	1,382
Clay	3-A	2,461	3,316	Hayesville	111
Cleveland	3-D	12,696	16,571	Shelby	990
Columbus	5-G	8,474	14,439	Whiteville §	2,670
Craven	4-I	20,516	19,729	New Berne	6,443
Cumberland	4-G	17,035	23,836	Fayetteville	3,485
Currituck	2-K	5,131	6,476	Currituck C. H.	
Dare	3-D	2,778	3,243	Manteo.	
Davidson	3-F	17,414	20,333	Lexington	626
Davie	2-E	9,620	11,096	Mocksville	562
Duplin	4-I	15,542	18,773	Kenansville	376
Durham‡	2-G	.....	......	Durham	2,041
Edgecombe	2-I	22,970	26,181	Tarborough	1,600
Forsyth	2-F	13,050	18,070	Winston	2,854
Franklin	2-H	14,134	20,829	Louisburg	730
Gaston	3-D	12,602	14,254	Dallas	417
Gates	2-J	7,724	8,897	Gatesville	187
Graham	3-A	......	2,335	Robbinsville	47
Granville	2-H	24,831	31,286	Oxford	1,349
Greene	3-I	8,687	10,037	Snow Hill	332
Guilford	2-F	21,736	23,585	Greensborough	2,105
Halifax	2-I	20,408	30,300	Halifax	376
Harnett	3-G	8,895	10,862	Lillington	63
Haywood	3-B	7,921	10,271	Waynesville	225
Henderson	3-C	7,706	10,281	Hendersonville	554
Hertford	2-I	9,273	11,843	Winton	253
Hyde	3-K	6,445	7,765	Swan Quarter§	1,178
Iredell	3-E	16,931	22,675	Statesville	1,062
Jackson	3-B	6,683	7,343	Webster	107
Johnston	3-H	16,897	23,461	Smithfield	485
Jones	4-I	5,002	7,491	Trenton	149
Lenoir	4-I	10,434	15,344	Kinston	1,216
Lincoln	3-D	9,573	11,061	Lincolnton	708
McDowell	3-C	7,592	9,836	Marion	372
Macon	3-B	6,615	8,064	Franklin	207
Madison	2-C	8,192	12,810	Marshall	175
Martin	3-I	9,647	13,140	Williamston	483
Mecklenburg	3-E	24,299	34,175	Charlotte	7,094
Mitchell	2-C	4,705	9,435	Bakersville	476
Montgomery	3-F	7,487	9,374	Troy	130
Moore	3-G	12,040	16,821	Carthage	366
Nash	2-H	11,077	17,731	Nashville	212
New Hanover	5-H	27,978	21,376	Wilmington	17,350
Northampton	2-I	14,749	20,032	Jackson	255
Onslow	5-I	7,569	9,829	Jacksonville	94
Orange	2-G	17,507	23,698	Hillsborough	781
Pamlico	4-J	......	6,323	Bayborough	209
Pasquotank	2-J	8,131	10,369	Elizabeth City	2,315
Pender	5-H	......	12,468	Burgaw.	
Perquimans	2-J	7,945	9,466	Hertford	661
Person	2-G	11,170	13,719	Roxborough	483
Pitt	3-I	17,276	21,794	Greenville	912
Polk	3-C	4,319	5,062	Columbus	71
Randolph	3-F	17,551	20,836	Ashborough	299
Richmond	4-F	12,882	18,245	Rockingham§	2,482
Robeson	4-G	16,262	23,880	Lumberton	533
Rockingham	2-F	15,708	21,744	Wentworth	242
Rowan	3-E	16,810	19,965	Salisbury	2,723
Rutherford	3-C	13,121	15,198	Rutherfordton	300
Sampson	4-H	16,436	22,894	Clinton	620
Stanley	3-F	8,315	10,505	Albemarle §	1,802
Stokes	2-F	11,208	15,353	Danbury	144
Surry	2-E	11,252	15,302	Dobson §	1,747
Swain	3-B	......	3,784	Charleston §.	1,352
Transylvania	3-C	3,536	5,340	Brevard	223
Tyrrell	3-K	4,173	4,545	Columbia	166
Union	4-E	12,217	18,056	Monroe	1,564
Vance‡	2-H	......	......	Henderson	1,421
Wake	3-H	35,617	47,939	Raleigh	9,265
Warren	2-H	17,768	22,619	Warrenton	816
Washington	3-J	6,516	8,928	Plymouth	836
Watauga	2-D	5,287	8,160	Boone	167
Wayne	3-H	18,144	24,951	Goldsborough	3,286
Wilkes	2-D	15,539	19,181	Wilkesborough	200
Wilson	3-H	12,258	16,064	Wilson	1,475
Yadkin	2-E	10,697	12,420	Yadkinville	129
Yancey	2-C	5,909	7,694	Burnsville§	709
Total		1,071,361	1,399,750		

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* On farms only.

† Reference for location of counties. See map of North and South Carolina, in article SOUTH CAROLINA.

‡ Organized since census of 1880.

§ Townships.

were besides 9 State banks and trust companies, with $463,807 capital and $1,063,523 deposits, and 4 private bankers, with $40,833 capital and $102,240 deposits. Of insurance companies there was 1 local company reported in 1881; amount of losses paid same year, $312,200.

Education, etc.—The number of children of school-age (six to twenty-one years) in 1880 was 459,324, of whom 256,422 were enrolled in public schools, with average daily attendance of 164,570. Aggregate expenditure for public schools in 1880, $383,709, of which salaries of teachers required $328,717. There are 8 colleges or universities, employing 80 instructors, with 1222 students, paying tuition fees in 1880 of $27,500. There were published in North Carolina, in 1882, 123 newspapers and periodicals, 9 of which were daily.

Churches.—The Baptists are in the majority, having 1809 churches, 1065 ministers, and 167,699 members; Methodist Episcopal, South, 218 ministers, 73,802 members; Presbyterians, South, 228 churches, 116 ministers, 18,471 members; Christians (Disciples of Christ), 100 churches, 79 ministers, 14,700 members; Protestant Methodists, 165 churches, 109 ministers, 12,400 members; Methodist Episcopal, 173 churches, 55 ministers, 12,228 members; Lutherans, 61 churches, 34 ministers, 7000 members; Protestant Episcopal, 78 churches, 68 ministers, 5294 members; Presbyterians, 83 churches, 30 ministers, 4762 members; Roman Catholics, 11 churches, 8 priests and about 1800 Catholic population; and 15 other denominations, having from 4000 to 75 members each.

Population.—In 1860, 992,622; 1870, 1,071,361; 1880, 1,399,750 (white 867,242, colored 532,508, including 1230 Indians and 1 Japanese).

Principal Cities and Towns, Pop. 1880.—Wilmington, 17,350; Raleigh (cap.), 9265; Charlotte, 7094; New Berne, 6443; Fayetteville, 3485: Goldsborough, 3286; Winston, 2854; Asheville, 2616; Greensborough, 2105; Beaufort, 2009.

History.—The coast of North Carolina was explored in 1584 by two vessels sent out by Sir Walter Raleigh. In Apr., 1585, Raleigh sent out a colony of 108 persons. This expedition began a settlement at Roanoke Island, but the colonists returned the next year. In 1587, Sir Walter sent out a second colony, of about the same number, but, absorbed in the wars in Europe, he neglected his American colony; and when he sought for it some years later, all traces of it had disappeared. In 1662, Charles II. made a grant to the duke of Albemarle (Gen. Monk), the earl of Clarendon, Sir H. Berkeley (then governor of Virginia), and five others, of all lands lying between the 31st and 36th degrees of N. lat., westward to the Pacific. The grantees, organized as "Lords Proprietors of the Province of Carolina," were to have political control over the colonies which should be planted there. Great efforts were made by the lords proprietors to draw colonists to Carolina. Colonies of French, German, and Swiss Protestants were sent over, and New Berne was founded by the latter. There was a short but fierce war with the Tuscaroras and other Indians (1711–13), but it terminated successfully for the colonists, and for 60 years they had no further trouble from the Indians. About 1700 the colony was divided into North Carolina and South Carolina, and separate governments were organized. In 1729 the rights, interests, and franchises of the lords proprietors were purchased by the crown, and the colony passed under royal control. Large bodies of emigrants from the North of Ireland, from the Scottish Highlands, and a band of Moravians settled in the colony. The last legislature which recognized the royal authority was that of Mar., 1774. The following August a provincial congress was called by the people, and appointed delegates to the Continental Congress to meet at Philadelphia. In Apr., 1775, a second provincial congress was called to meet in the following August. The congress met and organized a provincial government for the colony and a committee of safety, and provided for raising several regiments for public defence. In May, 1775, a few inhabitants of Mecklenburg co. formed an association for the assertion of political rights in the colony, and in an address delivered on the occasion renounced allegiance to the British crown; this movement was called the "Mecklenburg Declaration of Independence," but did not receive general support. On Apr. 12, 1776, the colonial congress empowered its delegates to the Continental Congress at Philadelphia to concur with those of other colonies in declaring independence and forming foreign alliances. The Declaration of Independence was ratified by North Carolina Aug. 1, 1776. On Dec. 18, 1776, a convention met at Halifax and framed a constitution for the State, which remained the organic law of the State until 1835. The Constitution of the U. S. framed by the convention of 1787 was rejected by North Carolina in 1788, but the following year it was ratified by the State. During the war of 1812, North Carolina had no battles or serious losses on her own territory. After the election of President Lincoln, in Nov., 1860, many of the citizens sympathized with the secession movement. The general assembly which met in Jan., 1861, called a convention to meet in the following May to consider the question of secession, On the 20th of May the convention passed an ordnance of secession, and adopted and ratified the constitution of the Confederate States framed at Montgomery, Ala. Provision was made soon after for the representation of the State in the Confederate Congress at Richmond. On Apr. 28, 1865, Gov. Vance issued a proclamation announcing that the war was at an end. W. W. Holden was appointed provisional governor of the State in June, 1865, and in August an election of delegates to a constitutional convention at Raleigh was ordered. This convention met on Oct. 2, 1865, repealed the ordnance of secession, and formally declared that slavery and involuntary servitude should be and were for ever prohibited within the State. In May, 1866, the constitutional convention was again convened, and made some radical changes in the State constitution which were rejected by the people. At the annual election in Aug., 1866, the legislature refused to ratify the Fourteenth Amendment to the Constitution of the U. S. By the reconstruction act of Congress of Mar., 1867, North Carolina was declared to be still under military authority, and all existing governments to be provisional till the State, by adopting the course prescribed by the act, should be qualified for readmission to the Union. Another convention was called, and delegates elected to it in accordance with the provisions of the reconstruction act, Nov. 20, 1867. The convention met at Raleigh, Feb. 14, 1868, and adopted a constitution which was ratified by the people. This was approved by Congress June 23, 1868, and, the Fourteenth Amendment being ratified by the legislature, the State was restored to the Union in July, 1868.

Governors of the Colony and State.

Under the Lords Proprietors.	
George Drummond	1663–67
Samuel Stevens	1667–74
——— Cartwright	1674–77
——— Miller	1677–78
John Culpepper	1678–80
John Harvey*	1680–81
John Jenkins	1681–83
Seth Sothel	1683–89
Philip Ludwell	1689–93
Alexander Livingston	1693–95
Thomas Harvey	1695–1705
Henderson Walker	1705–09
William Grover	1709–10
Edward Hyde	1710–22
Thomas Pollock*	1722
William Reed	1722–24
George Burrington	1724–25
Sir Richard Everhard	1725–30
Under the Crown.	
George Burrington	1730–34
Gabriel Johnston	1734–53
Nathaniel Rice	1753–54
Matthew Rowan	1754
Arthur Dobbs	1754–65
William Tryon	1765–71
Josiah Martin	1771–75
Governors of the State.	
Richard Caswell	1777–79
Abner Nast	1779–81
Alexander Martin	1782–84
Richard Caswell	1784–87
Samuel Johnston	1787–89
Alexander Martin	1789–92
Richard D. Spaight	1792–95
Samuel Ashe	1795–98
William R. Davie	1798–99
Benjamin Williams	1799–1802
James Turner	1802–05
Nathaniel Alexander	1805–07
Benjamin Williams	1807–08
David Stone	1808–10
Benjamin Smith	1810–11
William Hawkins	1811–14
William Miller	1814–17
John Branch	1817–20
Jesse Franklin	1820–21
Gabriel Holmes	1821–24
Hutchings G. Burton	1824–27
James Iredell	1827–28
John Owen	1828–30
Montfort Stokes	1830–32
David L. Swain	1832–35
Richard D. Spaight	1835–37
Edward B. Dudley	1837–41
John M. Morehead	1841–45
William A. Graham	1845–49
Charles Manly	1849–51
David S. Reid	1851–55
Thomas Bragg	1855–59
John W. Ellis*	1859–61
H. T. Clark (acting)	1861–62
Zebulon B. Vance	1862–65
W. W. Holden (prov.)	1865
Jonathan Worth	1865–68
William W. Holden†	1868–71
Tod R. Caldwell	1871–74
Curtis H. Brogden	1874–77
Zebulon B. Vance	1877–79
Thomas J. Jarvis	1879–85
Alfred M. Scales	1885–89

REVISED BY A. R. SPOFFORD.

North Clarendon, Pa. See APPENDIX.

North'cote (Sir STAFFORD HENRY), BART., F. R. S., b. in London, England, Oct. 27, 1818; graduated with honors at Balliol College, Oxford; was called to the bar at the Inner Temple 1847: was one of the secretaries of the Universal Exhibition of 1851; entered Parliament as a Conservative 1855; took an active part in all questions relating to art and education; was president of the board of trade in Lord Derby's third administration 1866, secretary of state for India Mar., 1867–Dec., 1868; was a member of the high joint commission which drew up the treaty of Washington 1871; became chancellor of the exchequer in Disraeli's cabinet Feb., 1874; published *Twenty Years of Financial Policy* (1862); elected governor of the Hudson's Bay Company Jan., 1869; became first lord of the treasury June, 1885.

North-east, R. R. junction, Erie co., Pa. (see map of Pennsylvania, ref. 1–A, for location of county), on the Lake Shore and Michigan Southern and the New York Chicago and St. Louis R. Rs., 15 miles E. of Erie, contains the Lake Shore Seminary, a furnace, a paper-mill, a woollen-factory, a barrel-factory, a fine park, and a woodenware manufactory. Pop. in 1870, 900; in 1880, 1396.

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* Died in office.

† Impeached and deposed.

Northern Indians. See MIGRATIONS OF THE AMERICAN ABORIGINES, by HON. LEWIS H. MORGAN.

Northern Lights. See AURORA BOREALIS.

Northfield, city and R. R. centre, Rice co., Minn. (see map of Minnesota, ref. 10–E, for location of county), on the Chicago Milwaukee and St. Paul and the Minneapolis and St. Louis R. Rs., 40 miles S. of St. Paul, has a good school system, is the seat of Carleton College, and has manufacturing interests. Pop. in 1880, 2296; in 1885, 2948.

Northfield, Washington co., Vt. (see map of Vermont, ref. 5–C, for location of county), on Central Vt. R. R., 10 miles S. by W. of Montpelier, has good graded and high schools, Lewis College, formerly Norwich University, and quarries of argillaceous slate. Pop. in 1880, 1313.

Northford, on R. R., New Haven co., Conn. (see map of Connecticut, ref. 6–D, for location of county). Pop. in 1880, 510.

North He'ro, cap. of Grand Isle co., Vt. (see map of Vermont, ref. 2–A, for location of county), 51 miles N. W. of Montpelier, has good schools and several churches. Pop. of tp. in 1870, 601; in 1880, 637.

North Hol'land, Canal of. In the sixteenth century Amsterdam was one of the first commercial ports of Europe. The gradual advancement of the art of navigation, together with the increase in draught of vessels, demanded an access more favorable than was afforded by the difficult and shoal channels through the Zuyder Zee. To supply such an access, the North Holland Canal was cut from Buiksluyt, opposite Amsterdam, to the Helder, a distance of 51 miles. It is 124 feet broad at the surface and 31 feet at the bottom, and is available for vessels drawing 18 feet of water. But in winter it is blocked up by ice, and its capacity is not equal to that of the largest sea-going commercial vessels. Hence the construction of the NORTH SEA CANAL (which see). J. G. BARNARD.

North La Crosse, on R. R., La Crosse co., Wis. (see map of Wisconsin, ref. 6–B, for location of county), 1 mile N. of city of La Crosse. Pop. not in census.

North Manchester, Conn. See APPENDIX.

North Manchester, R. R. junction, Wabash co., Ind. (see map of Indiana, ref. 3–F, for location of county), 14 miles N. E. of Wabash, has an academy and manufacturing interests. Pop. in 1880, 1585.

North Platte, city, cap. of Lincoln co., Neb. (see map of Nebraska, ref. 10–D, for location of county), situated on the Union Pacific R. R., 300 miles W. of the Missouri River, has the repair-shops of the Union Pacific R. R. and derives much support from R. R. employés and track-hands. Stock-raising constitutes a leading industry. Pop. in 1880, 363; in 1885, 2540.

Northport, Suffolk co., N. Y. (see map of New York, ref. 7–D, for location of county), on Long Island R. R. and Northport harbor, an arm of Long Island Sound, has shipyards, brickyards, deposits of fire-sand and clay, and a mill. Pop. in 1870, 1060; in 1880, 1381.

North River. See HUDSON RIVER.

North'rop (BIRDSEY GRANT), A. M., b. at Kent, Conn., July 18, 1817; graduated at Yale in 1841; studied divinity at New Haven; Congregational pastor at Saxonville, Mass., 1846–57; agent of Mass. board of education 1857–66; became sec. of Conn. State board of education 1869.

Northrop (GEORGE WASHINGTON), D. D., b. Oct. 15, 1826, at Antwerp, Jefferson co., N. Y.; graduated at Williams College (Mass.) 1854, Rochester Theological Seminary 1857; was first instructor, then professor of church history, in Rochester Theological Seminary till 1867; then elected president and professor of Christian theology in the Baptist Union Theological Seminary, Chicago, Ill.

North Sea, or **German Ocean** (anc. *Mare Germanicum*), lies between Great Britain and the continent of Europe, having the former and the Orkney and Shetland Isles on the W., and Norway, Denmark, Hanover, Belgium, and part of France on the E. and S. Its extreme length from Dover Straits to the most northern of the Shetland Isles, between which and the coast of Norway it merges into the North Atlantic, is about 700 miles; greatest breadth about 420 miles. By the "Skager Rack" Inlet and its extension, the "Kattegat," between the coasts of Denmark and of Norway and Sweden, it communicates with the Baltic Sea. By the Straits of Dover and ENGLISH CHANNEL (which see) it has its southern communication with the Atlantic. The depth varies from 66 to 500 feet, the greatest depths being in the northern portions between the N. of Scotland and Norway. (See *Johnston's Physical Geography.*) If a line be drawn from the N. point of Denmark to the mouth of the Humber, all S. has 30 fathoms or less, which is said to be the average depth. A line from the same point to Edinburgh will leave S. of it nearly all the 50 fathom depths. Farther N. the depth increases rapidly, and is said to attain 190 fathoms near the Norway coast. The bed of the sea is traversed by several vast shoals, the greatest of which, the Dogger Bank, occupies the centre of the sea from lat. 54° 10′ to 57° 24′ N., lon. 1° to 6° 7′ E.; another extends from the Firth of Forth, Scotland, in a N. E. direction a distance of 110 miles, while others run from Denmark and Jutland more than 100 miles to the N. W. The great oceanic tidal wave, deflected around the British Isles, enters this sea from the N. Pursuing its course southward, it rules the tides as far S. as the Thames and opposite coast, sensibly affects the tides of the Continent through the Channel, but, encountering the tide wave from the English Channel in the southern portions, the tidal phenomena are there the result of the conflict, or rather the union, of the two distinct waves, each exaggerated by a shelving bottom and the contraction between converging shores. At the Orkneys the rise is but 12 feet; at the mouth of the Humber and Thames 18 to 20 feet. Washing the shores of populous empires, the North Sea, notwithstanding the manifest dangers due to its currents, fogs, banks, and contracted area, teems with shipping, and has been, indeed, the cradle of navigation to the northern nations, as was the Mediterranean to the ancients. Its fisheries of cod, mackerel, herring, etc. are important, and contribute in no small degree to the wealth and characteristic development of its marginal population. The island of HELIGOLAND (which see) is the only one which properly belongs to the North Sea. The numerous islands along the coast of Norway, Denmark, and Holland are rather fragments of a broken coast-line than islands in the sea. One-ninth of the total river discharge of Europe is received by the North Sea from the Humber, Thames, the Rhine and Scheldt, Eider, Elbe, Weser, etc., and from the "firths" and "fiords" of the Scotch and Norway coasts. The ZUYDER ZEE (which see), which is entered from the North Sea at the Helder, is separated by the chain of sand islands, Texel, Terschelling, etc., which are the existing fragments of the ancient coast-line. The great work of modern hydraulic and maritime engineering, the NORTH SEA CANAL (which see), makes Amsterdam virtually a seaport of the North Sea. (See *Zur Physik des Meeres*, by Dr. Meyer, from the second annual report of the Kiel commission for investigation of the German seas. Berlin, 1874.) J. G. BARNARD.

North Sea Canal of Holland (called in Holland **The Amsterdam Canal**). Even before making the NORTH HOLLAND CANAL (which see) it had been proposed to connect Amsterdam directly with the North Sea. That work answered the existing exigencies, but it was found not to answer those arising from the modern developments of commerce. The bold project of a *direct* water communication with the North Sea through the Y (Dutch Ij), the Wijkermeer, and across the very narrow neck of land (*Holland op zijn Smalst*) which separates the latter from the sea, was revived in 1854. The difficulties were great. Nine different "commissions" of engineers and other experts successively studied and reported upon the subject; and it was not until Jan., 1863, that the law authorizing the construction was perfected and the work undertaken. The project involved not only the canal itself, with its sea-locks and harbor, but the shutting off of the Y at its eastern end from the Zuyder Zee by a dam one mile in length with locks adequate to the purposes of all the coasting-trade of the Zuyder, and of the lighter draught vessels for the North Sea, which still may enter by the Helder. The formation of this dam and the construction of its triple locks,[*] founded by means of a coffer-dam 550 feet in diameter in 18 feet of water on 9000 piles, are among the most remarkable works of hydraulic engineering of recent times.

The canal has a bottom width of 27 mètres (90 feet, about) and a depth of 7½ mètres, or 25 feet; it is carried by embankments dredged from the bottom or brought from the land through the Y and Wijkermeer (the depth of which averages about six feet) and by an excavation (4 miles) through the sand *downs* of the isthmus; total length, 23,700 mètres (14½ miles). The great sea-lock is situated two-thirds of a mile from the shore-line. It has a double (in length) lock-pond of 120 mètres (400 feet, nearly) in total length, 60 feet width, with 25 feet depth on the lock-sills. It is founded at 36 feet below mean low water in the sand of the coast downs, "a depth never before drained in the Netherlands." An artificial harbor has been constructed at the sea entrance (for which see HARBOR). The canal was opened for traffic on Nov. 1, 1876. The waters of the Y and Wijkermeer are drained into the canal, reclaiming 13,142 acres of arable land. To keep the level of the canal down to 1.6 feet below high water at Amsterdam, and thus permit the adjacent lands to be drained, centrifugal pumps driven by steam-power are placed at the Zuyder Zee locks, pumping from the canal into the Zuyder Zee, and also at eight points along the reclaimed land. At low water natural drainage can be effected through the North Sea through the sea-lock. The works cost about $15,000,000. The traffic on the canal is large and constantly increasing. (For further particulars see *Professional Papers* No. 22, Corps of Engineers, U. S. A., by the writer, and the work of M. Croizette Desnoyers, ingénieur-en-chef des ponts et chausées. Also a full description of the works in *Proc. Inst. C. E.*, vol. lxii., 1880. (See Ship Canals.)

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[*] Called the "Orange Locks" (*Oranje Sluizen*), after the reigning family.

J. G. Barnard. Revised by J. J. R. Croes.

North Spring′field, R. R. junction, Greene co., Mo. (see map of Missouri, ref. 7–F, for location of county), on the St. Louis and San Francisco R. R., 241 miles S. W. of St. Louis, has a union school building, Drury College, R. R. machine-shops, a woollen and a flouring mill. Pop. in 1880, 994.

North Syd′ney, a port of entry of Cape Breton Island and county, on the N. W. arm of Sydney Harbor, 18 miles N. of Sydney. Coal is extensively shipped here. There are a marine railway, a U. S. consulate, a weekly newspaper, manufactures of leather, shoes, etc. Steamers connect with Sydney. Pop. of sub-district in 1881, 5484.

Northum′berland, the northernmost county of England, is bounded E. by the North Sea and N. by Scotland. Area, 1952 square miles. Pop. 434,086. The western part of the county consists of the bare and naked Cheviot Mountains and wild moorlands. Toward the E. coast are large fertile valleys with good pasturage and soil fitted for tillage. The principal source of wealth, however, is in the rich mines of lead, copper, and coal in the Cheviot Mountains, which yield annually 20,000,000 tons of coal.

Northumberland, R. R. centre, Northumberland co., Pa. (see map of Pennsylvania, ref. 4–G, for location of county), at the confluence of the N. and W. branches of the Susquehanna River, has a fine park, a rolling-mill and nail-factory, a very large furnace, planing, flouring, and saw mills, car shops, and a farm-implement manufactory. Pop. in 1870, 1788; in 1880, 2293.

Northumberland (Algernon **Percy**), fourth Duke of, second son of the second duke, b. in England Dec. 15, 1792; educated at Eton; entered the navy in childhood; retired 1815; was created Baron Prudhoe 1816; spent many years in travel, especially in Egypt and other Eastern countries; collected a magnificent Oriental museum; founded churches, schools, and charitable institutions, and promoted historical, philological, and archæological research; married Lady Eleanor Grosvenor, daughter of the marquis of Westminster, 1842; succeeded his brother Hugh in the dukedom 1847; restored and decorated upon a splendid scale the ancient seat of the family, Alnwick Castle; was first lord of the admiralty 1853; made a knight of the Garter 1858; was F. R. S., F. S. A., D. C. L., and president of the Royal Institution. D. at Alnwick Castle Feb. 12, 1865.

Northumberland (John **Dudley**), Duke of, b. in England in 1502; commanded the English squadron during the war with France 1544–45; was an executor of the king's will 1547; intrigued against the protector Somerset 1549; acquired chief power in the council 1550; was created earl of Northumberland, lord high steward, and earl marshal 1551; married his fourth son, Lord Guilford Dudley, to Lady Jane Grey, May, 1553; prevailed on Edward to adopt Lady Jane as his successor, June; placed her on the throne July 10, and was executed as a traitor Aug. 22, 1553.

Northum′bria, the largest kingdom of the Saxon Heptarchy, embracing, as its name imports, the region N. of the Humber, and at one time extending to the Forth in Scotland. It was formed into a kingdom by Ida about 547 by the union of Bernicia and Deira. The kingdom was divided at the death of Ida, but reunited under Ethelfrith 593, became the leading British power under Oswald 634–42, and was extinguished by Egbert 827, when the name of England was first applied to the kingdom resulting from the aggregation of the minor states to Wessex and Northumbria. The present county of Northumberland shows a survival of the name of a kingdom many times greater in extent.

North Ver′non, city and R. R. centre, Jennings co., Ind. (see map of Indiana, ref. 9–F, for location of county), 72 miles W. of Cincinnati, has a large academy, furniture-factories, a woollen-mill, and flouring-mills. Pop. in 1870, 1758; in 1880, 1842.

North-western University, an institution of learning of the M. E. Church, situated at Evanston, Cook co., Ill., on the shore of Lake Michigan, 12 miles N. of Chicago. Chartered in 1851 and formally opened in 1855, it now consists of seven distinct colleges, namely, of literature and science, literature and art (for women), technology, music, theology, law, and medicine, besides a preparatory department. The theological department, known as Garrett Biblical Institute, was established in 1856; the medical and legal departments are located at Chicago, having been assimilated to the university in 1869 and 1873, in which years the ladies' college at Evanston was also brought under the same management and the technological department was begun. The library possesses a fund of $60,000, and now consists of 30,000 volumes. All the courses of instruction are open to both sexes.

North-west Passage, a communication by sea between the Atlantic and Pacific oceans, which from the sixteenth to the middle of the nineteenth century was vainly sought by scores of navigators. (See Polar Research.)

Northwest Prov′inces, or **Agra,** a great political division of British India, situated around the upper and middle course of the Ganges, and bounded by Kumaon, Nepaul, Gwalior, and Rajpootana. They consist of the provinces of Delhi, Merut, Rohilcund, Agra, Allahabad, and Benares, and comprise an area of 83,573 square miles, with 30,777,941 inhabitants. Cap. Allahabad.

Northwest Ter′ritories, a general name for all the unorganized portions of British North America. Area, including Arctic islands, 2,665,252 square miles. In 1876 the district of Kewatin, 395,000 square miles, was constituted. Assiniboia (95,000 square miles), Saskatchewan (114,000 square miles), Alberta (100,000 square miles), and Athabasca (122,000 square miles), were organized in 1882.

Face of the Country, Climate, etc.—In general the valleys of the Mackenzie and Red River may be said to be continuous with that of the Mississippi. The iron and lignite-bearing beds of Colorado and Wyoming in the U. S. appear to continue northward to the Arctic Ocean. The country S. and W. of Hudson's Bay is generally well wooded, and has a fair soil, but the severe and long winters will probably always prevent the general settlement of this part. There are great tracts called "barrens," where the hardy lichen called *tripe de roche* (*Gyrophora pustulata*) alone furnishes a poor and scanty food for the lost *voyageur*. In geology, area, soil, and climate the valley of the Nelson resembles that of the Volga. That of the Athabasca is quite as favorable for settlement. The Peace River country has a better climate than that of Manitoba or Northern Minnesota, and is also well watered and timbered, while the soil is not excelled by any. Northward, to within 800 miles of the Arctic Ocean, the western part of the country is generally arable, and one-half will probably be suitable for wheat-growing. The Mackenzie River is navigable for seagoing ships to Fort Simpson. Above the Stony Rapids at this point it is again navigable into Great Slave Lake.

The presence of Canadian French *voyageurs* and trappers and of Scotch traders has given origin to a small class of half breeds. The chief support of the natives and whites has been hunting and trapping for furs. Buffalo, beavers, sables, martens, wolves, foxes, bears, otters, fishers, etc. are very numerous, making this the most important fur-producing region in the world. Pop. in 1881, 56,446.

North′wood, cap. of Worth co., Ia. (see map of Iowa, ref. 2–H, for location of county), on R. R. and Shell Rock River, has a high school, extensive flouring, saw, and carding mills, etc. Pop. in 1870, 289; in 1880, 844.

Norton, cap. of Norton co., Kan. (see map of Kansas, ref. 4–D, for location of county), on Prairie Dog Creek (also called Norton Centre). Pop. in 1880, 634.

Norton (Andrews), b. at Hingham, Mass., Dec. 31, 1786; graduated at Harvard College 1804; studied theology; was tutor at Bowdoin College 1809–10, at Harvard 1811–12; edited the *General Repository* 1812; became lecturer on biblical criticism and librarian 1813. On the organization of the Harvard Divinity School (1819) he became Dexter professor of sacred literature; resigned the office of librarian 1821, and the professorship 1830, on account of ill-health; devoted the remainder of his life to literary pursuits; wrote some devotional poems, many reviews and essays, and several controversial treatises in support of Unitarian theology and against infidelity; published an elaborate and learned work, *The Genuineness of the Gospels* (vol. i. 1837; vols. ii. and iii. 1844; vol. iv., posthumous, 1855). D. at Newport, R. I., Sept. 18, 1853, leaving in MS. a *Translation of the Gospels* (1855).

Norton (Charles Eliot), LL.D., son of Andrews, b. at Cambridge, Mass., Nov. 16, 1827; graduated at Harvard College 1846; engaged in commerce in Boston; went to India as supercargo of a ship 1849; travelled there extensively; returned home through Europe 1850; wrote *Considerations on some Recent Social Theories* (1853); edited, with Dr. Ezra Abbot, his father's posthumous writings (1855); resided in Europe 1855–57; published *Notes of Travel and Study in Italy* (1860); edited the papers of the Loyal Publication Society 1861–65; was associate editor of the *North American Review* (1864–68); issued a translation of Dante's *Vita Nuova* (1867); again in Europe 1868–73; made LL.D. by Oxford University 1884.

Norton (John), b. at Stortford, Hertford, England, May 6, 1606; educated at Cambridge; became curate of Stortford; came to Plymouth, Mass., 1635; preached there during one winter; became minister of the church at Ipswich 1636; was a prominent member of the convention which formed the "Cambridge Platform" 1648; became colleague of Rev. John Wilson as minister of the First church at Boston 1652, and went to England with Gov. Bradstreet as agent of the colony to present an address to Charles II. D. at Boston Apr. 5, 1663. He wrote a large number of works. His *Life* was written by Rev. A. W. McClure in vol. ii. of the *Lives of the Chief Fathers of New England.*

Norton (John Pitkin), b. at Farmington, Conn., 1822; graduated at Yale College 1846; became first professor of agricultural chemistry in that institution 1847; published many scattered essays on scientific and agricultural subjects, and was author of *Elements of Scientific Agriculture* (1850) and the *Appendix* to Stephens's *Book of the Farm* (2 vols., 1858). D. at New Haven Sept. 5, 1852.

Norton (Sidney Augustus), LL.D., b. at Bloomfield, O., Jan. 11, 1835, was graduated from Union College in 1856; afterward made a special study of chemistry in Bonn, Leipzig, and Heidelberg; has been since his graduation a teacher, chiefly of natural science, and of late years chemistry only: has been tutor and professor in Union College, in Miami Medical College, in Starling Medical College, and elsewhere; since 1873 he has been professor of chemistry in the Ohio State University, at Columbus, O.; has written numerous essays upon topics relating to education and science, and a series of textbooks upon physics and chemistry; has also published original researches in natural science.

Norton (William Augustus), A. M., b. at East Bloomfield, N. Y., Oct. 25, 1810; graduated at West Point 1831; was assistant prof. of natural philosophy at West Point 1831–33; prof. of natural philosophy and astronomy in the University of New York 1833–39; in Delaware College 1839–50; president of Delaware College 1850–52; became prof. of civil engineering, Yale College, in 1852; author of textbooks on astronomy, physics, etc. D. Sept. 21, 1883.

Norton (William E.), b. in Boston, Mass., June 28, 1843, was apprenticed in youth to a house, sign, and fresco painter; went to sea at eighteen; at twenty-two began a successful career as a marine painter.

Nor'walk, Fairfield co., Conn. (see map of Connecticut, ref. 6–C, for location of county), 42 miles by rail from New York City, is on the Danbury and Norwalk R. R., and contains an excellent harbor, 4 public halls, fine schools, public and private, with several institutes and seminaries, a public library, carriage-factories, shipyards, a marine and a horse railway, an abundant supply of water and gas throughout the city, felt-mills, iron-foundries, planing and grist mills, chemical works, an iron bolt and screw factory, etc. The Norwalk lockworks and the Norwalk ironworks are among the largest establishments of the kind in the country. Norwalk sends many flowers to New York during the winter. The oyster-trade of Norwalk is extensive, a capital of over $2,000,000 being invested in this industry. The tp. includes the city and seaport of South Norwalk (which see). Numbers of New York residents make this place their summer abode. Pop. of tp. in 1870, 12,119; in 1880, 13,956, including 5308 in Norwalk borough and 3726 in South Norwalk.

Norwalk, city and R. R. centre, cap. of Huron co., O. (see map of Ohio, ref. 2–F, for location of county), equidistant from Cleveland and Toledo, has good union schools, knitting- and sewing-machine factory, planing- and grist-mills, shoe-factory, breweries, and repair-shops. Principal industry, farming. Pop. in 1870, 4498; in 1880, 5704.

Nor'way [Nor. *Norge;* Ger. *Norwegen*], an independent kingdom of Europe, united with Sweden under the same royal dynasty, forms the western part of the Scandinavian peninsula, and extends from lat. 57° 58′ N. to lat. 71° 10′ N., a distance of about 1080 miles, with a breadth of 270 miles in lat. 61° N., but only 20 miles in lat. 67° N. It is bounded E. by Sweden and Russia, S. by Skagerrack, W. by the Atlantic, and N. by the Arctic Ocean, and in its whole length its coast-line is fringed with innumerable islands and indented with long, narrow fjords, of which the most remarkable are Christianiafjord from the Skagerrack, Bukkefjord, Sognefjord, Hardangerfjord, and Tronhjemsfjord from the Atlantic, and Porsang and Warangerfjords from the Arctic Ocean. North Cape forms its northern extremity, Cape Lindesnäs its southern. Area, 122,279 square miles. The Scandinavian peninsula is one continuous mass of mountains, the main axis of which is the Kjöll, which, running in a nearly southern direction, forms the boundary between Norway and Sweden, until in lat. 63° N. it turns into Norway, in a nearly western direction, under the name of Dovrefjell. In lat. 62° N. the Dovrefjell resumes the southern direction, and under different names, Langefjell, Fillefjell, Sognefjell, Hardangerfjell, etc., it covers the whole southern part of Norway, ending in Cape Lindesnäs. The Kjöll, Dovrefjell, etc. are not exactly mountain-ranges, but rather elevated plateaus of considerable breadth, from which bold and majestic peaks rise isolated, and which, to the E., slope down towards the Baltic and the Danish seas through large terraces or tracts of table-land, intersected by broad valleys, or now and then broken up by the rivers into regions of alpine character; while to the W. the plateaus generally extend to the ocean, facing the Atlantic with steep, rocky coasts, and rent to the bottom with frightful fissures, which, with their blue fjords and dark, forest-clad sides, form valleys of a peculiarly wild, romantic beauty. The average height of the plateaus in the Kjöll is 2000 feet, and in the Dovrefjell and Langefjell 4000 feet. The highest peaks are—in the Kjöll, Sulitelma, 6342 feet; in the Dovrefjell, Sneehätten, 8115 feet; in the Langefjell, Skagstölstind, 8390 feet; and in the Fillefjell, Gousta, 6000 feet. The principal valleys of the eastern slope of the plateaus are Ostredalen and Guldbrandsdalen; the most beautiful vale of the western part is that around the Hardangerfjord. The chief river is the Glommen, which after joining the Lougen is called Stor-Elven, forms the beautiful fall Sarpfossen, and falls into the Skagerrack. Besides this, Norway has many smaller streams, of which, however, none are navigable on account of the rapids, cataracts, and falls which generally occupy their whole course. They are, nevertheless, of great industrial importance, as they float down the timber to the ports, and afford most of the power with which the mining and milling machinery of the country is worked.

On account of the great extent of the land from S. to N., and on account of the great difference in the elevation of the surface, the climate of Norway differs considerably in different places. But, considering that one-third of the country is situated within the Arctic zone, and the whole of it has a considerable elevation, the climate must be called peculiarly mild. Cultivation of grain, which in Siberia ceases at lat. 60° N., extends in Norway to lat. 70° N. The snow-line descends in Norway in lat. 61° N. only to a point 5500 feet above the sea, and in lat. 70° N. to one 3500 feet above the sea, while in Siberia the marshes on a level with the sea are frozen many fathoms deep in lat. 70° N. This mildness of the Norwegian climate is due to the presence of the Gulf Stream close to its shores; if the Gulf Stream were to turn its course towards Greenland, civilized life would immediately die out in Norway. According to its climate and vegetation, the country may be divided into three belts—the agricultural belt, where a little wheat, more rye, and much barley, oats, and potatoes are raised, and where the apple and cherry tree, the rose and the lilac, are grown among patches of forests and pasture-land; the forest belt, where the ground is covered with one continuous forest of fir, pine, and birch, with patches of cultivated land along the fjords and rivers, and fields of pasture-land on the heights; and the pasture belt, where the trees, even the shrubs, disappear, where no grain, hardly a berry, will ripen, where nothing will grow but a little grass or moss and lichens, on which the reindeer feed. These three belts may be observed both by moving from S. to N. and by ascending from the fjord to the plateau.

Although agriculture, the rearing of cattle, sheep, and goats, and dairy-farming are carried on with great industry and perseverance, and in many cases—as, for instance, with respect to irrigation—also with great sagacity, still, the country does not produce food in sufficient quantity; grain, meat, butter, and cheese are imported. The chief sources of wealth which Norway possesses are its timber, fisheries, and mines. The annual export of timber amounts to 200,000 lasts, having a value of nearly $2,000,000. In some places the forests were formerly cut down ruthlessly, and the effect was that in the vicinity the glaciers descended much lower, and large fields of good pasture-land were buried for ever under the ice and snow. Great care is now taken not to destroy the forests, and the supply of timber is actually inexhaustible; the only difficulty is how to get at it, as no roads lead, or ever will lead, into the crags and clefts where it grows. Still more important are the fisheries. They yield an annual revenue of $3,000,000 or $4,000,000. All the rivers teem with salmon and salmon-trout; rich oyster-beds are found all along the coasts; lobsters of the finest quality abound; the cod-fisheries at Lofoden give an annual return of 9000 tons of dried fish, besides 22,000 barrels of oil and 6000 barrels of roe, and the herring fisheries along the south-western coast yield annually between 500,000 and 600,000 tons of fish. Norway has about 120,000 people and over 25,000 boats engaged in the fisheries (three-fourths in the cod-fisheries). The total value of the fisheries in 1881 was over $5,000,000. Of the mines, the copperworks at Röraas, the ironworks at Laurvig, and the silver-mines at Kongsberg are the most remarkable; a return valued at from $600,000 to $800,000 is annually obtained from them. The only branch of manufacturing industry which is developed to some degree of perfection and extensively carried on is shipbuilding. The Norwegian merchant fleet consisted in 1868 of 6909 ships, with a tonnage of 225,903 lasts, and manned by 47,570 of the best sailors in the world; in 1873 the vessels numbered 7447, of 1,243,433 tons burden, and manned by 56,147 men; and in 1881 the number of vessels had increased to 7977, of 1,520,404 tons burden, and manned by 60,064 sailors. Of the total number, 4952, of 1,431,565 tons, were engaged in foreign trade; 359, of 65,627 tons, were steamers. The timber is mostly exported to Holland and France, the dried, salted, and smoked fish to the Mediterranean. In 1883 there were 971 miles of railway in Norway, and 5672 miles of telegraph-lines, with 300 stations.

The population of Norway numbers 1,806,900, of whom about 25,000 are Lapps and Finns, living in the northernmost portion of the country. The Norwegians are a strongly-built race, of middle size, with light complexion, light hair, and blue eyes. They are passionate, but self-controlled: audacious, but calm; often shrewd, sometimes false. They have great respect for religion, without being superstitious, and great respect for law, though they are very independent. The established religion is the Lutheran, but other religions are tolerated. Education is very general and very good, although the official system is antiquated and insufficiently carried out. But in a Norwegian family the father never ceases to learn from religious, political, agronomic tracts and pamphlets, which form a characteristic feature of Norwegian literature; and he is always anxious to teach his children what he has found to be sound knowledge.

The earliest history of the Norwegian people has two salient points—the colonization of Iceland in 974, with the visits to Vinland, and the conquest of the Scotch islands; but besides these two great and striking events its domestic history and the history of its daily intercourse with its neighbors have no general interest, though very remarkable when studied in details—astonishing on account of the vitality and animal spirits shown, and interesting on account of the brilliant characters and sublime ideas depicted. In the fourteenth century, however, the people became exhausted. From 1387 to 1814 it was united to Denmark, from which it received very little attention. At the end of the eighteenth century the Norwegian people awakened once more, and when (in 1814) Denmark was compelled to cede Norway to Sweden, thus paying England's and Russia's debt to Bernadotte for his treachery to Napoleon, the Norwegians protested in a dignified and determined manner against being disposed of in such a summary manner; the result of which protest was that Norway to-day is not a province of Sweden, but an independent kingdom, enjoying a free and liberal constitution dating Nov. 4, 1814. The Storthing, consisting of 114 members, is the representative of the sovereign people, and in it is vested the whole legislative power. The king possesses the right of a suspensive veto only over laws passed by the Storthing. The royal veto may be exercised twice; but if the same bill pass three Storthing formed by separate and subsequent elections, it becomes the law of the land without the assent of the king. The Storthing meets every year without any writ from the king or the executive. CLEMENS PETERSEN.

Norway, Oxford co., Me. (see map of Maine, ref. 9–A, for location of county), 42 miles from Portland, on the Grand Trunk R. R., has a high school, a woollen-mill, also paper and pulp mills, flouring-mills, tanneries, a large shoe-factory, carriage, hub, and shovel-handle establishments, a pianoforte, organ, and melodeon manufactory, and a key-factory. Pop. in 1870, 916; in 1880, 1467.

Norway, Menominee co., Mich. (see map of Michigan, ref. 3–F, for location of county), on Menominee River R. R. (Peninsular division of C. & N. W. R. R.), in N. W. part of the State. Pop. of tp. in 1884, 2831.

Norwegian Language and Literature. The separation of Norway from Denmark in 1814 was accompanied by the establishment of an independent government in Norway under a free constitution and in a merely dynastic union with Sweden. It was expected that this great change in the social and political position of the country would soon be followed by the awakening of a national life among the people, and it was hoped that in the course of time this life would present itself to the world in an original literature. These expectations were not disappointed. Hardly half a century had passed ere a truly national literature arose, which from its very beginning commanded the respect of the two other Scandinavian countries, and soon attracted considerable attention in Germany and in England. But the introduction to this literature was strange.

During the union between Denmark and Norway the common literature was Danish. The amount of talent which the Norwegian people contributed to that literature is very considerable, but there is no trace of any specifically Norwegian influence. When the separation took place, all civilization in Norway was Danish—church and school, courts and newspapers, society and business. Under this layer of Danish ideas and Danish language moved the large mass of the people—farmers, sailors, miners, fishermen, and mechanics—speaking various dialects of the old Norse or Icelandic language, and living with the same ideas as their ancestors 1000 years before. Such a state of affairs was intolerable, and the first to break it was Henry Wergeland (1808–45). Wergeland was a highly gifted man, of a strongly-framed mind, but his habits were wild and his temper was uneven, always swinging between enthusiasm and hatred. His theoretical standpoint was the rationalism and philanthropism of the eighteenth century, and his practical purpose the expulsion from Norway of everything Danish. His opposition to Denmark was confused in its measures and uncouth in its manners, but its principle was just and its influence sound. He wrote many volumes of lyrics, epics, dramas, etc., but only a few pages of these have any æsthetic worth. Two small tales, one love-song, some sailors' chants, some children's prayers, and one patriotic song—that is all, but that is of the most exquisite beauty. Meanwhile, Danish literature had made a great step onward with Adam Oehlensläger. Its ideas had become modern, its imagination romantic. And soon this movement reached Norway, where it was represented by J. S. Welhaven (1807–72). It was by no means Welhaven's idea to support that which in Norway was Danish, still less to make the Norwegian civilization a branch of the Danish; he was too patriotic, too proud a man, and had too cultivated a mind. But to the eyes of his adversaries it looked so when he attacked Wergeland and ridiculed his crude and antiquated ideas of art, his narrow patriotism smelling of the village. The contest was really between the eighteenth and the nineteenth centuries, but people were told that it was between Norwegian and Danish, and people became furious. Welhaven's writings, both in prose and in verse, were always elegant in form and rich in ideas. He had a brilliant imagination, a biting sarcasm, and no inconsiderable power of reflection. The most perfect of his productions are two ballads, *Asgaardsrejen* and *Protesilaus*, and a didactic poem, *Epistle to a Young Poet.* The contest between Welhaven and Wergeland, beginning in 1834, lasted for many years, and was exceedingly bitter, as literary quarrels always are when the position of the combatants is ill defined and their principles misunderstood, and when they condescend to use popular prejudices as weapons and horse-whips as arguments. Much, however, was made clear to the Norwegian people through this protracted and noisy embroilment, and it forms the introduction to Norwegian literature. About 1840 a number of Norwegian philologists and historians concentrated their enthusiasm and their talent on the study of the old Norse language and the history of Norway before the union with Denmark; and their works formed not only a most valuable part of the Norwegian literature in the wider sense of the word, but also a direct preparation for a literature proper; they created the national spirit. Nothing is of more importance or of greater influence in the formation and development of the national character than a striking picture of the primitive type; around it people gather instinctively, and they model themselves unconsciously after it. Such an image was produced by the writings of Faye, Unger, Munch, Keyser, Bugge, and others, and living blood was infused into this image by the labors of Asbjörnsen, Moe, Eilert Sundt, and Ivar Aasen—men of quite another stamp, but not of less, or less beneficial, influence. Asbjörnsen and Moe collected the popular tales which still lived on the lips of the people, and the product was most charming; a certain tone of calm, dry humor occurring in some of the tales is especially irresistible.

The collection was read by everybody in Norway, and by everybody with delight. Eilert Sundt is a statistician, but he studies not so much the fact as its cause, and he writes not so much in figures as in pictures. He wanders from North Cape to Christiansand, climbing every rock, creeping into every vale where a countryman of his has settled, and everywhere he looks, asks, listens till he understands. Then he sometimes publishes a book, or rather a pamphlet, the effect of which is similar to that produced by those famous Latin epistles by which the world is informed that the laws of gravitation or the relation between electricity and magnetism have been discovered. Ivar Aasen is a philologist, and his grammars, dictionaries, and linguistic essays give a clear and complete account of the present state of the different dialects spoken in Norway, and of their relation to each other and to the old Norse. Thus were produced that knowledge, understanding, and sympathy which make the inhabitants of a country a nation, and which made it possible that in 1856 such a book as *Synnöve Solbakken* could be written, and immediately acknowledged as the beginning of Norwegian literature. As this literature is not more than twenty years old, it has, of course, not yet a history; but how rich and valuable it has already become may be gathered from the articles on BJÖRNSTJERNE BJÖRNSON, HENRIK IBSEN, JONAS LIE, KJELLAND, and others, whose works are also partially known to English readers. The general character of this literature —consisting chiefly of dramas and novels, with a very slight lyric element—is a strongly-marked realism. Those dramas and novels are books of reform rather than books of entertainment. They contain very little, either in style or in composition, which reminds of that so-called free play of the imagination once considered the chief characteristic of true poetry. They delineate actual life with an almost photographic precision, and they do so, not to amuse, but to instruct and improve, the reader.

The language in which this literature is written differs from the Danish partly in its vocabulary, which is purer, more powerful, and more impressive—partly in its style, which is shorter more compact, and more emphatic. But the difference is very slight. The dramas of Björnson and Ibsen have been performed in Danish theatres by Danish actors, without the alteration of one word. It is probable, however, that a greater difference will be developed in the course of time. There is in the Norwegian literature a party—not represented by any authors, but to some degree supported by Ivar Aasen—which purposes to form a new Norwegian language of elements taken from the different dialects; and when this new language is ready, the Norwegian nation, young and old, will be invited to sit down with grammar and dictionary to learn this its mother-tongue or native language. Of course, it is only in a very young nation that such ideas can be pursued in earnest for a long time, or be allowed to overawe everything else with its noise. But the youth of the nation is not only an excuse for its extravagances; it indicates also, that in the extravagances themselves there may be some truth which the future will develop. CLEMENS PETERSEN.

Nor′wich, a large, old, and prosperous, but (with exception of its fine market-place) rather indifferently built town of England, the capital of the county of Norfolk, on the Wensum, near its junction with the Yare. It has several interesting buildings, among which is the cathedral, built in 1094, with a noble tower and spire 315 feet high; large manufactures of worsted, silk, and cotton fabrics, especially crapes, gauzes, muslins, bombazines, and damasks; and a lively export and import trade. Pop. 87,843.

Norwich, a city and R. R. centre, one of the caps. of New London co., Conn. (see map of Connecticut, ref. 5–F, for location of county), at the head of the Thames River, 15 miles from Long Island Sound, has a free academy, a good common-school system, embracing a series of graded schools, fine waterworks, manufactories of cotton and woollen goods, paper, firearms, wood-working machinery, wood type, envelope-printing presses, bar iron, printing presses, and machinery. Its cotton, woollen, and paper mills are among the largest in the U. S. The water-power formed by three streams which make up the Thames is calculated to be greater than that of all Rhode Island. The city has 2 public squares, a horse railway, and is supplied with gas. In 1870 the city included the tp. Pop. in 1870, 16,653; of tp. in 1880, 21,143, including 15,112 in city.

Norwich, R. R. junction, cap. of Chenango co., N. Y. (see map of New York, ref. 5–H, for location of county), on the Chenango River and Canal, has extensive manufactories of harnesses and pianos. Pop. of tp. in 1870, 5601; in 1880, 5756.

Norwich Crag, a local shelly deposit found on the E. coast of England, and belonging to the Later Pliocene. The term "fluvio-marine crag," also applied to it, indicates the conditions under which it originated, and its fossils compared with those of the "red crag," upon which it rests, mark the gradual advance of the cold epoch that culminated in the glacial period. EDWARD C. H. DAY.

Norwood (THOMAS MASON), b. in Talbot co., Ga., Apr. 26, 1830; received an academic education at Culloden, Monroe co., and graduated at Emory College, Oxford, Ga., in 1850; was admitted to the bar in Feb., 1852; opened an office at Savannah in Mar., 1857; was a member of the State legislature from the county of Chatham in 1861–62; was alternate elector for the State at large on the Seymour and Blair ticket in 1868, and was elected to the U. S. Senate for six years from Mar. 4, 1871. His seat was contested by Foster Blodgett, but was finally awarded to Mr. Norwood Dec. 19, 1871. Mr. Norwood is a Democrat. As a writer and an orator he is distinguished by purity of language and elegance of style, as well as scholarly attainments. His newspaper articles in the political canvass of 1870, over the signature of "Nemesis," are among the finest specimens of polished invective of this generation. The same may be said of his two speeches delivered in the U. S. Senate during the 43d Congress. A. H. STEPHENS.

Nose. See NOSTRILS, DISEASES OF.

Nosol′ogy [Gr. νόσος, "disease," and λόγος, "discourse"], the doctrine of diseases, that branch of medical science which treats of the classification and nomenclature of diseases. The object of nosology is to arrange diseases in accordance with some definite law by their peculiar nature or by the prominent characteristics by which we distinguish one from the other. The classification and nomenclature of diseases have changed with the successive theories of the indefinite periods of medicine: with the development of anatomy and physiology, and especially of pathology, the classification of diseases has been based upon the known morbid changes and the organ or apparatus involved, with symptoms peculiar to the disease or causes if known. The object of nomenclature in modern times is to obtain groupings of some diseases indicative of their sameness in cause and nature, and exponent of our positive knowledge, and of others by known characteristics, and thus to afford a uniform nomenclature for medical literature and further study and record, and an artificial aid in comparing them and arriving at correct diagnosis.

The theory of Hippocrates was, that disease was due to perversion of one or more of the "four humors." The "Methodists" of the Egyptian school and early Roman period believed that external matter was related to the pores of the body, which admitted atoms to circulate through the organism. Hence, all diseases were states of relaxation or contraction. Aretæus, of the Arabian school, divides diseases into the acute and chronic only.

Attempts at systematic classification of disease are of modern date. Sauvages, professor of botany and medicine at the celebrated school of Montpellier, France, was the first nosologist of eminence. His first classification, published in 1731 with the approval and supervision of the great Boerhaave, divided diseases only into genera. He studied thirty years upon this, and in 1763 published, in five volumes, his complete classification, including diseases in species. Sauvages' method was very defective, including as diseases many symptoms, as weakness, pains, discharges, which were effects only of disease. Linnæus, the great botanist, attempted in 1763 a classification of diseases upon the method of known causes and similar manifestations—a system necessarily as incomplete as the knowledge upon which it was based. Vogel in 1764, Sagar in 1776, McBride in 1772 produced classifications. The classification of Dr. Cullen, published in 1772, has many adherents to this day. He divides diseases into four great classes: (1) Pyrexiæ, including all fevers and diseases with increased heat; (2) Neuroses, diseases in which the nervous system is affected; (3) Cachexiæ, diseases of bad habit or condition of the body; (4) Locales, diseases of special parts or organs disconnected with general causes or constitutional disturbance. Each of these classes has several orders. Thus, the class Pyrexiæ includes Order I., Febres, the fevers; Order II., Phlegmasiæ, the inflammations, as of the brain, heart, lungs, or liver; Order III., Exanthemata, the eruptive disorders, as measles, scarlatina, and smallpox; Order IV., Hemorrhaginæ, hæmorrhages, as nose-bleed, spitting of blood, hæmorrhoids; Order V., Profluvia, or mucous fluxes, as catarrhs and dysentery. Thus, of each class there are several orders, each having groups of allied diseases—in all 150. Swediaur in 1812, and many others, have modified the original tabulations of Cullen. Pinel supplanted it by a classification, also based upon symptoms, issued in 1813, and long popular in France. A new method of classification, however, became popular. Known as the physiological method, it was based upon the derangements observed in the properties, powers, or functions of single organs or systems of organs. Such was the method of Ploucquet in Germany, and of Young (1813) and Good (1817) in England. Thus we find in Good's celebrated method, Class I., Cœliaca, or diseases of the digestive functions; Class II., Pneumatica, or diseases of the respiratory functions, and so on—classes for the perversion of the circulation of the blood, the nervous system, the sexual organs, and glands for secretion and excretion. Each of these classes has further subdivisions of orders, genera, and species. Dr. Good further endeavored to distinguish the different orders and genera by terminations designating the peculiar kind of perversion which the organ or function had undergone, and to distinguish the species in each individual disease by a special descriptive name. Thus, an ordinary diarrhœa or catarrh of the bowels would be found in Class I., Cœliaca, since the digestive functions were disturbed; in Order I., Enterica, as the intestines were the special seat of the disease; in Genus 8, Diarrhœa, a looseness or flowing through; and in Species 3, Diarrhœa mucosa, since the evacuations were of mucus. Of all such systems, most of them at present obsolete, it may be said that, while possessing serious errors and defects, they led men to observe and reflect upon the nature and cause of disease, and educated a school of thorough symptomatologists, close observers of the symptoms by which early and correct diagnosis is to be attained. A congress to secure a uniform nomenclature for the record of deaths and diseases throughout Europe was convened at Paris in 1855, at Brussels in 1856, and at Vienna in 1857. Although the nomenclatures in the several countries of continental Europe and in England are not absolutely uniform, they are nearly so and easily convertible. The system of Dr. William Farr, as the most useful and practical system of record, and as embodying established and recognized laws of the origin of diseases where they are known, has been modified and adopted by the Royal College, and is that employed by the registrar-general of England, the U. S. census bureau, and the boards of health of New York and other cities, with immaterial modifications. The classification, as employed by the board of health of New York City, is as follows: *Class I., Zymotic Diseases* (*zymosis* signifying the multiplication or ferment of a source of disease within the body): *Order 1, Miasmatic diseases*, smallpox, varioloid, measles, scarlatina, diphtheria, quinsy, croup, whooping-cough, typhus fever, typhoid fever, erysipelas, carbuncle, dysentery, diarrhœa, cholera morbus, cholera, cholera infantum, entero-colitis, cerebro-spinal meningitis, intermittent fever, yellow fever, pyæmia, septicæmia; *Order 2, Enthetic and inoculated diseases*, syphilis, malignant pustule, gangrene, hydrophobia; *Order 3, Dietic diseases*, inanition, dyspepsia, scurvy, purpura, alcoholism. *Class II., Constitutional Diseases; Order 1, Diathetic diseases*, gout, rheumatism, dropsy, cancer, noma (gangrene of mouth), mortification; *Order 2, Tubercular diseases*, scrofula, marasmus, phthisis pulmonalis, hydrocephalus, psoas abscess. *Class III., Local Diseases: Order 1, Nervous diseases*, meningitis, encephalitis, softening of the brain, progressive locomotor ataxia, apoplexy, paralysis, insanity, epilepsy, chorea, sunstroke, convulsions, tetanus, congestion of brain, hemiplegia, paraplegia; *Order 2, Circulatory diseases*, pericarditis, aneurism of the heart, aneurism of the aorta, diseases of the heart, phlebitis, angina pectoris, epistaxis (nose-bleed), hæmorrhage from the ear; *Order 3, Respiratory diseases*, laryngitis, bronchitis, pleuritis, hydrothorax, pneumonia, asthma, gangrene, congestion and hæmorrhage of lungs; *Order 4, Digestive diseases*, gastritis, enteritis, peritonitis, ascites, ulceration of intestines, obstruction of intestines, stricture of intestines, hernia, cirrhosis of liver, ileus (colic), lead colic, lead disease, intussusception, fistula in ano, ulcer of the stomach, obstruction of gall-duct, hepatitis, jaundice, liver disease, anæmia, hæmatemesis; *Order 5, Urinary diseases*, nephritis, nephria (Bright's disease), diabetes, cystitis, disease of the kidney, disease of prostate gland, Addison's disease, stricture of the urethra, retention of urine, uræmia; *Order 6, Generative diseases*, ovarian dropsy, ovarian tumor, uterine tumor, uterine disease, metritis, metro-peritonitis, puerperal peritonitis, pelvic cellulitis, ovaritis; *Order 7, Locomotory diseases*, arthritis, hip-joint disease, disease of spine, caries, necrosis, rachitis, osteomyelitis; *Order 8, Integumentary system*, phlegmon, ulcer, tumor, abscess, pemphigus, sclerema, herpes. *Class IV., Developmental Diseases: Order 1* (children), premature birth, still-birth, convulsion of new-born, hæmorrhage of cord, cyanosis, spina bifida, atelectasis of lungs, malformations, teething; *Order 2* (women), childbirth, puerperal convulsions, flooding, miscarriage, puerperal mania, phlegmasia dolens; *Order 3* (age), old age, senile gangrene; *Order 4* (nutrition), atrophy, debility. *Class V., Death by Violence: Order 1* (accident), fractures, wounds, burns and scalds, poison, drowning, suffocation; *Order 2*, homicide; *Order 3*, suicide.

This classification includes the causes of death during one year. Dr. Farr's complete classification includes many more, indigenous in Europe and in the British East Indies, but unknown in this country. All classifications of disease and deaths for public purposes are necessarily practical rather than accurately scientific. Thus, apoplexy or hæmorrhage in the brain is enumerated in the same group with hemiplegia, its usual result. But hemiplegia has other causes than apoplexy, which are often obscure; hence. the diagnosis is confined to the condition. A practical classification for public record takes cognizance often of the immediate method of disease and death where the first and true cause was unknown or overlooked by carelessness or ignorance. Thus, nose-bleed as a cause of death may have resulted from injury, excited circulation, mitral disease of the heart, or the perverted state of the blood in disorganizing febrile disease. In exceptional cases it retains old names of diseases, well recognized, but having an unknown or unsettled pathology, as "phlegmasia dolens," or milk leg. The value of a generally accepted nomenclature and classification of diseases is great. Published reports exhibit at a glance the class of diseases most prevalent and fatal in different seasons in different communities and sections of the country, and point to the sources which sanitary science may remove. With the progress of pathology and a further insight into the nature of diseases, many will change location, diseases now classified as functional or local being traced to a cause and ranked with organic and constitutional diseases. Diphtheria would formerly be classed as a local ulcerous sore throat; it is now ranked as a zymotic disease, as it is conceded to be a general blood disease, having as one of its symptoms the diphtheritic exudation in the throat.

E. Darwin Hudson, Jr.

Nos'toc, a genus of Algæ growing in fresh water or in damp places on the ground. The genus contains a number of species, all of which are composed of threads, consisting of small globular cells, between which are inserted, at intervals, larger cells called *heterocysts*. The threads are intricately wound round one another and the whole surrounded by a mass of jelly. No mode of sexual reproduction has yet been discovered in the Nostocs. An asexual method of reproduction has been described by Thuret (*Sur la Réproduction du Nostoc verrucosum, Annales des Sciences naturelles*, 1844) and Janchewski (*Observations sur la Réproduction de quelques Nostochacées, Ann. des Sciences naturelles*, 5 série, tome 19). The Nostocs have given the name to a group of rather ill-defined genera, which form a suborder of the Phycochromaceæ. Some lichenologists, as Prof. T. M. Fries, do not regard the Nostocs as algæ, but as the Gonidia which have escaped from some species of Collema, a genus of lichens where the Gonidia resemble the chains of Nostoc. Others, including De Bary, Bornet, Schwendener, and most of the leading botanists of France and Germany, regard the Nostocs as Algæ, and consider that in Collema we have an example of a fungus parasitic upon an alga.

Nostrada'mus, whose true name was Michel de Notredame, was b. Dec. 14, 1503, at St. Rémi, in Provence, of Jewish parents; studied medicine at Avignon and Montpellier, and settled as a physician first at Agen, in the present department of Lot-et-Garonne, and afterwards at Salon, near Aix, where he d. July 2, 1566. He was a good physician, and during the time of the plague, which at this period twice visited Southern France, he rendered great service. His immense fame, however, was built on a less solid foundation—on his capacity as an astrologer. In 1555 he published his *Prophéties*, written in quatrains, and giving in an obscure and enigmatical manner prophecies concerning the coming centuries. The book made an immense sensation and was much studied. Many royal persons—Catharine de' Medici, Henry II., Charles IX., and others—consulted him and loaded him with presents; the last mentioned even made him his life-physician. In after times the book also found students and admirers; the latest is M. E. Bareste, whose *Nostradamus* appeared at Paris in 1842. In 1781 the book was forbidden by the pope, as it was found to contain a prophecy of the abolition of the papal authority. Nostradamus also published an almanac containing weather prophecies.

Nos'trils, Dis'eases of. The nostrils or nares are divided into the anterior nares, which can be seen by external inspection of the openings of the nose, and the posterior nares, to be seen only by aid of small circular mirrors placed in the back of the throat to reflect light, admitted through the mouth, to the nasal cavities above. The most common of their diseases is catarrh. Nasal catarrh is produced by cold air, by insufflating dust, or by irritants. It is the beginning of many cases of laryngitis and bronchitis. It is the chief catarrhal condition in influenza, in which disease catarrh extends through the nasal ducts to the eyes, the Eustachian tubes to the ears, and into the frontal sinuses. Simple recent nasal catarrh produces a watery, alkaline serum. When more pronounced the catarrhal flow is less serous, contains mucous, corpuscles, and is viscid or even tenacious—is yellowish and purulent in color. Chronic catarrh may result in constriction of the anterior nares, in the development of exuberant granulations, and polypus. In the posterior nares, by extension to the throat, it more often results in permanent or obstinate naso-pharyngeal catarrh. Such chronic catarrh may give rise only to habitual coughing and hawking of mucus, but it often impairs the hearing by tumefaction at the aperture of the Eustachian ducts or by extension to the middle ear. Nasal polypus is an attached tumor in the nostrils, originally a small projecting mass of granulations or enlarged glandular tissue. When chronic nasal catarrh has resulted in ulceration and death of the cartilages or bones of the nose, the discharge is often offensive, and is known as ozæna. Close examination will discover particles of necrosed matter. Ozæna is more often the result of nasal catarrh in strumous, tubercular, and syphilitic persons. Epistaxis or nose-bleed is the result of local causes, as irritating or picking the nostrils; it is a frequent occurrence in persons having disease of the mitral valve of the heart; it is a symptom peculiar to typhoid fever; it is often due to excessive exercise and to excitement. The catarrhal diseases of the nostrils are treated by topical applications, inhalations, and sprays. Ozæna demands the insufflation or injection of antiseptic washes or the surgical removal of dead bone. Polypus is removed by cutting or tearing. Nose-bleed is checked by cold applications on the nose, by plugging the nostril with lint, or the introduction of styptics, as tannic acid, pernitrate and persulphate of iron. In extensive bleeding from the nose the nostrils have to be plugged from behind. E. Darwin Hudson, Jr.

No′ta (Alberto), a distinguished Piedmontese author of comedies, b. in Turin in 1785; d. in the same city in 1847. At the age of eighteen he received his legal degree from the university of his native town. Besides his literary labors, he acted as librarian, first to Prince di Carignano, then to the king, Carlo Alberto, and occupied successively many highly honorable offices in the civil magistracy. Nota was called the Piedmontese Goldoni, but he differs as widely from Goldoni as does Terence from Plautus. The plot of his comedies is correct and regular, the style sustained and almost elegant, but one rarely finds in them either originality, fire, or the true *vis comica*. The best comedies of Nota are the following: *I Primi Passi al mal Costume, La Fiera, L'Irrequieta, Il Progettista, L'Oppressore e l'Oppresso, La Lusinghiera, Educazione e Natura.*

Not′ables, in France, comprised not only the born nobility, but also persons who enjoyed certain social privileges and immunities on account of the office which they held. When in course of time the États Généraux came into frequent collision with the royal power, the kings convoked in their stead Assemblées des Notables, and as these assemblies were composed of persons who were dependent on the court or had the same interest as it, they proved much more manageable. The last Assemblée des Notables met Nov. 6, 1788, to discuss the forms under which the États Généraux should be convened.

Notacanth′idæ [from *Notacanthus*], a family of fishes of the order Opisthomi. The body is elongated (but not eel-like), and the tail tapers strongly backward; it is covered with very small cycloid scales; the lateral line is conspicuous; the head is conic, and the snout more or less produced; the mouth is inferior, the cleft moderate, and the lower jaw quite movable; the teeth are minute and pointed; the branchial apertures are normally extended; there are about eight branchiostegal rays; the dorsal fin is only represented by a number (7–30) of short disconnected spines about the middle of the length; the anal is elongated, and armed with numerous (12–15) spines in front; the caudal small and (typically at least) connected with the anal; the pectorals are well developed, and the ventrals are abdominal and composed of spinous (2–4) and articulated (7–8) rays. Five species are known—viz. *Notacanthus nasus*, Greenland; *N. Bonapartii* and *N. Mediterraneus*; *N. sexspinis*, Australia; and *Zanotacanthus Rissoanus* (*Notacanthus Rissoanus*, Fil. & Ver.), Mediterranean. The last species is generically distinguished by the numerous (over 30) dorsal spines and proboscis-like snout. Theodore Gill.

Not′ary Pub′lic. This is an officer known to all civilized nations, and who existed under the rules of the civil or Roman law. His principal duties are to protest bills of exchange and to make such other protests or declarations as accord with the usage of merchants. Other duties are frequently added by statute, such as to demand payment of promissory notes and to make protests in case of non-payment, so as to charge indorsers, to administer oaths or affirmations, and to take acknowledgments of deeds or other instruments. The term "protest," as here used, means an official declaration by the notary of the existence of a fact connected with the performance of his duties. This certificate, when authorized by law, is in general presumptive evidence that the facts certified to took place. Thus, a "protest" of a foreign bill of exchange for non-acceptance or non-payment is sufficient evidence on the trial of an action to charge the drawer or indorsers.

A notary is a ministerial officer, and is liable to a party injured by the negligent performance of his duties. Statutes also frequently declare his responsibility for misconduct, both civil and criminal. It is clear that in the absence of any statute his conduct is governed by that general rule of law which prescribes that any person who enters upon an undertaking requiring ordinary care and skill is bound to use ordinary diligence, and is liable to any one injured by the want of it. Still, if under the direction of an employer he commit an error in such an act as protesting a bill of exchange, the fact that he follows such direction will be a sufficient excuse.

When called upon to perform a strict notarial act he must in general perform it personally. He cannot delegate it to any other person, as, for example, to a clerk. This proposition is but a branch of a wider rule that an agency requiring trust and confidence cannot be delegated. If, however, there is a settled commercial usage in the place where a foreign bill of exchange is payable that protest may be made by a notary's clerk, evidence of such usage is admissible to establish it, and thus give the sanction of law to the notary's delegation of authority. This last proposition proceeds upon the ground that the necessity of protest in the case of foreign bills is a matter of mercantile usage, and a special custom in a particular place may enlarge or qualify ordinary practice. It frequently happens that when a bill of exchange is given to an agent for collection, that person employs a notary to make a protest who is guilty of negligence, and thus discharges the drawer and indorsers. The question then recurs whether the principal may sue the agent, or whether his remedy is against the notary. Upon this point there is much divergence of judicial opinion. Some courts take a distinction between the case where the act is strictly notarial and where it is not. In the former case they hold that the notary is liable directly to the original employer or principal. In the latter case—*e. g.* giving notice of the non-payment of an inland bill of exchange (an act which any person though not a notary may perform)—he is simply the agent of his immediate employer, and cannot be sued by the person for whose benefit the notice was to be given. It is, however, held in a considerable number of the States that when a banker or other person acting as collecting agent has employed a competent notary who is guilty of an act of negligence, the remedy of the injured party is solely against the notary, without reference to the fact whether the act is strictly notarial or not. The distinction between the liability of a notary for strictly notarial and non-notarial acts has been taken in other instances. Thus, it has been said that in the case of a foreign bill not only should protest be made, but notice should be given by him to all the antecedent parties, but that in the case of inland bills it is not his duty to give notice of dishonor to any one but the person from whom he received it. It is desirable that where such a distinction exists, as it tends to confuse and mislead, it should be remedied by statute. It is well settled that where a statute enjoins upon a notary in protesting promissory notes, etc. the duty of giving notice of dishonor to antecedent parties, he is bound to notify them, and is liable to an action on the part of one who may be injured by his neglect. T. W. Dwight.

Notasul′ga, Macon co., Ala. (see map of Alabama, ref. 5-E, for location of county), on the Western R. R. Pop. in 1880, 236.

Nota′tion [Lat. *notatio*], in chemistry, an ingenious system of abbreviating and condensing statements of the chemical composition of bodies, and of their changes and transformations, by means of *symbols*. From the earliest days of the science, even in alchemical times, various methods of accomplishing this have been attempted, but the first useful basis of the present system was laid, curiously enough, in the same identical year in which the present system of nomenclature (that of Guyton de Morveau and Lavoisier) was founded—1787—(see Nomenclature) by Hassenfratz and Adet. These chemists first used the initial letters of the Latin names to express the metals, surrounding each, however, with a *circle*, which was their general symbol for a metal. Dalton, when he founded the atomic theory, adopted these symbols, circle and all, as he considered the atoms probably spherical in form. Berzelius in 1815 brought the symbolic notation into its present form, by introducing coefficients to indicate the numbers of equivalents, with a number of other important devices.

While speaking of the initiation of the invention of chemical symbols, it should be mentioned that Hassenfratz and Adet, in their original symbols, introduced features, now entirely forgotten, to which in this age of science we shall unquestionably have to return. They had a symbol to express caloric or heat, and their symbol for water admitted of three modifications for its three known states of ice, water, and steam. We shall soon doubtless have to introduce into our chemical notation such symbols, to express, probably, not exactly *quantities* of heat involved and engendered, but at least amounts of thermodynamic *energy*. One of our most acute American scientists, H. F. Walling, at the meeting of the American Association in 1875, brought this matter forward and urged strongly its necessity.

In the article on CHEMISTRY will be found a tabulation of the symbols of Berzelius, as still used throughout the world. Each symbol, alone, stands for one equivalent weight, and a numerical coefficient placed before or after it multiplies it by so much. When a compound is to be represented, made up of two or more other compounds, a *comma* or *period* is used—the latter being generally the most approved—to represent the secondary combination. Thus, common copperas or green vitriol is thus represented: $FeO.SO_3.7H_2O$; meaning a compound of iron and oxygen, combined with another compound of sulphur and oxygen, combined again with 7 equivalents of water. When a small coefficient is placed *after* the symbol, as in O_3 and H_2 in this case, it applies to that one symbol only; but when a larger coefficient is placed *before* a group of symbols, as in the $7H_2O$, it multiplies them all, at least up to the next period. The sign + is often used to express combination, but not by recent correct and critical writers, being reserved by such entirely for use in expressing chemical *reactions*, to indicate the mere *bringing together* of the reacting substances within the sphere of possible reaction, and the mere state of *admixture* or juxtaposition of the resulting products. Thus, $FeO.SO_3 + Na_2O.CO_2 = Na_2O.SO_3 + FeO.CO_2$, means that the previous mixture of *ferrous sulphate* and *sodic carbonate* produces *sodic sulphate* and *ferrous carbonate*. Berzelius devised, also, for the important purpose of abbreviating long and complex formulæ, particularly in mineralogical chemistry, two kinds of symbols, called "dotted symbols" and "cross-barred symbols." In dotted symbols equivalents of oxygen are represented by so many dots placed over the symbol of the element with which it is combined; thus:

$\ddot{\mathrm{Si}}$, silica,

$\dddot{\mathrm{S}}$, sulphuric acid,

$\overset{\cdot\cdot\cdot\cdot\cdot}{\mathrm{P}}_2$, phosphoric acid.

The cross-barred symbol simply indicates *two equivalents* of the element for which it stands. Sometimes he combined the dots and cross-bars, representing, for example, alumina, Al_2O_3, by $\overset{\cdot\cdot\cdot}{\not{\mathrm{Al}}}$; ferric oxide, Fe_2O_3, by $\overset{\cdot\cdot\cdot}{\not{\mathrm{F}}\mathrm{e}}$; phosphoric acid by $\overset{\cdot\cdot\cdot\cdot\cdot}{\not{\mathrm{P}}}$; and so on.

A good deal of use is made at the present day of *parentheses* in our notation, in writing out complex formulæ, the different simpler molecules contained or supposed to be contained in the more complex compound being enclosed in separate parentheses; and when a coefficient is then placed either before or after such a parenthetic collocation of symbols, it multiplies all those, and only those, within the parentheses. Thus, for example,

Common alum, $(K_2O.SO_3)(Al_2O_3.3SO_3).24H_2O$;
Zinc-ethyle, $(C_2H_5)_2.Zn$;
Stanno-dimethyle-diethyle, $(CH_3)_2(C_2H_5)_2.Sn$;
Sugar of lead, $Pb(C_2H_3O_2)_2.3H_2O$.

Sometimes parentheses are used within parentheses:

Microcosmic salt, $(Na_2O.(NH_4)_2O.H_2O)P_2O_5.6H_2O$.

In the representation of compounds according to the theories of types and substitutions, which play so large a part in the chemical literature of the present day, other devices are used: thus, the element or radical supposed to have been substituted for one or more hydrogen-equivalents is placed *over* the remaining hydrogen in the symbol. Hydrate of potash, considered as belonging to the water-type, would thus be written $\genfrac{}{}{0pt}{}{K}{H}O$, water itself, for comparison, being written $\genfrac{}{}{0pt}{}{H}{H}O$. Ammonic hydrate would be $\genfrac{}{}{0pt}{}{NH_4}{H}O$. Sometimes a brace is used in this kind of formulation for the sake of distinctness. Thus, propylamine, according to this system, might be written $N\begin{cases}C_3H_7,\\H,\\H,\end{cases}$ and methyl-ethyl-amylamine, $N\begin{cases}CH_3,\\C_2H_5,\\C_5H_{11}.\end{cases}$ Wood-spirit and common alcohol, regarded as substitution-products of the marsh-gas type, and containing "hydroxyl," will be $C\begin{cases}HO,\\H,\\H,\\H,\end{cases}$ and $C\begin{cases}CH_3.\\HO.\\H.\\H.\end{cases}$

An important invention in notation is the use of *bonds* between elemental symbols, to express the relations of equivalence, sometimes called "atomicity." The affinity of a monad element is represented by one dash, of a dyad by two, of a triad by three, and so on. Water is represented by placing the dyad oxygen between the two hydrogen monads; thus, H—O—H, the two dashes representing the two bonds of affinity of dyadic oxygen, supposed to be saturated, in water. They represent likewise each the total affinity of one of the hydrogen monads, which are therefore also both satisfied or saturated. One more example may be given in carbonic acid gas, represented thus, O=C=O, the tetradic carbon having four bonds and the oxygen dyads two each. By following out this system very curious results are obtained in the shape of hypothetical "constitutional formulæ" for compounds of all degrees of complexity. To explain these would take very large space, and, as has been elsewhere stated, they are liable to the great objection that they inculcate the idea of construction of molecules (which in nature must have geometrical structure) *on the same plane*, involving thus a gross absurdity. HENRY WURTZ.

Notation [Lat. *notatio*]. Mathematical notation is a conventional method of representing quantities and operations by means of symbols. It explains the meaning of individual symbols, both of operation and of quantity, and shows how to combine them so as to express in the simplest manner every mathematical operation. A simple and comprehensive system of notation is essential to the progress of every science, but in no branch is a complete system more necessary than in mathematics, and in no branch has there been a greater diversity of systems proposed. Our present system is the result of the labors of many men, living in different ages, speaking different languages, and possessing different habits of thought; from these diverse sources a mathematical language has sprung up, defective in many respects, and yet sufficiently simple and copious for most of the purposes of analysis and investigation. Each department of mathematics has its own notation; in this article will only be considered the notation of arithmetic, or the method of writing numbers.

There are at present in general use only two systems of arithmetical notation, the *common* system and the Roman; in addition to these we shall also explain the method of the ancient Greeks.

(1) *The Common System.*—This is sometimes called the *Arabic*, because the figures which it employs were introduced into Europe by the Arabs. The following figures, expressing values regularly increasing by one from nothing to nine, are used in this system: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. These figures, taken separately, are called *digits*. The first one, named *naught*, is also called a *cipher* or *zero*; it stands for no number. The remaining ones are called *significant* figures. All integral numbers are expressed by writing the proper digits in a line. The digit on the right is said to stand in the *first* place, the one preceding this in the *second* place, the next preceding in the *third* place, and so on. This order of arrangement is called the *scale* of the system. The same digit always indicates the same number of units, but the value of the unit indicated depends on the place it occupies in the scale. If a digit stands in the first place, it expresses simple units or *ones*; if in the second place, it expresses *tens*; if in the third place, it expresses *hundreds*; the value of the unit in any place is always ten times that of the unit in the next lower place. Thus, the combination 376 stands for 3 *hundreds*, 7 *tens*, and 6 *ones*, or for the number *three hundred and seventy-six*. If we place a point—which we call the decimal point—on the right of the first place, we may continue the scale downward to any extent: in this case, the digit on the right of the point is said to stand in the *first place of decimals*, the next stands in the *second place of decimals*, the next in the *third place*, and so on. The unit of the first place of decimals is *one-tenth*; that of the second place, *one-hundredth*; that of the third place, *one-thousandth*; and so on. Thus, the combination .325 stands for 3 *tenths*, 2 *hundredths*, and 5 *thousandths*, or for the number 325-*thousandths*. The scale thus completed is called the decimal scale; it will be noted that this scale is continuous throughout; that is, in proceeding from right to left the unit of each place is ten times that of the preceding place. If we place a cipher in each place, we may write the decimal scale as follows:

	Period of billions.			Period of millions.			Period of thousands.			Period of units.				Period of thousandths.			Period of millionths.			
etc. etc.	hundreds of billions,	tens of billions,	billions,	hundreds of millions,	tens of millions,	millions,	hundreds of thousands,	tens of thousands,	thousands,	hundreds,	tens,	units,	*Decimal point.*	tenths,	hundredths,	thousandths,	ten-thousandths,	hundred-thousandths,	millionths,	etc. etc.
	0	0	0,	0	0	0,	0	0	0,	0	0	0	.	0	0	0,	0	0	0	

For convenience of reading, the scale is separated into periods, each of which embraces three places, and is named as shown above. The denominations above billions are trillions, quadrillions, quintillions, etc., deriving their names from the Latin numerals. If a digit is written in the place of any cipher in the blank scale above given, it will express a corresponding number of units of the name indicated; thus, the combination 326,812,435.278,812, expresses the number 326 *millions*, 812 *thousands*, 435 *units*, and 278 *thousandths*, 812 *millionths*. It will be observed that the unit of each place is some power of 10: thus, the unit of the first place is 10^0, or 1; that of the second place is 10^1, or 10; that of the third place is 10^2, or 100; and so on. In like manner the unit of the first decimal place is 10^{-1}, or $\frac{1}{10}$; that of the second place of decimals is 10^{-2}, or $\frac{1}{100}$; that of the third place is 10^{-3}, or $\frac{1}{1000}$; and so on. It is from this law of relation that we name the scale a *decimal* scale; for like reason we call this system of indicating numbers the *decimal system*. In the system just explained the units corresponding to the different places are in geometrical progression, the *base* or *radix* of which is 10. Similar scales might be constructed having any other number as a *radix*, but such scales are not in common use.

(2) *The Roman Method.*—In the Roman method of notation seven capital letters are used. These letters and the values they express are shown below:

Letters,	I.,	V.,	X.,	L.,	C.,	D.,	M.
Values,	1,	5,	10,	50,	100,	500,	1000.

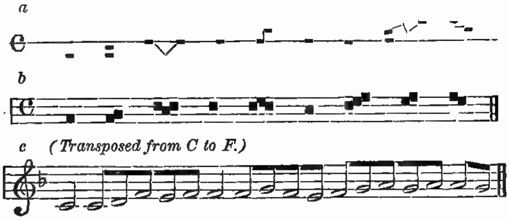
Other numbers than those above are expressed by combining these letters according to the following laws: 1st, If a letter is repeated, the number that it denotes is repeated. 2d, If a letter is written after another which denotes a greater number, the value of the latter is increased by that of the former. 3d, If a letter is written before one that denotes a greater number, the value of the latter is to be diminished by that of the former. Thus, III. denotes 3, and XXX. denotes 30; VI. denotes 6, and LX. denotes 60: XC. denotes 90, and IX. denotes 9. The combination MDCCCLXXV. is read 1875. This system is only used for dates, headings of chapters, and the like. It is a very cumbrous system, and is by no means adapted to the ordinary requirements of numerical computation.

(3) *The Grecian Method.*—The ancient Greeks represented numbers by means of the letters of their alphabet, to which they added the three obsolete characters ϛ′, ϙ′, and ϡ. Thus, the consecutive numbers from 1 to 9 were represented by the characters α, β, γ, δ, ε, ϛ, ζ, η, and θ—*simple units;* the tens from 1 ten to 9 tens, or the numbers from 10 to 90, were represented by the characters ι, κ, λ, μ, ν, ξ, ο, π, and ϙ—*tens;* and the hundreds up to nine hundred were represented by the characters ρ, σ, τ, υ, φ, χ, ψ, ω, and ϡ—*hundreds.* Thousands were expressed by a subscript dash; thus, the number 3000 was written ͵γ. The letter M written below any symbol increased its value ten thousand times; these conventional principles enabled them to write any number up to 1,000,000,000. The following examples show how numbers were expressed in this system:

͵θ ϡ ϙ θ′, *nine thousand nine hundred and ninety-nine.*
͵δ τ π β′, *four thousand three hundred and eighty-two.*
͵γ α′, *three thousand and one.*

Other devices for expressing numbers were conceived by Archimedes, Apollonius, and others, but the entire system was, like that of the Romans, extremely unwieldy and ill fitted to practical computations. W. G. Peck.

Notation [Lat. *notatio*]. In music this term is now commonly used in a larger sense than formerly, to denote the mode or system by which musical thoughts are represented in writing, including all the signs, characters, figures, and arbitrary marks necessary to render such thoughts intelligible and expressive of the author's conceptions. The system now in use is mainly a product of the last three or four centuries, and is remarkable as possessing many of the properties of a universal language. In all civilized nations musical symbols are the same, and musical compositions when correctly written receive everywhere substantially the same interpretation. In ancient times the recording of musical ideas, however simple they might be, was a subject of perplexity and uncertainty, even among those who could give expression to other forms of thought in refined, exact, and appropriate language. To convey from one mind to another a clear idea merely of the *pitch* and the *duration* of several tones or sounds, though comprising only a very limited series, required of course certain signs or symbols which should possess a fixed and recognized meaning. The earliest signs adopted for this purpose seem to have been the letters of the alphabet, which were sometimes placed erect, sometimes inverted, mutilated, commingled, or cast into various fanciful forms, so that by degrees more than 100 of such characters came into use. After this, greater simplicity was secured by the use of only a few Roman letters, the lower octave being represented by capitals, the second octave by small letters, and the third by small letters doubled. Besides the letter system, another mode of representing musical sounds came into use, the leading feature of which was a single straight line—black, red, or yellow—above and below which the various sounds were indicated chiefly by dots, either on the line or more or less distant from it. An illustration of this is given at *a* in the following example, taken from a work by Padre Martini, with its interpretation in black notes at *b*, and in modern notes at *c*:



As late as the thirteenth and fourteenth centuries numberless crooked marks, loops, curves, hooks, wavy lines, and other signs, besides the dots, were used with the single straight line, forming a most intricate and curious system, not easy to be interpreted even by the most skilful of modern musicians. The introduction of *several* lines with their spaces, and notes of fixed form and duration, was the next important step. The lines were at first only four in number, though we sometimes find the staves belonging to two or three voices (with their proper clefs) so crowded together as to look like one stave of eight or twelve lines. (The ancient *notes* belonging to the four-line stave have already been described in the article Large, to which the reader is referred.) To indicate the *pitch* of the notes, two clefs were used—viz. one to mark the place of middle C, and the other that of the F below. These clefs were not permanently fixed on any particular line, but placed on such a line as would serve most conveniently to keep the notes within the bounds of the stave and the spaces above and below. The stave now in universal use consists of five lines, that number being found most convenient for the eye; and to each stave is prefixed a clef to designate, as from a starting-point, the various degrees of acuteness or gravity of the notes employed. Of these clefs, that of F for the bass and that of G for the upper parts are of most frequent use in modern music, the C clef being reserved for certain orchestral parts, and also occasionally used for the tenor and alto in church music. Instead of the cumbrous notes formerly employed, with square, oblong, and lozenge shapes, the round-headed form, both white and black, is now exclusively used, the old square breve seldom appearing except in the music of the church. "The invention of the minim, crotchet, quaver, and semiquaver is ascribed to John de Muris, a doctor of the Sorbonne, who made this important addition to notation . . . in the year 1338. The demisemiquaver first appeared in the seventeenth century." (*Penny Cyclopædia.*) Of these notes, the semibreve is now taken as the standard of unity or the note of longest duration, but the *extent* of that duration is not determined by clock-time, but by the will of the composer or performer. The actual speed of a piece of music is indicated by regulative terms or signs at the commencement, or is left to the discretion of the performer; but in all cases the time given to the semibreve determines the time of each minim, crotchet, quaver, etc., because these notes stand to it in the relation of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$. $\frac{1}{16}$, etc. Intervals of silence also, corresponding in duration with the several kinds of notes, are indicated by characters called *rests.* To meet the want of notes bearing other ratios to the semibreve, as $\frac{3}{4}$, $\frac{3}{8}$. $\frac{3}{16}$, etc., the simple process of adding a dot to a note was adopted, whereby its duration became one-half longer—a dotted minim, for instance, being $\frac{3}{4}$ of a semibreve, a dotted crotchet $\frac{3}{8}$, etc. The dot is sometimes doubled; in which case the time expressed by the first dot is increased one-half. These dots are equally applicable to the rests or marks of silence. To the moderns must also be ascribed the systematic and rhythmical division of music into phrases, sections, periods, and measures or bars, and the marks by which the latter are represented—viz. bar-strokes of various kinds. The use of bars was not general till about the middle of the seventeenth century, and to the same period is to be referred the grouping of quavers, semiquavers, etc. by ties or ligatures connecting their stems. Under the head of notation are also comprised the numerous signs of expression, emphasis, loudness and softness, retardation and acceleration of speed, various kinds of ornament, and all the marks belonging to the province of harmony. WILLIAM STAUNTON.

Note Engraving. See ENGRAVING, BANK-NOTE.

Notes [from Lat. *nota;* Fr. and Ger. *note,* a known "mark" or "sign"], in music, the characters by which the relative *duration* of the several sounds is expressed; thus, a semibreve occupies as much time as two minims, four crotchets, etc. The *pitch,* or degree of acuteness or gravity of the sounds represented by these characters, is not determined by their *form,* but by their *position* on the lines or spaces of the stave. (See NOTATION.) In a less accurate sense, the term "note" is often used for the *sound* of which it is the representative, as when we say a high note or a low note, meaning a high or low sound. Though not strictly correct, this usage of the word is common even in scientific works and in ordinary converse, through a defect or want in the vocabulary of musical terms.

WILLIAM STAUNTON.

Nothop'idæ [from *Nothopsis*—*νόθος*, "false" or "spurious," and ὄψις, "appearance"—the only certainly known genus], a family of non-venomous snakes related to the boas and pythons, but of small size. The body and tail are compressed, covered with subequal scales, with the gastrosteges (abdominal plates) narrow and angulate and the urosteges (sub-caudal plates) in two rows; the head is flat, oval, and moderately distinct, and covered with small scales above; the post-frontal is of considerable size, "and sends forward along the margin of the frontal a process as far as the prefrontal;" the lower jaw resembles that of the Colubridæ in lacking the coronoid bone; the teeth are present on the intermaxillaries, as well as maxillaries and mandible, and are entire; no posterior extremities or hooks are developed. This family has been established by Prof. Cope for a peculiar generic type (*Northopsis rugosus*) made known by himself. According to this zoologist, "its superficial characters remind one at once of the Peropoda (*i. e.* pythons and boas), and the double urosteges suggest the Pythons." In the development of the post-frontal bone, however, it recalls the Achrochordidæ. The only known species is an inhabitant of Central America, and has a strange resemblance in coloration to the young of *Trygonocephalus atrox,* from the same country, and the *T. neovidii* of Brazil. "This is so marked as to constitute a case of mimetic analogy. But few cases of the mimicry of *crotaline* venomous snakes are to be observed in S. America, the imitations being chiefly of the other venomous group, *Proteroglypha,* as represented by *Elaps.*" In allusion to this mimicry or false characters the type has received its generic name. THEO. GILL.

No'tice, in law. This word is sometimes used as equivalent to the act of giving information of some fact. At other times it means information or knowledge obtained in whatever way. Considered as knowledge, it is of two general kinds—*actual* and *constructive.* "Actual" notice includes cases where information of a fact is given directly to a party or one who represents him. "Constructive" notice takes place when a person gains information from which he ought to have derived knowledge of a principal fact by means of an inquiry, or when a positive rule of law on grounds of public policy charges him with knowledge. In the variety of constructive notice first stated there is an element of negligence or lack of good faith. Thus, if a person in taking a conveyance should find in it a clause which pointed to some other conveyance for information as to points in the line of his title, there would be a want of diligence on his part in not referring to the latter, and the law would charge him with all the knowledge that he would have obtained from a diligent examination of the instrument to which the reference was made. An instance of the other branch of constructive notice is that of the pendency of a suit in a court of equity, the regular rule in that court being that while a suit is pending no change can be made in the state of things by the introduction of succeeding parties, and every one who may purchase the property in question is bound to know of the existence and state of the litigation until final decree is rendered. Another instance of importance is that of the registration of deeds and conveyances in general, and the docketing of judgments in accordance with law. Every person acquiring the title is charged by law with the knowledge of these claims. (See RECORDING OF DEEDS.)

Some of the leading cases of the act of giving notice will now be stated. It may be premised that as notice consists simply in communicating information, no writing is in general necessary unless the notice be made requisite by statute. On grounds of expediency, in cases of importance written notices should be adopted.

(1) *Notice of Dishonor of Commercial Paper.*—In order to charge a drawer or an indorser of a bill of exchange or an indorser of a promissory note, it is necessary when a demand for acceptance or payment has been made of the drawee or acceptor of the bill or maker of the note, and either acceptance or payment has been refused, to give prompt notice of such refusal. A failure to comply with this rule discharges the parties entitled to notice from all liability. (See BILL OF EXCHANGE and PROMISSORY NOTES.)

(2) *Notice to Quit.*—This is a request from a landlord to a tenant to leave premises under lease, and to give up the possession at a specified time. No such notice is necessary when the time for the expiration of the lease is fixed. On the other hand, when the lease is for an uncertain period or at the will of both parties, such notice is requisite. It emanates from the owner or his agent, is addressed to the tenant, and is delivered to him personally if he can be found at his usual place of abode, and if not there to some member of his family of suitable age and discretion. A specified time (six months) must in general be allowed to expire between the giving of the notice and the termination of the tenancy, which in some cases must occur at the end of the year. (See TENANCY FROM YEAR TO YEAR.) This time is sometimes changed by statute. Any act on the part of the landlord recognizing the tenant's continuance in the premises beyond the specified time is a waiver of the notice. It may be added that statutes in a number of the States provide for giving notice in case of non-payment of rent as a basis for evicting the tenant by summary proceedings before a magistrate; and a similar practice exists for terminating the tenancy itself. (For details the statutes must be consulted.)

(3) *Notice in other Cases as an Element in a Contract and as a Condition to its Formation or Performance.*—It may be stated generally that when notice is expressly required in a contract, or impliedly called for by the circumstances of the case, it becomes a condition to the formation of the agreement or to its performance, and must be proved by the party bound to give it. There is but little difficulty, of course, where notice is expressly required. Much uncertainty attends the point when the duty to give notice is to be implied. This seems in many instances to turn upon the inquiry whether the act on which the right to demand performance is perfectly indefinite, or whether it is specific. If it be *indefinite*—as, *e. g.*, "to pay for certain stacks of grain as much as the plaintiff sold such grain for to any other man"—notice of the price paid by the other person is necessary. Accordingly, notice is in general necessary where the act is to be done at the option of the plaintiff. On the other hand, if the act agreed to be done be *specific,* such as to pay $1000 on the marriage of A, notice is not requisite. Where an act is to be done upon notice, there may be a question as to the time which should be allowed to intervene between the giving of the notice and the performance of the act. This will depend upon circumstances. Thus, if on the illness of an actor notice were to be given to another performer to assume a part in which he had acquired celebrity, time (in the absence of an express agreement) would need to be allowed for preparation proportioned to the reputation at stake.

(4) *Notice by an Assignee of a Claim.*—It is a general rule of law that if a creditor assign a claim, the debtor will not be affected by the assignment without notice of it. This rule has an important application in the case of an assignment of a mortgage. The debtor must be allowed all payments made by him to the mortgagee until notice is given. After that he must pay the assignee.

(5) *Notice as bearing upon the Good Faith of a Purchaser of Property.*—This is a subject of great magnitude, and growing day by day of more consequence. There is a large class of cases in which a contract or transaction is capable of being set aside or repudiated as long as the original parties to it or those who immediately represent them are solely concerned. On the other hand, when a purchaser in good faith intervenes, the transaction cannot be disturbed. If, however, though a purchaser for value, he have notice of the fraudulent or unfair element in the original transaction, he must stand in the position of the one from whom he buys. Instances of the application of this doctrine are found in negotiable paper fraudulently obtained or stolen, and in the case of lands or chattels to

which an apparent title has been obtained by fraud, or to which a trust has been attached unknown to the purchaser. Notice in all these will fasten upon the purchaser the consequences of the fraud or breach of trust, so far as these may affect the ownership of the property acquired by him. It may be either actual or constructive, as already explained. A common instance of "constructive" notice in this class of cases is that afforded by possession of the property in litigation on the part of the person claiming against the purchaser. Thus, if one should obtain a contract from the owner of land and go into possession, the owner still having the title, and the latter should convey to a purchaser for value, there would be sufficient notice of the contractor's rights to be derived from his possession. Notice may be given to an agent, such as an attorney employed in the business, as well as to the principal. When given to an agent it must in general be communicated to him at the time and in the course of the transaction. Assuming that the information is duly given to the agent, it is immaterial whether the principal is actually apprised of the facts or not.

(6) *Notice in Legal Practice or Procedure.*—This subject is of prime consequence as a branch of procedure. It is a general rule that no step of importance can be taken by one party in a cause, and affecting the other, without giving him notice. The details of the matter are regulated by rules of court or statute. If a proceeding is allowed in the first instance without notice (*ex parte*), an opportunity is afforded for a hearing at some subsequent stage of the cause. Notice affords an important topic in the introduction of evidence. (See Evidence.) It is a general rule in that branch of the law that if a written instrument is to be made use of, the instrument itself, and not a copy, is to be introduced. If that cannot be had, a copy may be offered, or even oral proof of the contents. This is secondary evidence. To lay a foundation for these, if the instrument is in the possession of the opposite party he must have timely notice to produce it. If he fail to comply with the notice, secondary evidence may be resorted to. (For further information on the various topics referred to in this article, consult (*lis pendens*) Bill of Exchange, Landlord and Tenant, Evidence, Equity, Fraud, and the textbooks and authorities therein referred to.) T. W. Dwight.

Notidand′idæ [from *Notidanus*—νῶτος, "back," and ἰδανός, "comely"—one of the genera], a family of selachians of the order Squali or sharks, distinguished from all others by the increased number of branchial apertures. In the form of the body they resemble the typical sharks: the skin is shagreen-like; the head depressed, oval, with the snout protuberant; the eye has no nictitant membrane; the nostrils are inferior and distant from the mouth; the mouth has a crescent-like cleft; the teeth are very unlike in the opposite jaws, those in the upper jaw being broad and armed with several cusps, one of which extends beyond the others, but in the lower jaw are six pectinated teeth on each side forwards, and several smaller posterior ones; the branchial apertures are six or seven in number; small spiracles are persistent on each side of the neck; the dorsal fin is single and inserted far backwards behind the ventrals; the anal is well developed and behind the dorsal; the pectorals have an anterior edge straight from the base; the ventrals normal. The family is distinguished, in addition to the peculiarities enumerated, by a number of others, and is composed of three genera, *Hexanchus* and *Heptanchus*, represented by species in the Mediterranean and Atlantic Ocean, and *Notorhynchus*, with representatives in the S. African seas and on the western coast of N. America. Theodore Gill.

No′to, town of Sicily, province of Syracuse, about 19 miles S. W. of the city of Syracuse, stands on a hill not far from the Ionian Sea, and commands a charming valley, watered by the stream to which the town gives its name. The old town, built on the ruins of a still older (*Neëtum* or *Netum*, 448 b. c.), flourished during the Roman empire, shared the changing fortunes of the island in the Middle Ages, but was completely destroyed by a terrible earthquake in 1693. The new town is about 4 miles from the old site; the buildings are comparatively modern and the streets broad. It carries on a considerable trade in grain, wine, oil, and fruits. Pop. in 1881, 18,239.

Not′ochord [νῶτος, "back," and χορδή, a "cord"], or **Chorda Dorsalis,** a cellular rod of soft cartilaginous or semi-cartilaginous consistency that appears in the embryo beneath the primitive groove, forming the floor of the cerebro-spinal canal and supporting the cerebro-spinal nervous centres. It thus corresponds in position to the front part of the spinal column. In most vertebrates it is gradually surrounded and ultimately more or less completely obliterated by the growth of cartilaginous plates destined finally to become the ossified bodies of the vertebræ; in some types, however, as the lancelet (*Amphioxus*), the sturgeons, and the lampreys, the notochord is persistent; and this was much more generally the case with the fishes of the early geological periods. Edward C. H. Day.

Notopter′idæ [from *Notopterus*—νῶτος, "back," and πτερόν, "fin"—the typical genus], a family of teleocephalous fishes of the suborder Phyzostomi, distinguished by many peculiar characters. The body is elongated and tapers backwards; the abdomen is armed with a double serrature; the scales are small, the lateral line distinct and slightly incurved from the back; the head is rather small, compressed, and conical; the opercular apparatus incomplete, the sub-operculum being atrophied; the nostrils double; the mouth has a lateral oblique cleft; the margin of the upper jaw is formed by the intermaxillaries towards the middle and the maxillaries on the sides; the teeth are small and developed in a narrow band or series on the jaws as well as palate and sphenoid bones; branchial apertures not confluent, the membrane being partially attached; branchiostegal rays 3–9; dorsal small; inserted back of the middle of the back, or entirely wanting; and fin very long and united with the caudal; ventrals rudimentary (in which case they are a little before the vent, and united) or wanting. The skeleton has a number of peculiarities; the pteriotic is external, annular, and encloses a large cavity; the basis cranii is double; there are 70 or more vertebræ; the caudal vertebræ are nearly equally developed above and below; the stomach has no blind sack, but two pyloric appendages are developed; the air-bladder is divided in the interior; the ovaries discharge their eggs directly into the abdominal cavity, from which they are afterwards excluded. The family is composed of fresh-water fishes, attaining considerable size, and peculiar to the fresh waters of India and Africa. There are two very distinct genera: (1) *Notopterus*, in which the dorsal fin is developed, and (2) *Xenomystus*, in which it is absent. The latter is represented by a single species, which has, as yet, been found only in the river Niger. Theo. Gill.

Notor′nis. Amongst the bones of extinct birds found in New Zealand by Mr. Mantell were some of a bird of about the size of a fowl, which Prof. Owen named *Notornis*. The interest attaching to the species was subsequently greatly enhanced when Mr. Mantell obtained the skin and bones of a bird recently killed, which proved to belong to the same species as the semi-fossil bones. The notornis appears to belong to the Rallidæ or rail family, approaching nearest to the coots, but differing from all its known relatives, and singularly agreeing with the other ancient birds of New Zealand in the remarkably feeble structure and small dimensions of the wings. When shown to the natives, Mr. Mantell says, "No one had seen such a bird, but all agreed that it was the traditional *moho*, or *takahé*, which they had believed utterly extinct." (See Moa.) Edward C. H. Day.

Nototheni′idæ (from *Notothenia*—νοτόθεν, "southern" —the typical genus), a family of teleocephalous fishes, of the suborder Acanthopteri, representing in the southern seas to some extent the codfishes of the northern. The body is elongated; the scales ctenoid, regularly imbricated, and of moderate size; the lateral line runs high on the side near the dorsal fin, and is either interrupted or continued into the upper half of the caudal; the head is oval and scarcely compressed; the opercula normally developed and unarmed; the nostrils double between the eyes and snout; the mouth terminal, with the cleft lateral; the upper jaw little protractile, with the supramaxillaries retractile in part under the preorbital; teeth acute, present on the jaws as well as palate; branchial apertures extending forwards; branchiostegal rays six; dorsal fins two, the anterior short, with comparatively few spines, the posterior very long; anal little shorter than the second dorsal; caudal moderately developed; pectorals with the rays branched; ventrals jugular, each with a spine and five rays. The vertebræ are developed in increased number (in *Notothenia purpuriceps* 15 + 31); the stomach is moderate and cæcal, and the pyloric appendages present in small number (3 to 5). The family is composed of several genera, which have been differentiated among two subfamilies, viz. *Notothenlinæ*, in which the lateral line is interrupted, including *Notothenia* and *Macronotothen*, and *Eleginiinæ*, in which the lateral line is divided, and including *Eleginus* and *Eleginops*. The species are all inhabitants of the southern seas. The greatest number of species belong to the typical genus (*Notothenia*), and some of them are abundant on the southern coasts of S. America, and contiguous islands, as well as Kerguelen's Land, Australia, etc. Theodore Gill.

Notre Dame′, St. Joseph co., Ind. (see map of Indiana, ref. 1–E, for location of county), 1 m. N. of South Bend, on Michigan Central R. R., contains University of

Notre Dame du Lac, St. Joseph's Manual Labor School, and St. Mary's Academy. Pop. about 800.

Notre Dame, School Sisters of, founded in 1597 by Peter Fourier (1565–1640) and Alice Leclerc (1576–1622). In 1832 the order was restored; introduced in 1847 to the U. S., and received new papal confirmation. It has many houses in the U. S.

Notre Dame, Sisters of, a Roman Catholic sisterhood founded 1804 by Julie Billiart (1751–1816) and by J. D. Varin, a French Jesuit; have houses in the U. S. Another congregation of this name has its mother-house at Namur, and has houses in the Pacific States, to which it was introduced by P. J. de Smet in 1844.

Notre Dame, Sisters of the Congregation of, or **Congregational Nuns,** founded at Montreal in 1653 by Margaret Bourgeoys; found in Canada and the U. S.

Nott (Abraham), b. at Saybrook, Conn., in 1767; graduated at Yale College 1787; studied theology; taught school in Georgia; was admitted to the bar at Camden, S. C., 1791; settled on a plantation on the Pacolet River; was a member of Congress 1799–1801; practised law with great success at Charleston 1804–10, when he was elected a judge of the court of appeals, and retained that post until his death, at Fairfield, S. C., June 19, 1830.

Nott (Eliphalet), D. D., LL.D., b. at Ashford, Conn., June 25, 1773; graduated at Brown University 1795, in which year he was licensed to preach, and settled at Cherry Valley, N. Y., uniting the duties of pastor of a Presbyterian church with those of principal of an academy; was pastor of a church at Albany 1798–1804, acquiring celebrity as a pulpit-orator, especially by a sermon on the death of Alexander Hamilton; was elected president of Union College, Schenectady, N. Y., 1804, retaining that post more than sixty years, until his death, Jan. 29, 1866. Dr. Nott acquired a considerable fortune by several inventions in stoves and other apparatus for warming buildings, and gave large sums for the endowment of Union College and the foundation of scholarships for poor students. When he entered upon his duties as president, the institution had only 14 students and was in great pecuniary embarrassment, but under his management it became one of the strongest literary institutions in the country, and 3700 students were graduated from it during his presidency. Among his publications were *Counsels to Young Men* (1810) and *Lectures on Temperance* (1847).

Nott (Gustavus Adolphus), M. D., b. in Columbia, S. C., was a younger brother of the distinguished Josiah C. Nott; d. June 6, 1875, in Montgomery, Ala.; received the degree of M. D. from the medical college of his native State; in 1839 was elected professor of anatomy in the medical department of the University of Louisiana; in 1848 was transferred to that of materia medica and therapeutics, and in 1849 made dean of the faculty. He was a surgeon in the Confederate army. Paul F. Eve.

Nott (Henry Junius), son of Judge Abraham, b. on the Pacolet River, Union district, S. C., Nov. 4, 1797; graduated at South Carolina College 1812; visited Europe; was admitted to the bar 1818; became partner with David J. MacCord, with whom he edited 2 vols. of law-reports; went again to Europe for his health 1821; was elected during his absence professor of criticism and logic in South Carolina College; filled that post with ability until 1834; wrote many essays for the *Southern Review;* published in other periodicals a series of humorous sketches, collected at New York under the title *Novelettes of a Traveller* (2 vols., 1834); visited New York in 1837, where with his wife he embarked for Charleston on the steamer Home, and both perished in the shipwreck of that vessel on the coast of North Carolina Oct. 13, 1837.

Nott (Josiah Clark), M. D., son of Judge Abraham, b. at Columbia, S. C., Mar. 31, 1804; graduated at South Carolina College 1824, and in medicine at Philadelphia 1827; was two years demonstrator of anatomy to Dr. Physick; commenced practice at Columbia; spent two years in Europe studying medicine and natural history 1835–36; settled as a physician at Mobile, Ala., where he established a medical college; was for a short time professor of anatomy in the University of Louisiana (1857), and removed to New York City in 1868. D. at Mobile Mar. 31, 1873. Besides many scientific articles in medical journals and other periodicals, Dr. Nott was author of *Two Lectures on the Connection between the Biblical and Physical History of Man* (1849), *The Physical History of the Jewish Race* (1850), *Types of Mankind* (1854), and *Indigenous Races of the Earth* (1857).

Nott (Samuel), D. D., brother of Dr. Eliphalet, b. at Saybrook, Conn., Jan. 23, 1754; graduated at Yale College 1780; became pastor of the Congregational church at Franklin, Conn., Mar. 18, 1782, and filled that pulpit seventy years, until his death May 26, 1852. Dr. Nott was somewhat prominent as a theological instructor, and was long the patriarch of the clergy of New England.

Nott (Samuel), son of Dr. Samuel, b. at Franklin, Conn., in 1788; graduated at Union College 1808, and at Andover Theological Seminary 1810; was ordained Feb. 6, 1812, as one of the first band of missionaries sent to India by the A. B. C. F. M.; returned on account of ill-health 1816; was a teacher in New York until 1822; pastor of a church at Galway, N. Y., 1823–29, at Wareham, Mass., 1829–49; after which he established and conducted until 1858, with great success, a private academy at Wareham. The last eleven years of his life were passed with a son at Hartford, Conn., where he d. June 1, 1869. Author of *Sixteen Years' Preaching and Procedure at Wareham* (1845) and of *Slavery and the Remedy* (1856).

Nott (Sir William), K. C. B., b. at Carmarthen, Wiltshire, England, Jan. 20, 1780; entered the military service of the East India Company 1800; retired with the rank of major after a service of thirty-six years, and settled near his native place; but the loss of his fortune by the failure of a Calcutta bank induced him to return to India at the age of fifty years. In 1842 he had the good fortune to extricate the British army from its peril in Afghanistan by holding Candahar, retaking Ghuznee, Sept. 6, and re-entering Cabool with Gen. Pollock Sept. 15; for which services he received the rank of major-general, the thanks of Parliament, the highest order of knighthood, and an annuity of £1000 from the East India Company. D. at Carmarthen Jan. 1, 1845.

Not'tingham, or **Nottinghamshire,** or the county of **Notts,** county of Central England, comprising an area of 822 square miles, with a population of 391,815. The eastern part, the vale of the Trent, is level and low; the rest is hilly, partly consisting of moorland, partly covered with remnants of the famous old Forest of Sherwood, the haunt of Robin Hood. The cultivation of hops is carried on extensively, but the principal industry of the inhabitants is the manufacture of lace and of cotton hosiery, which two branches are developed more extensively and to a higher degree of perfection than in any other part of England. Much of the surface is laid out for gardening purposes. Coal, but inferior to that of Newcastle, marl, and good building-stone are found.

Nottingham, town of England, the capital of the county of Notts, on the Leen, near its junction with the Trent. It has a large and handsome market-place, but is otherwise indifferently built, standing on the side of a rather steep hill, which the streets climb in terraces. On the top of the hill stood the castle which was founded in the time of the Conqueror and transformed into a modern fortress in the sixteenth century, but which is now in ruins. Its manufactures of cotton and silk hosiery and of bobbinet and lace are most important. Its iron and brass works, its malting business, and its trade in corn and cattle are extensive. Pop. (with the suburbs), 186,656.

Nottingham (Custis Bell), b. in Northampton co., Va., May 21, 1818; received his classical education in Dickinson College, and graduated M. D. in the Jefferson Medical College, Philadelphia, 1844; practised in Houston co., Ga., nine years, and then removed to Macon. He has performed ovariotomy and lithotomy, and has been president of the Georgia Medical Society. Paul F. Eve.

Nottingham (Heneage **Finch**), D. C. L., first Earl of, son of Sir Heneage Finch, recorder of London, b. in Kent Dec. 23, 1621; educated at Westminster School and at Christ Church, Oxford; studied law and was called to the bar at the Inner Temple 1645; was a member of the Convention Parliament Apr., 1660; made knight, baronet, and solicitor-general by Charles II. June, 1660; was returned to Parliament for the University of Oxford 1661; became attorney-general May, 1670; lord keeper of the privy seal, with the title of Baron Finch of Daventry, Nov., 1673; lord high chancellor of England Dec. 19, 1675; presided at the trial of Lord Stafford 1680; was created earl of Nottingham May 12, 1681, and d. in London Dec. 18, 1682. Famed in his own time for powers of oratory, his portrait was given by Dryden under the character of Amri in his *Absalom and Achitophel.*—His son and successor in the earldom, Daniel Finch, b. about 1647, educated at Christ Church, Oxford, became a privy councillor and first commissioner of the admiralty 1679; was one of the commissioners to treat with William, prince of Orange, 1688; was secretary of state under William and Mary 1689–93; attended William to the congress at the Hague 1690; quarrelled with Admiral Russell 1672; was again secretary of state under Anne 1702–04; became one of the lords justices for the administration of affairs 1714; was lord president of the council Sept., 1714–Feb., 1715;

wrote an answer to Whiston on the Trinity (1721), for which he was thanked by the University of Oxford; succeeded to the earldom of Winchelsea 1729, and d. Jan. 21, 1730.

Nottnagel (Christopher), b. at Hilberghausen, Franconia, Germany, in 1607, was appointed professor of mathematics in the University of Wittenberg in 1634, and d. in 1666. He published *Substitutiones Mathematicæ* (1645), *Manuale fortificatorium* (1659), *De hypothesetus astronomicis*, etc.

Nottoway Court-house, cap. of Nottoway co., Va. (see map of Virginia, ref. 6–G, for location of county), on the Norfolk and Western R. R. Pop. in 1880, 173.

Nottoways, a tribe of American Indians of the Huron-Iroquois family, resided on the river of the same name in Virginia, where a small remnant remained and preserved the language until within the present century. The Nottoways of full blood are now extinct, as well as their language, which was related to the Huron and Susquehanna.

Nou'kha, town of Asiatic Russia, government of Trans-Caucasia, at the foot of the Caucasian Alps. The inhabitants, numbering 24,994, and consisting mostly of Tartars and Mohammedans, are engaged in breeding silkworms; the vicinity is one garden of mulberry trees.

Noun [from Lat. *nomen*, a "name"], in grammar, the name of a class of words which denote persons, things, or ideas. In the first case, a noun is called *proper*, as John, Peter, etc.; in the second, *common* or *concrete*, as horse, church, etc.; in the third, *general* or *abstract*, as virtue, goodness, etc. The common or concrete nouns are called *appellative* when they denote the material, as milk, dust, etc.; and *collective* when they denote a whole consisting of many single individuals, as mankind, cavalry, etc. In the different systems of grammar and logic many other divisions and subdivisions are to be found, but they are generally of subordinate importance. Nouns admit of three kinds of modification or inflection—*gender*, masculine, feminine, neuter; *number*, singular, dual, plural; and *case*, nominative, genitive, dative, accusative, vocative, ablative. But the inflection of nouns is of very different extent in the different languages, some languages having no gender, others only two numbers, and others no cases, or only two, or even more than those above mentioned. The difference between the noun or substantive and the two other principal classes of words, adjectives and verbs, may be defined thus: the noun denotes an object in fact, the adjective a quality of the object, and the verb the state in which it is considered. (For further information see the respective articles on Gender, Inflection, Language, etc.)

Noureddin. See Noor-ed-Deen.

Nourse (J. E.), b. in Washington, D. C., Apr. 17, 1819; graduated at Jefferson College, Pa., 1837; taught school in Washington 1840–50, when appointed professor of ethics and English studies at the U. S. Naval Academy, having been meanwhile (1852) ordained minister in the Presbyterian Church; ordered to U. S. Naval Observatory in 1865. Author of various professional works, including a *Memoir of the Suez Canal*, of the *Founding and Progress of the Naval Observatory*, *American Explorations in the Ice Zones* (1884), etc.

Novac'ulite, an argillaceous slate containing a very large proportion of silica, perfectly compact and homogeneous, with a splintery fracture. It is highly valued for sharpening tools, and is commonly known as whetstone, whetslate, honestone, and oilstone. Edward C. H. Day.

Nova'lis, the pseudonym under which Friedrich von Hardenberg is generally known in German literature, where he occupies a conspicuous place as one of the leaders of the romantic school. He was b. May 2, 1772, at Wiedestedt, a family estate situated in the countship of Mansfeld in Saxony; studied jurisprudence, chemistry, and mathematics at Jena, Leipsic, and Wittenberg; attended the mining school of Freiberg; held a position at the salines of Weissenfels, of which his father was director; and d. at Wiedestedt Mar. 25, 1801. His works, consisting of an unfinished romance, *Heinrich von Ofterdingen* (translated into English, Cambridge, Mass., 1842), a number of lyrical poems, especially hymns, and fragments on philosophy and religion, were published by his friends, Friedrich von Schlegel and Tieck (Berlin, 1802), and have been often reprinted. Besides the Bible, his favorites were Böhme, Zinzendorf, and the Neo-Platonists; the deep religious enthusiasm of his heart is often singularly mixed with mystical and fantastical flights of imagination.

Nova'ra, town of Italy, province of Novara, in lat. 45° 26' N., lon. 8° 37' E., about 30 miles W. of Milan, on a rising ground in the midst of the great fertile plain between the Sesia and the Po, and commands a fine distant view both of the Alps and the Apennines. Thirty years since this town was surrounded by lofty bastions and entered only by four low gates of rude architecture, so that it had altogether the aspect of a fortress. Now the walls, towers, and gates are demolished, the streets widened and paved, and the city wears a cheerful look. The cathedral of Novara rivals St. Ambrogio of Milan in antiquity, being founded A. D. 400, and is of much interest; there are also other noteworthy churches, besides numerous fine public buildings and private palaces. Charitable institutions of all sorts abound, and the provision for general education is liberal. Novara is the largest grain-market in Piedmont, and the manufactures of the town are numerous and extensive. Among these are cotton and linen cloths, starch, candles, sausages, earthenware, hides, etc. Novara is of pre-Roman origin; its inhabitants were noted for their industry in the time of Pliny; it played no inconsiderable part in the mediæval history of Northern Italy, and has been the theatre of important events in modern times. In 1500, Ludovico il Moro was held a prisoner here; in 1513 Novara was the scene of a battle that ended in the expulsion of the French from Italy; in 1821 the constitutional troops were here defeated by the Austrians; and here again, in 1849, the Austrians once more triumphed over the Sardinian army, after which the unhappy Charles Albert gave over his crown to his more fortunate son, Victor Emmanuel. Pop. in 1881, 33,077.

Novara di Sicil'ia, town of Sicily, province of Messina, about 15 miles S. W. of Castroreale. There are silver, copper, and lead mines near it. Pop. 7772.

No'va Sco'tia [Lat. for "New Scotland"], a province of the Dominion of Canada, consisting of the peninsula of Nova Scotia proper (area, 15,627 square miles), with the island of Cape Breton and numerous small islands adjacent to the mainland. Total area, 20,907 square miles. Sable Island in the Atlantic, lat. 43° 59' N., lon. 59° 47' W., belongs also to Nova Scotia. It is 85 miles distant from the mainland. Nova Scotia proper is a roughly-shaped parallelogram, extending 280 miles from N. E. to S. W. It is from 50 to 120 miles wide, and is joined to New Brunswick by an isthmus, which at its W. extremity is low and only 13 miles wide. It has been proposed to cut a canal through the isthmus from the Bay of Fundy to Baie Verte. The Minas Channel and Basin and Cobequid Bay extend from the Bay of Fundy nearly 80 miles into the province. The coast-line measures over 1200 miles, and is everywhere broken into deep bays and noble harbors. One of the most remarkable of these is the tideless Bras d'Or of Cape Breton, which, with St. Peter's Canal, half a mile long, bisects that island.

Surface, Geology, and Minerals.—The formations from the Laurentian to the Carboniferous prevail, but are much broken by dykes of unstratified rock. Ranges of low hills extend lengthwise through the country. The valleys are naturally fertile; the hill-country is often rocky and poor. The dyked marsh-lands near the Bay of Fundy are remarkably fertile. Among the mineral products are bituminous coal, oil-shales, iron, gold, gypsum, and fine sandstone for building purposes and for grindstones. The coal-fields of Cumberland, Pictou, and Cape Breton are of remarkable geological character, but are smaller and less valuable than was once believed. They are quite extensively wrought; 1,365,811 tons were mined in 1882. The coal of Glace Bay, C. B., is highly prized as a gas-coal. The Nova Scotia gold-field occupies fully one-third of the area of the province. The gold-bearing quartz averages considerably richer than that of Australia. In 1882, 14,107 ounces of gold were produced in Nova Scotia.

Industrial Pursuits.—Besides the working of coal, iron, and gold mines and quarries of gypsum, grindstone, and building-stone, which are largely exported to the U. S., there is to that country a heavy export of fire-wood, tanner's bark, potatoes, hay, oats, and other products. In 1881, 529,251 bushels of wheat, 228,748 of barley, 47,567 of rye, 1,873,113 of oats, 339,718 of buckwheat, 37,220 of peas and beans, 8128 of grass- and clover-seeds, 7,378,387 of potatoes, 1,006,711 of turnips, 326,143 of other roots, and 597,731 tons of hay were produced. There were 57,167 horses, 325,603 cattle, 377,801 sheep, and 47,256 swine. The country is heavily timbered, and forest products are shipped extensively to Great Britain. Shipbuilding is an important industry; 122 vessels, tonnage 31,361, were built in 1882. Codfish, herring, hake, haddock, salmon, lobsters, halibut, and other fish are very extensively caught and exported. In 1882 the value of fish exported was $4,437,364. The manufactures include fish and seal oils, lumber, leather, and castings. Total exports in 1881, $9,217,295; total imports, $8,701,589.

Climate.—The influence of the Gulf Stream renders the winters rather milder than those of Quebec, or even those of New England in general. But the coasts in winter are often enveloped in fogs and rain-clouds. In summer the climate is delightfully cool, and the abundance of trout and salmon and of forest game renders the province an agreeable summer resort for sportsmen and others. The northern coast is much obstructed in winter by ice.

Inhabitants, Religion, etc.—The people are in part descendants of the old Acadian or French colonists. Another part are descended from early colonists from Great Britain and Ireland. In the N. the Gaelic and Irish are quite extensively spoken. At the time of the American Revolution a great number of loyalists, or "Tories," emigrated to the province from the U. S. The British troops carried considerable numbers of negroes from Savannah and Charleston to Nova Scotia at the close of that war; here their descendants still live. Many Germans and Swiss settled at Lunenburg and vicinity in 1753; their descendants form a large and respectable body of citizens. There are some 2125 Micmac and other Indians, who are peaceable and partly civilized; they are Roman Catholics. The Anglican Church is under the lord bishop of Nova Scotia and Prince Edward's Island. The see-house is at Halifax. The Roman Catholics are under the archbishop of Halifax and the bishop and coadjutor-bishop of Arichat. The other churches are the Kirk of Scotland, the Presbyterian Church of the Lower Provinces, the Methodist Church, the Methodist Episcopal, and African Methodist, the Baptist and the Congregational churches, with a few Christians, Lutherans, Universalists, Adventists, and others.

Railroads.—There are 600 miles of railway in Nova Scotia, exclusive of mining and local tramways.

Education.—An effective system of public education has been established. There are county normal and training schools and various academies and denominational schools, also 6 colleges—viz. Dalhousie, St. Mary's (Roman Catholic), Presbyterian, Acadia (Baptist), St. Francis (Roman Catholic), and King's (Episcopal).

History, Government, and Statistics.—Nova Scotia, with New Brunswick and a part of Maine, once constituted the French colony of Acadia (*Acadie*). Attempts were made to colonize it in 1518 and 1598. In 1604 a settlement was established at Port Royal by the Sieur de Monts, a Huguenot gentleman. But religious differences among the colonists and the attack in 1613 by the Virginians under Sir Samuel Argall broke up the colony for the time. During the numerous wars between the French and English the Acadians were more than once mostly expatriated by the English colonists. The last and most famous event of this kind occurred in 1755. James I. and Charles I. of England each granted Nova Scotia to Englishmen, and the latter organized a body of baronets of Nova Scotia, each of whom agreed to furnish six colonists, and was in return to receive 16,000 acres of land, but few if any ever received their land. The final cession of Nova Scotia to Great Britain occurred in 1713, and the third and most nearly complete expatriation of the French-speaking colonists in 1755 was, as it now appears, an act of military necessity. In 1763, Cape Breton, thrice attacked and thrice taken from the French, was annexed to Nova Scotia. It was detached in 1784, and re-annexed in 1819. Prince Edward's Island was separated in 1770, and New Brunswick in 1784. Nova Scotia joined the Dominion in 1867, though a strong party opposed the union. The debt of Nova Scotia was assumed by the Dominion, and the annual Dominion subsidy pays the principal part of the expenses of the provincial government. There is also a handsome royalty on mines and on coal, and a good income from the sale of crown-lands. The province sends 10 senators and 21 representatives to the Dominion Parliament. The province has a lieutenant-governor and an executive council of eight, including the treasurer, attorney-general, secretary, and commissioner of public works. The legislature has 20 members of the upper and 38 of the lower house. There are 18 counties—viz. Hants, King's, Annapolis, Digby, Yarmouth, Shelburne, Green's, Lunenburg, Halifax, Cumberland, Colchester, Pictou, Antigonish, Guysborough, Inverness (C. B.), Victoria (C. B.), Cape Breton (C. B.), and Richmond (C. B.). Among the principal towns are Halifax (the capital), Pictou, New Glasgow, Sydney, North Sydney, Yarmouth, Liverpool, Lunenburg, and Windsor. The population of Nova Scotia in 1851 was 276,117; in 1861, 330,857; in 1871, 387,799; in 1881, 440,572. Nova Scotia has for many years been quietly and steadily advancing in wealth, population, and intelligence, but on account of the low price of labor thousands of her sons and daughters have emigrated to the U. S., where they are generally industrious, thrifty, and respected citizens. CHAS. W. GREENE.

Nova'tian [Lat. *Novatianus*], a schismatic Roman bishop of the third century, sometimes called the first false pope, founder of the rigorous Puritanic sect called Novatians. Perhaps he had been a Stoic philosopher. He was learned and eloquent, but of melancholic temperament; was baptized clinically, and soon after became a presbyter. In 251 he was persuaded by Novatus from Carthage (with whom he is not to be confounded) to be made bishop in opposition to Cornelius. Socrates (*Hist.* iv. 28) says he suffered martyrdom in the reign of Valerian (253–260 A. D.). We have a letter of his to Cyprian, in the name of the presbyters and deacons of Rome (*Ep.* xxxi.). He wrote also *De Cibis Judaicis* (about 250) and *De Trinitate* (about 256), a very valuable treatise. There is an excellent edition of his writings by Welchman (1724), but the best is by Jackson (1728). The sect spread E. and W., and continued till after 450 A. D. R. D. HITCHCOCK.

Novatianism. See NOVATIAN.

Nova'tion, in law. The doctrines of novation were derived from the civil or Roman law. Its general meaning in that system of jurisprudence is the act of substituting one contract for another. This might be either by putting a new contract of the debtor himself in the place of an existing one, or that of a third person, the original debt in either case being discharged. The first case was more strictly termed *novation;* the second, *delegation.* The "novation" of the English and American law corresponds to the "delegation" of the Roman law, which is described by Domat to be "the change of one debtor for another, when he who is indebted substitutes a third person, who obliges himself in his stead to the creditor, so that the first debtor is acquitted and his obligation extinguished, and the creditor contents himself with the new debtor." (Sec. 2318.) This is a correct definition of novation as now understood, and requires the assent of all the parties concerned. Thus, if A owes $1000 to B, and the latter owes the same amount to C, by mutual agreement the existing contracts may be extinguished by means of a new contract on the part of A to pay C. The inquiry may be made as to what is the consideration of the new contract. The answer is, that the act of C in surrendering his claim against B is a sufficient consideration. (See CONSIDERATION.) On the other hand, if C still retains his claim against B, the promise of C is without consideration and void. Some doubt has been entertained whether the rules of "novation" can be extended to a case where the debts are unequal in amount. Thus, if, in the case supposed, A owed B $1000 and B owed C $2000, would the same rules be applied as if the debts were equal in amount? The answer is, that if the parties intend to extinguish the larger debt by the substitution of the smaller one in its place, their intent will be carried out. On the other hand, they may so make their novation that $1000 of the claim against B will be extinguished by the promise of A, and the balance remain due from B. Under these rules, if an order be written by a creditor to his debtor requesting him to pay the amount of the debt to his own creditor, there is no novation until the debtor's assent is obtained and the creditor surrender his claim against the person on whom the order is drawn. A novation must be carefully distinguished from the assignment of a debt. In the latter case the purchaser obtains no new contract, but merely acquires by transfer the right of the existing creditor; while in the former the fundamental fact is that the old debt is wholly or partially extinguished, and a new contract substituted in the place of that which has been surrendered. A novation can only be made with the debtor's assent; an assignment may be made without it. An assignment to become complete requires notice to the debtor; a novation does not. An assignee takes the claim subject to any equitable defences which the debtor has against the claim. One who acquires by novation becomes a holder for a valuable consideration as against the promiser, and any defences which that person may have had against the original creditor can no longer be urged. T. W. DWIGHT.

No'va Zem'bla, a group of islands situated in the Arctic Ocean in lon. 52° E. and lat. 71° N., and belonging to Russia. They are uninhabited, but visited during the summer by whalers and hunters of bears and reindeer. They have been explored by Nordenskjöld.

Nov'el. This form of fictitious writing is peculiarly the outgrowth of modern civilization. When life was more purely external, and heroic deeds were acted upon the stage or celebrated by wandering bards, as was the case in the earlier ages of the world, the epic, the drama, and the lyric were the natural vehicles of narrative. As manners and customs lost their picturesqueness, the peculiar literary expression which had fitted the needs of earlier times was superseded. Rhythm, which adds so much to narrative spoken or sung, is a trammel to narrative written. As the whole character of modern life became more subjective, as thought turned inward for its material instead of outward, the expression of thought changed. Poetry, like every other fine art, is peculiarly unfitted to become the vehicle for analysis and for didactic teaching, and poetry, therefore, in this age of self-contemplation, is superseded by prose, the epic and the drama (except for stage representation) by the novel. What the drama was to the ruder and more excitable period of the earlier and less conventional past, the novel aspires to be for us. The imaginative spirit which characterizes a nation in its youth requires a poetical medium. The drama, with its picturesque effects, its scenery, and its action, possesses a certain power in the characterization of manners and the display of the comic side of character. As society becomes more decorous and oddities of manner are smoothed down, the delineator of life must go below the surface, and seize for his material upon the salient points of character rather than upon any external traits. The modern novel of the highest type therefore depends for its interest upon a close analysis of human motive, a delineation of that inner life of joy and sorrow, the ecstasy or tragedy which for ever ebbs and flows with no less power and passion because it is hidden beneath the mask of conventionality. The whole character of fictitious narrative therefore changes with the changing life which it depicts.

The transition from the earlier to the later form of narrative is marked by the rise of the romance, a prose fiction whose interest turns mainly upon marvellous incident. The natural reaction—out of which the modern novel was born—from the stilted heroic romance and absurd sentimental pastoral of the seventeenth century was towards the commonplace and even vulgar. A few noted writers who have been either the founders or the most characteristic representatives of certain schools may be briefly mentioned. Daniel De Foe (1661–1731) was the first of the extreme realists who attained any celebrity. Except as the author of *Robinson Crusoe* he is scarcely known to modern readers, but in all his writings there is a marvellous verisimilitude, an air of absolute truth "resembling that of a deposition upon oath," which defies the skepticism of the reader. His stories are generally laid among outlaws, in the very purlieus of society, and have—with the exception of *Robinson Crusoe*, which is saved from the objectionable features of his other works by its peculiar character—been forgotten. His apparition of Mrs. Veal, which was published as a sort of prelude to a stupid volume, *Drelincourt on Death*, caused the whole edition to be sold. His stories were again and again received as veritable histories, with nothing to recommend them to the public belief but their wonderful air of veracity. This effect was produced by an accumulation of details, and often by such a multitude of irrelevant statements as would be used by an uncultivated narrator. Richardson uses much the same means to paint his picture of a higher life, and to paint it with a higher ideal of his art. He strives to individualize character rather than to make vivid mere incident. The vast accumulation of details is more than modern readers will endure. Richardson, though his aim was higher, both as regards the matter and the manner of his writing, never attained to De Foe's peculiar excellency; in whatever he writes the writer is always present. In humor and quiet satire, in the power to seize the salient points of character, and in the ability to give a characteristic portrait with a few skilful touches, Fielding far surpassed Richardson. Smollett, with whom Fielding is always associated, chooses exceptional absurdities rather than ordinary characters, manners, or incidents as the materials out of which his novels are made up; it is only his strong humor which redeems them from contempt. Both Smollett and Fielding are far inferior to Richardson in morality and refinement. Fielding as greatly excelled Smollett in plot as Smollett excelled him in humor and wit. Sterne, whose productions are now very little read, presents a curious mixture of genius, sentimentality, oddity, insufferable affectation, and indecency. His humor is exquisite, differing from that of Smollett in being the result of a quick insight into human follies and absurdities, rather than in a mere combination of circumstances. These, with Goldsmith, who is too well known, through his exquisite story of *The Vicar of Wakefield*, to need comment, are the five great novelists of George II.'s reign.

The season of romance had seemed fairly over, but in 1769 came its Indian summer. The old stories of terrors and escapes, of heroic deeds and impossible complications of circumstances, of unfathomable mysteries and supernatural appearances, were revived. The best specimens of this class of fiction are to be found in Horace Walpole's *Castle of Otranto*, Mrs. Radcliffe's *Mysteries of Udolpho*, Clara Reeve's *Old English Baron*, and M. G. Lewis's *Monk*. The works of Miss Burney (Madame d'Arblay) created a very great sensation at the time of their appearance—a sensation which does not seem justified by their intrinsic merit. After her day the realistic school again appears in force in the works of Miss Austen and Miss Edgeworth. These novels are marked by sound sense, shrewd insight, keen humor, and high moral tone, but are lacking (in Miss Edgeworth to an unpardonable degree) in the glorifying power of the imagination. In 1814 came the "Great Wizard of the North" to overturn traditions and to give a color and character to novel-writing which it had before lacked. Walter Scott represents perfectly the transition period from the romance to the novel: adventures, marvels, escapes, even a strong flavor of the supernatural, are to be found in most of his fictions. Yet these materials, artistically used as they are, do not constitute his chief claim to glory. The work is lifted up from the plane of the romance to the higher level of the novel by his delicate discriminations, his exquisite touches of character, the vivacity of the conversations, the poetic descriptions of nature, apart from its mere value as scenery, as an accessory to the incident. Scott has, however, never written in the truly modern style: he is never didactic. While he is always moral, he has no distinct moral purpose in his writings. He is moral because, like Shakspeare, he paints life truly, and at the same time from a high moral standpoint. He does not go into the minute analysis of human motive, the close scrutiny of mental processes, which we find in the best of our late novelists, such as Kingsley, Bulwer, Thackeray, and George Eliot. But it is with Scott, as the founder of a school, as a great reformer in his own department of literature, that we have mainly to do. The historical novel proper is his creation. It had made some pretensions to existence in *The Recess* of Miss Lee and the *Scottish Chiefs* of Miss Porter—romances in which the names were historical, and pretty much all the rest fictitious. It is not so much that Scott has had worthy imitators as that he gave a new impulse to novel-writing and lifted it upon a higher plane; that he gave to it a new dignity; that he proved how much simplicity, purity of style, and conscientious study of character could effect with the most ordinary material.

The most modern school of English novels defies classification. We have historical, political, dramatic, and legal novels, novels of society, novels with a didactic purpose, novels of foreign life written in English, and many which are *sui generis*. The most distinguished names which have adorned the annals of the present should perhaps be mentioned: Sir Edward Bulwer-Lytton, Charles Kingsley, Charles Dickens, Charles Reade, William Makepeace Thackeray, Samuel Warren, Charles Lever, Benjamin Disraeli, Baroness Tautphœus, Anthony Trollope, George Eliot, James Fenimore Cooper, and Nathaniel Hawthorne. Some of the names enumerated are chiefly distinguished as the founders of a peculiar style, others as pre-eminent in a school already in existence.

All art teaches us that ideal truth is a far more important element in our mental development than mere mechanical accuracy. The bare facts of history have a far less value in mental training than those great principles of human nature which underlie and make the facts. A genuine work of art in the department of novel-writing is history—the manners and customs of a certain period, life itself, compelled by the power of genius to yield up its secret. It is mental and moral philosophy; it is political economy; it is the wisdom gathered by bitter suffering and painful discipline made incarnate and compelled to speak for the world's behoof. In proportion as the evil of false art and false morality in this department of letters is deadly, so is the benefit of true art and high morality incalculably great. (See APPENDIX.) S. B. HERRICK.

Novel'da, town of Spain, province of Alicante, on the Vinolapo, has corn and oil mills and large distilleries. Pop. 8802.

Novella'ra, town of Italy, province of Reggio nell' Emilia. It is situated on a plain between the Enza, the Po, and the Secchia, is a walled town, and has a large crenellated castle with a lofty tower, the former residence of the great Gonzaga family, and containing some of the works of Correggio. The archives are very curious and valuable. The parochial church also contains objects of much interest. Pop. 7087.

Novel'lo (VINCENT), b. in London, England, Sept. 6, 1781, was of Italian descent; became organist of the Portuguese chapel at an early age; was one of the members of the Royal Society of Musicians and a founder of the Philharmonic Society; was a voluminous editor of old musical classics and composer of numerous pieces of considerable merit. D. at Nice, France, in Sept., 1861.—His daughter, CLARA ANASTASIA, b. in London June 15, 1818, a distinguished soprano singer and prima donna, retired from the stage in 1848 on her marriage with Count Gigliucci, an Italian nobleman.—Another daughter is the distinguished Shakspearean scholar, MRS. MARY COWDEN CLARKE.

Novells. See Law, The Civil.

Novem′ber [Lat., from *novem*, "nine"] was formerly the ninth month in the year, but in the present or Gregorian year (new style) it is the eleventh month.

Nov′gorod, government of European Russia, bounded W. by the government of St. Petersburg, and comprising an area of 47,234 square miles, with a population of 1,086,788. The ground is low, the surface mostly undulating, the soil not very rich, and the climate cold. Lakes and navigable rivers are numerous, and connected with each other by canals. Rye, barley, and oats are grown. Large forests and meadows are found, and timber and hay are the chief articles of export.

Novgorod, town of European Russia, capital of the government of Novgorod, on the Volkhov near its issue from Lake Ilmen. It is an old town, and was in the fifteenth century the largest and most important town of Northern Europe. It was in 862 made the capital of the Russian monarchy, founded in that year by Rurik, and on the thousandth anniversary of that event a magnificent monument was erected in the city, which otherwise is rather poorly built. It is now entirely dependent for its trade on St. Petersburg and Archangelsk. Pop. 17,599.

Novgorod-Sjewersk, town of European Russia, government of Tschernigov, on the Desna, has many educational institutions, both elementary, mechanical, and theological. Pop. 6415.

Novgorod-Wolynski, town of Russian Poland, government of Volhynia, on the Slatch, has some manufactures and 7464 inhabitants.

No′vi di Mo′dena, town of Italy, province of Modena, the scene of much civil strife during the Middle Ages. The country around is rich in grain, vines, mulberries, etc. Pop. 7418.

No′vi-Bazaar′, or **Jenipazar,** town of Austria-Hungary, in the eyalet of Bosnia, on the Rashka, an affluent of the Morawa, is wretchedly built, consisting mostly of narrow, filthy streets lined with mud huts, but its trade is important and its fairs much frequented. Pop. 15,000.

Nov′ikoff (Nikolai Ivanovitch), b. at Tikhvensk, near Moscow, Apr. 26, 1744; served for some time in the imperial guard at St. Petersburg, but abandoned afterwards the military career in order to devote himself exclusively to literature, and settled at Moscow, where he d. July 31, 1818. He edited the Moscow *Gazette*, founded the first circulating library in Russia, published the *Old Russian Library* (10 vols.), a most valuable collection of historical documents, and wrote *Russian Biographies* (19 vols.), also a very valuable work. His *History of the Jesuits*, published in the *Gazette*, gave umbrage to Catharine II., who finally threw him into prison as a revolutionist and confiscated his property. On the accession of Paul he was liberated, however, and reinstated in his patrimony.

No′vi Li′gure, town situated on the northern slopes of the Apennines, at the head of a wide and fruitful plain. It was formerly strongly fortified, having four gates with drawbridges. Of the four principal squares, that of the Duomo is the most attractive, being flanked by fine buildings and containing a fountain of excellent water. The three parochial churches are not without architectural merit, and many of the great Ligurian families have palaces here. Over the beautifully wooded hills near the town are scattered truly palatial country-seats. Novi contains a public library, museum, literary and artistic academies, and a valuable private picture-gallery to which strangers may have access. The silk manufactories here are of great extent, and the silk of Novi is preferred in France and England to that of Lombardy or Piedmont. Novi is said to have been destroyed by Attila; in 999 it is spoken of as *Corte Nova* or *Castro Novo*, and from that time till 1447, when it gave itself to Genoa, it maintained a semi-independence, though its castle was sometimes in the hands of the lords of Milan or of Monferrato. This town gave its name to the battle of Aug. 15, 1799, between the French and Russians, in which the French general, Joubert, lost his life. Pop. in 1881, 13,783.

No′vo-Georg′ievsk, town of Russian Poland, government of Plocki, 19 miles N. W. of Warsaw, at the confluence of the Bug and the Vistula, is strongly fortified and has 9886 inhabitants. It was founded by Napoleon in 1809 under the name of Modlin. In 1831, after its occupation by the Russians, it received its present name.

No′vo-Moskovsk′, town of European Russia, government of Yekaterinoslav, on the Samara, an affluent of the Dnieper, has large cattle and horse markets and manufactures of leather and tallow. Pop. 10,515.

No′vo-Tcherkask′, town of Russia, the capital of the Country of the Don Cossacks, on the Don, was founded in 1805. It is finely built, is the see of an archbishop, and has a large cathedral, extensive manufactures, and a lively trade in cattle, corn, and wine. Pop. 27,918.

No′vum Or′ganum [*i. e.* "new instrument"[*] or "new method"], the name given by Bacon to his great work treating of the proper mode of studying nature in order to extend the dominion of man over the inanimate world. Bacon's great aim was to recall the minds of men from what he deemed the vain and useless speculations of the ancient philosophers to the pursuit of the practical and useful. In order to present the different points of his subject in a manner at once comprehensive and striking, he has given them in the form of aphorisms. In the second aphorism of his first book he tells us that as the naked hand is often unable to perform its proper work without the aid of an instrument, so the human intellect, left to itself, is comparatively inefficient, and needs the help of instruments no less than the hand. To supply this need he composed his great work (published in 1620), comprising the ripe and rich results of a life of study. "In our judgment," says Macaulay, "Bacon's greatest performance is the first book of the *Novum Organum*. All the peculiarities of his extraordinary mind are found there in the highest perfection. Many of the aphorisms, but particularly those in which he gives examples of the influence of the *idola*, show a nicety of observation that has never been surpassed. Every part of the book blazes with wit, but with wit which is employed only to illustrate and decorate truth. No book ever made so great a revolution in the mode of thinking, overthrew so many prejudices, introduced so many new opinions. Yet no book was ever written in a less contentious spirit. . . . What we most admire is the vast capacity of that intellect which without effort takes in at once all the domains of science—all the past, the present, and the future, all the errors of 2000 years, all the encouraging signs of the passing times, all the bright hopes of the coming age." (*Essay on Lord Bacon*, 2d part, where will be found many eloquent and admirable passages upon the philosophy of Bacon, though the remarks of the critic on the ancient philosophers, particularly Plato, are to be received with great allowance.) J. Thomas.

Now′ell (Increase), b. in England about 1590; was chosen an assistant governor of Massachusetts Colony 1629, previous to its actual foundation; came with Winthrop in 1630; was ruling elder of Wilson's church 1630–32; one of the founders of the church in Charlestown 1632; commissioner for military affairs on the occasion of the first Pequot war 1634, and secretary of the colony 1636–49. D. at Boston Nov. 1, 1655.—His son Samuel, b. at Charlestown, Mass., Nov. 12, 1634; graduated at Harvard College 1653; became chaplain in Philip's war, and assistant treasurer 1680–86, and afterward treasurer of Harvard University. He was a staunch supporter of the old charter, and went to England in its behalf in 1688. He did not succeed, however, in accomplishing anything for his purpose, as he died soon after his arrival in London.

Noyes (Edward Follansbee). See Appendix.

Noyes (Eli), D. D., b. at Jefferson, Me., Apr. 27, 1814; was self-educated; began preaching in 1834; went as a Free-will Baptist missionary to Orissa, India, 1835; was successful both as an evangelist and as a teacher; became a skilful linguist, and published a Hebrew grammar and reader. Returning home with impaired health in 1841, he was for some years a pastor at Boston, afterwards, for ten years, editor of the *Morning Star*, the Free-will Baptist organ, and published *Lectures on the Truths of the Bible* (1853). D. at Lafayette, Ind., Sept. 10, 1854.

Noyes (George Rapall), D. D., b. in Newburyport, Mass., Mar. 6, 1798; graduated at Harvard in 1818, and studied divinity at Cambridge, Mass.; was tutor there 1825–27; held pastorates (Unitarian) at Brookfield and Petersham, Mass.; was Hancock professor of Hebrew, etc., and Dexter lecturer on biblical literature, 1840–68; published translations of Job, the Psalms, Proverbs, Prophets, Ecclesiastes, the Canticles, and the New Testament, besides numerous reviews, sermons, and other works. D. at Cambridge, Mass., June 3, 1868.

Noyes (James O.), M. D., b. at Owasco, N. Y., in 1829; became a surgeon in the Turkish army; was correspondent of the New York *Tribune* and the London *Chronicle*; published *Roumania, or the Border Land of the Christian and Turk; comprising Adventures of Travel in Eastern Europe and Western Asia* (1857); *The Gypsies; their History, Origin, and Manner of Life* (1858); wrote for several magazines, and became in 1858 proprietor and editor of the *Knickerbocker*.

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[*] *Organum* is the Latin form of the Greek ὄργανον, literally an "instrument," but applied to Aristotle's system of logic regarded as the instrument (or method) of all reasoning.

Noyes (JOHN HUMPHREY), b. at Brattleboro', Vt., Sept. 3, 1811; graduated at Dartmouth College in 1830; studied divinity at New Haven, Conn.; founded in 1838 a community of Perfectionists at East Poultney, Vt.; removed in 1847 to Lenox, Madison co., N. Y., where he established the ONEIDA COMMUNITY (which see), and subsequently established another branch at Wallingford, Conn.; author of various works sustaining his peculiar views.

Noyes (JOSIAH), M. D., b. in Atkinson, N. H., Oct. 25, 1776; graduated at Dartmouth College 1801; was tutor there 1807–08 studied medicine; became professor of chemistry and pharmacy at Fairfield College, and on the organization of Hamilton College, N. Y., became professor of chemistry and natural science, till 1830. Dr. Noyes was a lifelong friend of Daniel Webster, his college classmate, after whose death he furnished the literary executors of that statesman with reminiscences of his college career. D. at Clinton, N. Y., Nov. 1, 1853.

Noyes (NICHOLAS), b. at Newbury, Mass., Dec. 22, 1647; graduated at Harvard College 1667; was pastor at Haddam, Conn., thirteen years; afterwards minister of Salem from 1683 to his death, Dec. 13, 1717. He had much to do with promoting the lamentable witchcraft delusion, and at a later period publicly confessed his error.

Noyes (WILLIAM CURTIS), LL.D., b. at Schodack, N. Y., Aug. 19, 1805; was admitted to the bar 1827; took high rank as a lawyer in Oneida co.; removed to New York City 1838; was engaged in codifying the laws of the State of New York; was prominent as a Whig and as a Republican; was a member of the Peace convention of 1861, and chosen president of the New England Society the day before his death, at New York Dec. 25, 1864. He bequeathed his valuable law library to Hamilton College, New York.

Noyon′, town of France, department of Oise, has large manufactures of fine linen and cotton fabrics. Charlemagne resided here, Hugo Capet was crowned here, and it was the birthplace of John Calvin. Pop. 6252.

Nu′bia, the *Ethiopia* of the Romans and the *Cush* of the Bible, a territory of North-eastern Africa, between lat. 11° and 24° N., bounded N. by Egypt, E. by the Red Sea, S. by Abyssinia, and W. by Darfoor and the desert of Sahara, and belonging to Egypt since 1821, when it was conquered by Ibrahim Pasha. The name seems to have been derived from the Egyptian or Coptic *noub* ("gold"): It occurs also in *Nobatæ*, the name of the Libyan tribe settled here by Diocletian, and it is still retained in *Wady Nouba*, the name of the tract extending N. from the frontier of Dongola. Area, 35,000 square miles, with a population estimated at 400,000. The surface presents a series of elevated plains—that of Sennar, 1377 feet above the level of the sea, and that of Khartoom, 1263 feet, forming terraces on which the Nile descends from Abyssinia to Egypt, and which on both sides are framed in by low mountain-ranges, which respectively separate Nubia from the Red Sea and from the desert of Sahara. The soil is not very rich; the climate is extremely hot, though not unhealthy; and the ground is cultivable only in the valley of the Nile, which here is considerably narrower than in Egypt. The products are the same as in Egypt, only that here the giraffe and several species of antelopes and birds which belong to the central plateau of Africa are found. The inhabitants form a mixed population of negroes, Arabs, and descendants of the old Ethiopians. They hold the Mohammedan creed, and speak either the Arabic or the Ethiopian language. They live partly as agriculturists in well-built habitations, or as nomads in tents of a coarse black fabric made of camel's hair. The transit trade in the products of Central Africa is very important.

Nudibranchia′ta (from *nudus*, "naked," and *branchiæ*, "gills"), an order of gasteropod mollusks of the sub-class *Opisthobranchiata*. The sexes are united in the same individual; the heart has a single auricle; the branchiæ are exposed and arranged in fascicles on the back or atrophied; the otocysts are connected with the supraœsophagal ganglia, and sessile; the shell is developed in the embryo, in which it is spiral, but is soon lost, and the animal is naked throughout the rest of its life. The order is represented by numerous forms, all of which are inhabitants of the sea, in which they are found at all depths, from between tidemarks to at least more than 50 fathoms; and a few are pelagic, living at or near the surface of the open sea. There is great variation among the different members in the development of the branchiæ. The principal modifications in this respect are those which distinguish the primary groups or sub-orders of the order. In the Pygobranchia the gills are towards the middle of the hinder part of the back and distributed in a branched or plumose mass around the anus, and in many instances retractile within a sheath; in the Polybranchia the gills are variously distributed on the surface of the mantle, and in Pellibranchiata they are more or less atrophied, and the function of respiration is chiefly formed by the skin.

THEODORE GILL.

Nu′gent (Sir GEORGE), BART., b. in England June 10, 1757; he was educated at the Military Academy at Woolwich, and joined the 7th regiment as lieutenant at New York, Sept., 1777; was present at the storming of Forts Montgomery and Clinton; was appointed a captain in the 57th regiment in April, 1778, and did duty with that regiment in New Jersey and Connecticut until May, 1782, when he became a major; served under the duke of York in the war in Flanders, and was made a major-general; aided in suppressing the Irish rebellion 1798; became a baronet 1806; was commander-in-chief in India in 1811, and attained the rank of field-marshal in 1842. D. in England Mar. 11, 1849.

Nugent (GEORGE NUGENT **Grenville**), BARON, second son of the marquis of Buckingham, b. at Buckingham Castle, England, Dec. 30, 1788; educated at Oxford; entered Parliament under the courtesy title of Lord George Grenville in 1812; succeeded to an Irish barony on the death of his mother in 1813; published a poem on the English campaigns in Portugal; was an active promoter of the Reform Bill for years before its passage; became a junior lord of the treasury in the Whig administration of 1830; lord high commissioner of the Ionian Islands 1832–35; published *Oxford and Locke* (1829), *Memorials of Hampden* (1831), *Lands Classical and Sacred* (1841); was again in Parliament in 1847. D. Nov. 26, 1851.

Nuggi′na, town of British India, province of Bengal, is situated in lat. 29° 27′ N., and manufactures firearms. Pop. in 1881, 20,503.

Nui′sance, in law. This is a term of much breadth of meaning, and includes all structures, employments, or acts that in a manner not authorized by law are prejudicial to health, or that so incommode or offend as to render the exercise of personal rights or the use of property uncomfortable. The subject will be considered in this article under two divisions: I. General principles; II. Remedies and criminal proceedings.

I. Nuisances are arranged by law-writers into two principal classes, public and private. These do not necessarily differ in their nature. The general distinction between them concerns the persons affected by the wrongful act. Thus, a nuisance may be purely public, or it may be both public and private, or it may be strictly private. A nuisance purely public affects the neighborhood or community, without being specially injurious to any particular person. Instances are the exercise of offensive trades causing noisome odor, the erection of gunpowder-mills, the act of keeping gunpowder-magazines, or disorderly houses of any kind, such as places for gaming or unlicensed exhibitions of showmen and mountebanks. It has even been held that the act of making use of a building for the purpose of carrying forward for profit sports or amusements having no useful end —as, for example, a bowling-alley kept for gain or hire— is a public nuisance, even though gambling is prohibited. It is of the essence of a nuisance that the act complained of, or at least the mode of its exercise, should be unlawful. Accordingly, if permitted by statute it becomes lawful, and though all the other qualities of a nuisance be present no redress can be had. When unlawful, responsibility will not only attach to the author of the wrong, but to any one who, having control of the property upon which the nuisance is erected, continues it, at least after notice and request to remove it. So one who has erected a nuisance may be liable in some cases for its continuance, though he has parted with his estate.

Somewhat akin to a public nuisance is a *purpresture*. The more specific meaning of this term is an "enclosure" (*pourpris*, Fr.), and it refers to the act of enclosing public property for private purposes, as, for example, an encroachment by an adjoining owner upon a highway. Such an act may be both an encroachment and a public nuisance, or it may be simply an encroachment. Presumptively, an individual who appropriates any part of a public street or harbor to his own use without the consent of the proper authorities is guilty of a nuisance, and the burden of proof will devolve upon him to show that it is no injury to the public, and that a public right has not been violated. It has been decided by high authority that the erection of a crib or pier in such a harbor as that of the city of New York without competent authority is a nuisance in law, and that it is not so in fact is no defence.

A public nuisance will also be private when the unlawful act is specially injurious to some particular individual, or even to a number of persons having distinct rights. An unlawful disturbance of a public street might produce an injury to an adjoining owner of land far beyond that sustained by the rest of the community, and peculiar to himself, in which case he would have his separate remedy. Where, however, the unlawful act is of a public nature, without especially affecting any particular person, there will be no remedy allowed to individuals, but only a public prosecution can be had.

A nuisance is strictly private when only an action will lie at the suit of some private person. There are many acts which are ranked in the law as "nuisances" simply because they are unjustifiable interferences with the ordinary rights of enjoyment of private property. This is particularly true of encroachments upon incorporeal rights. (See HEREDITAMENTS, INCORPOREAL.) Thus, if one be the owner of a right of way, or of light, or of a right to draw water from a stream, or of a franchise, such as a ferry, and there is an unjustifiable interference by another with the exercise of his right, he may regard the unlawful act as in the nature of a nuisance. It is scarcely necessary to multiply instances by way of illustration. (Detailed information is to be sought in the reports and in the treatises upon torts and crimes. See TORT and CRIME.)

II. There is quite a variety of remedies allowed by law in order to do complete justice to parties injured by a nuisance, as well as a criminal proceeding with a view to deter offenders from encroaching upon the rights of the public.

(1) *Indictment.*—A public nuisance is in law a crime of the grade of a misdemeanor. If the defendant is convicted on the trial, he is liable to punishment by fine and imprisonment. Still, the chief end of the criminal prosecution is the removal of the nuisance, and the court will so adapt its judgment as to accomplish that result. Accordingly, where it appears that the nuisance continues to exist at the time of the prosecution, the defendant may be commanded to remove it at his own cost. He would only be required to do so much as to remove what was offensive; for example, if a noisome trade was carried on in a building, he would not be directed to destroy the building itself, but would only be prevented from using it for the purpose of the trade. If the party does not abate the nuisance in accordance with the order, the sheriff will be directed to do it at the defendant's cost.

(2) *Abatement without Legal Proceedings.*—This is one of the exceptional cases in which a person may take the law into his own hands and take away or remove the nuisance, so long as he commits no breach of the peace. Blackstone gives as the reason of this rule that such injuries as obstruct or annoy such things as are of daily convenience or use require an immediate remedy, and cannot wait for the slow progress of the ordinary forms of justice. This law of abatement would seem to be generally applicable to cases of private nuisance. On the other hand, where the nuisance is simply public, a private person would, according to the better opinion, have no right to proceed in this manner. He should await the ordinary course of criminal justice. If the act complained of is both a public and a private nuisance, the person specially injured by it would have a right of abatement. The act of abatement does not prevent the injured party from maintaining an action for damages.

(3) *Action at Law for a Removal of the Nuisance.*—This remedy is known as a "writ of nuisance" or "assize of nuisance." Under it the sheriff summons a jury to view the premises, and if the plaintiff is successful he has judgment both to have the nuisance abated and to recover damages. This proceeding can be instituted both against him who originated and him who continues the nuisance. This writ is only resorted to where the plaintiff has a freehold interest in land affected by the nuisance, and the defendant has a similar estate in the land upon which the unlawful act is performed. This writ is substantially in force in some of our States (*e. g.* New York), though modified as to its ancient forms.

(4) The more common remedy in a court of law is an action simply for damages, known as an "action on the case." This is governed by rules much less technical than those prevailing under the writ of nuisance. It is not necessary to consider this case in detail, as it is governed by ordinary rules prevailing in courts of law as to injuries of an indirect kind, and the plaintiff will be entitled to recover whatever damages he may prove himself to have sustained.

(5) *Suit in Equity.*—Courts of equity have jurisdiction over this class of cases in many instances, and may grant relief by the special process known as an injunction. (See INJUNCTION.) The jurisdiction of the court embraces public nuisances and purprestures, as well as encroachments upon private rights. In the case of a purpresture or public nuisance the attorney-general, acting in behalf of the State, files an information. (See INFORMATION.) The main ground of interference by this court is that it gives a more complete and perfect remedy than is attainable in a court of law, and is able more effectually to suppress vexatious litigation. By the grant of a perpetual injunction final relief is granted to the public, whereas an indictment at the common law only disposes of the particular case then before the court. When an individual sustains from a public nuisance an injury peculiar to himself, he has the like remedy in equity on his own application. It is necessary for the plaintiff in this class of cases to establish his claim by clear and satisfactory evidence. An injunction may also be had to restrain the continuance of a nuisance simply of a private character if it be injurious to property. A recent illustration is found in the case of a market-gardener whose garden was seriously damaged by noxious vapors and smoke issuing from neighboring gasworks. The plaintiff was awarded a perpetual injunction to restrain the further manufacture of the gas in a manner injurious to his crops. The instances that might be cited are very numerous both as to corporeal property and incorporeal rights. They all resolve themselves into cases where the injury caused by the nuisance cannot be adequately compensated by money or the unlawful act from its nature must occasion a continuing damage, which can only be prevented by the peculiar remedies of this court. In certain cases, where the act is plainly a nuisance, the court will proceed without the aid of a jury; in other cases, where the act is apparently lawful, but may become unlawful from negligence or mismanagement, the question of unlawfulness may be submitted to a jury through the medium of a court of law, and the equity court will make use of the verdict as establishing the requisite facts. So, where the injunction is asked for in aid of a legal right, unless that is clear, it must first be settled by an appropriate proceeding in a court of law. (Consult Gibbons on *The Law relative to Nuisances*, Yool's *Remedies in Equity*, and the works on *Equity Jurisprudence* of Story, Adams, or Willard (Potter's ed.).) T. W. DWIGHT.

Nu'kha, town of Asiatic Russia, government of Baku, Transcaucasia, is surrounded with a wall, and is celebrated for its production and manufacture of silk. Pop. 24,994.

Nullifica'tion [from the Lat. *nullifico,* used with *nullificatio* by Tertullian] is the act of making void or invalid. The word acquired no rights in the English language, we believe, although *nullify* occurs in Jeremy Taylor, until it became necessary in our political history to devise a term which should signify the so-called right of one or more of the States in the American Union to declare a law passed by the national legislature unconstitutional, and to refuse to be bound by such legislation. In other words, the right was asserted to belong to the States to interpret the Constitution each one for itself, and thus to impose a check of a new description on the general law-making power. The doctrine of the Constitution had been held to be, that if the House of Representatives, the Senate, and the President should together assent to an act of legislation, it should become a law; nay, further, that if the President objected to the bill and two-thirds of each of the houses should still sanction it, it should become a law notwithstanding his objections. In other words, it was a law in such a sense that all executive officers and others concerned with the laws should regard it to be such, and enforce it, excepting the single case in which constitutional objections should be formally made before the proper court. Should this occur, the ultimate decision would rest with the Supreme Court of the U. S., and if the decision there was adverse to the constitutionality of the law, there would be no adequate ground for prosecutions on the part of the government or of any official or private person against a person refusing to be bound by the law in question. Thus, there were conceivably four parties whose opinion needed to be taken before a law was sure of a place on the statute-book—the two houses, the chief magistrate, and the Supreme Court. The doctrine of nullification sought to add to these a fifth—the judgment of a State as expressed in a constitutional way. And it was held that the State thus nullifying an act or law of Congress was still in the Union, entitled to all its former privileges, although refusing obedience to the law or act in question. Should the general executive, however, make attempts to enforce such act or law within the territory of the nullifying State, then an unconstitutional wrong would begin, and the State would have the right to retire from the Union, while the U. S., of course, could have no right to obstruct the exercise of its will in this respect. The framers of the ordinance of nullification seemed to have been simple enough to suppose that such opposition would put an end to the attempt at force; probably they thought some compromise would be the natural issue of such a quarrel, and perhaps they hoped for support from one or more of the neighboring States.

But it is time to go into some details respecting the origin and occasion, as well as the result, of the controversy between South Carolina and the general government. In doing this we must avow our conviction that the tariff legislation had been unwise, one-sided, and adverse to the interests of the Southern States; and we trust that this confession will free us from suspicion of partiality while we give as brief a sketch of this history as possible.

The division of opinions in regard to the form of constitution most desirable for the Union gave rise, soon after the Constitution was accepted and went into operation, to a division in respect to its interpretation. This spirit appears especially in the Kentucky resolutions of 1798, followed by those of Virginia in 1799, during the great party strifes of the administration of John Adams. In the first of the resolutions just named, after the harmless declaration that the general government is one of limited powers, it is said that the government created by the compact between the States "was not made the exclusive or final judge of the extent of the powers delegated to itself, but that, as in all other cases of compact among powers having no common judge, each party has an equal right to judge for itself as well of infractions as of the mode and measure of redress." And they express the hope that the other States, "returning to their natural rights in cases not made federal, will concur in declaring [the alien and sedition laws] void and of no force, and will each take measures of its own in providing that neither these acts, nor any others of the general government not plainly and intentionally authorized by the Constitution, shall be exercised within their respective territories." These resolutions were written by Mr. Jefferson, as afterward appeared, and were the first act in the drama of opposition to the avowed and received sense of the Constitution which ended in secession and war in 1861. The Democratic party, which opposed the Constitution and feared consolidation, came into power at the expiration of Mr. Adams's term of office, and continued to manage the government for many years. In 1819 the struggle attending the admission of Missouri into the Union unless a line should be drawn limiting slavery, showed that new issues were coming before the people—that the Democratic party itself would not always be loyal to its Southern leaders. Then came the revival of manufactures after the peace with England of 1815, and the various tariff laws, which were claimed to be oppressive to the interests of the Southern States. The tariff of 1828 called up again the theory of making U. S. law void by State power; which theory was advocated by Mr. Hayne in the Senate of the U. S., and was shown in its danger and absurdity by Mr. Webster in his speech of Jan. 26, 1830.

It was within less than three years after this that the experiment of nullification was made by the State whose principal politicians had been imbuing the Southern States with the doctrine for a long time. In Nov., 1832, soon after Gen. Jackson's second election to the office of President, a convention, summoned to meet at the capital of South Carolina, drew up and unanimously reported the ordinance of nullification. In this ordinance the existing tariff, which, in a somewhat milder form, agreed with that of 1828, was pronounced "null and void, and no law, nor binding on this State, its officers, or citizens," and no duties on imports were to be paid within the State after Feb. 1, 1832. The ordinance also contained the provision that no appeal to the Supreme Court of the U. S. against its own validity should be permitted, and that any appeal from a decision of a court of the State upholding this ordinance should be treated as contempt of the court from whose decision such appeal should be taken. All officers and jurors in the State were required to obey the ordinance and all legislative acts made to keep it in force. And any measures of force adopted by the general government for the purpose of levying duties on the foreign commerce of South Carolina would justify the State in regarding itself no longer a member of the Union. (Cf. Greeley's *Amer. Con.*, p. 93.)

It was a great blessing to the Union that Gen. Jackson, a Southern man of vast popularity, a hero of the war of 1812–15 with Great Britain, was President; and we may add that it helped the cause of the Union that he had a feud with Mr. Calhoun, the prime author of nullification. He was not the equal of Mr. Calhoun in ability, but he had much more common sense; this quality enabled him to see through the web of sophistries of which the extreme States Rights doctrine was composed, after having been, as it would seem, on the side of nullification when it was first agitated. He acted with his usual energy. At a very early date he wrote to the collector of Charleston, giving him orders to employ the revenue cutters of his district and other means within his control in order to secure and protect from the State authorities vessels with cargoes liable to pay duties. And not long after the meeting of Congress in Dec., 1832, he sent to the houses his long state paper on nullification, in which he declared his intention to treat all armed resistance under the ordinance of South Carolina as treason against the U. S., and treated at large of the fallacies of the doctrine. This remarkable paper was not, it is altogether probable, his own production. Indeed, to compose it was beyond his ability and statesmanship. A versatile and able man, Edward Livingston, the author of the Louisiana code, then secretary of state, was the writer. But that Jackson, if he ever had fallen into the theory embodied in the Kentucky and Virginia resolutions, and appearing in a mature shape in the nullification ordinance, now saw its fallacies and dangers, is quite certain. And no one could say this with the same impressiveness as the hero of New Orleans. The teachings of this proclamation have entered to such a degree into the thinking of the country, and are now regarded as so manifestly just, that it is hardly necessary to make any quotations from it. We shall content ourselves with a single one, which shows that what was afterward called *secession* was here identified with the proceedings in South Carolina: "The Constitution of the U. S. forms a government, not a league; and whether it be formed by compact between the States or in any other manner, its character is the same. Each State having expressly parted with so many powers as to constitute, jointly with the other States, a single nation, cannot from that period possess any right to secede, because such secession does not break a league, but destroys the unity of a nation; and any injury to that union is not only a breach, which would result from the contravention of a compact, but is an offence against the whole Union. To say that any State may at pleasure secede from the Union is to say that the U. S. are not a nation, because it would be a solecism to contend that any part of a nation might dissolve its connection with the other parts, to their injury or ruin, without committing an offence."

Gen. Jackson's measures, his proclamation, just described, and his special message to Congress of Jan., 1833, on the same subject, turned the tide so far in favor of his views of constitutional law that the other Southern States, as well as the Northern, decidedly approved of his course. South Carolina, propitiated by a modification of the tariff—Mr. Clay's Compromise, so called—abandoned the ordinance of nullification, and the heresy slept awhile to awake again, revived and more intense, after a generation. T. D. WOOLSEY.

Numan'tia, an ancient city of Spain, the capital of the Celtiberian Arevaci, was situated on the Douro, near the present Soria in Old Castile, and became very celebrated on account of the heroic valor with which it defended its independence against the Romans. Of its population, 8000 men were capable of bearing arms, and with this force it fought successfully against Quintus Fulvius Nobilior in 153 B. C., Quintus Cæcilius Metellus in 143, Quintus Pompeius in 141, Marcus Popilius Lænas in 139, and Cneius Hostilius Mancinus in 137. But in 134, Publius Cornelius Scipio the Younger received the command. With an army of 60,000 men he laid siege to Numantia, and enclosed it completely. All sallies were in vain; escape was impossible; of help there came none. But still his propositions of surrender were rejected. The siege lasted for fifteen months. Then, one day Scipio marched his army into the city. No resistance was offered. The houses were closed. The streets were silent. The echo of the tramping columns and the croak of the carrion-crow were the only sounds heard, for the city was dead. Those whom plague and famine and the arrows of the besiegers had spared had fallen upon their own swords. Scipio stood in a tomb. He felt that he himself had been utterly defeated, and in his fury he levelled the vacant houses with the ground. CLEMENS PETERSEN.

Nu'ma Pompil'ius, the successor of Romulus, reigned from 715 to 672 B. C. All the ecclesiastical institutions which formed the basis of the religious ceremonial of the Romans were ascribed to him, and he also improved the social and political institutions of Rome.

Num'ber [Lat. *numerus*]. Abstractly considered, number is the measure of the relation between quantities of the same kind; in this sense it is identical with the term *ratio* or *quotient*. Technically considered, it is a *single* thing, or a *collection* of things of the same kind; it is in this sense that the term is generally employed in mathematics. By an extension of meaning always permissible in the use of mathematical terms, the term *number* is made to include 0, ∞, and also all *surds;* we shall use the term in this extended signification in the following article.

The thing taken as the basis of the collection is called a *unit*. If the logical character of the unit is specified, the number is said to be concrete; if the nature of the unit is not specified, the number is said to be abstract; thus, 7 *feet* is a concrete number, and 7 is an abstract number. So far as arithmetical computation is concerned, there is no difference between concrete and abstract numbers, provided we omit the name of the unit. The only difference in the final result is one of interpretation. Thus, if we have to multiply 7 *feet* by 5 *feet*, we neglect the name of the unit and multiply 7 by 5; we then take into account the nature of the concrete factors and interpret the result as 35 *square feet.* As the value of the unit of a number is in a measure arbitrary, we may, if we please, transform any given number into an equivalent one having a different unit; thus, the number 200 may be regarded as 20 *tens*, 2 *hundreds*, or as 400 *halves*. A great portion of arithmetical operations is concerned with such transformations, which are known under the general name of "reduction." In treating of numbers we regard the unit 1 as the primary *base* of the collection, in which case fractions are to be regarded as collections of equal parts of that base; thus, the fraction $\frac{3}{5}$ may be regarded as a collection of 3 units, each equal to $\frac{1}{5}$, and $\frac{5}{7}$lb. may be regarded as a collection of 5 units, each equal to $\frac{1}{7}$lb. The same principle enables us to express a number partly in terms of one unit and partly in terms of another, giving rise to compound and mixed numbers; thus, the expression £4 12*s*. is a compound number made up of 4 units, each equal to £1, and 12 units, each equal to 1*s.*; the mixed number $\$3\frac{2}{7}$ is composed of 3 units, each equal to $1, and 2 units, each equal to $\$\frac{1}{7}$. From this point of view we may regard every simple number, whether abstract or concrete, as a species of monomial in which the unit of the number corresponds to the literal part of the monomial; we may also regard compound and mixed numbers as species of polynomials. Thus regarded, all kinds of numbers become subject to the algebraic rules for treating monomial and polynomial expressions.

CLASSES OF NUMBERS.—Numbers are divided into classes in many different ways, according to their different properties. The names of some of these classes are given below, with a brief statement of their peculiar properties.

(1) *Odd and Even Numbers.*—The series of integers, 0, 1, 2, 3, 4, etc., called the series of *natural numbers*, is subdivided into two series—the series of *odd numbers*, 1, 3, 5, 7, etc., none of which is exactly divisible by 2, and the series of *even numbers*, 0, 2, 4, 6, etc., each of which is exactly divisible by 2. The following are some of the properties of these two classes of numbers: 1st, the sum or the difference of any two even numbers, or of any two odd numbers, is always an even number; 2d, the sum of any number of even numbers, or the sum of an even number of odd numbers, is an even number, but the sum of an odd number of odd numbers is an odd number; 3d, the product of any number of even numbers is an even number, and the product of any number of odd numbers is an odd number; 4th, all the integral powers of even numbers are even numbers, and all the integral powers of odd numbers are odd numbers, and consequently the difference between any power of an odd number and the number itself is an even number.

(2) *Prime and Composite Numbers.*—A *prime* number is one that cannot be exactly divided by any other number except 1; all numbers that are not prime are said to be composite—that is, composed of two or more factors; thus, 2, 3, 5, 7, etc. are prime numbers; 4, 6, 9, etc. are composite numbers. (See PRIME NUMBERS.)

(3) *Figurate Numbers.*—Figurate numbers are those which can be derived from the general form

$$\frac{n\,(n+1)\,(n+2)\;.\;.\;.\;(n+m)}{1\;.\;2\;.\;3\;\;.\;.\;.\;(m+1)}$$

by making particular suppositions on the arbitrary integers m and n. If we assume m equal to any whole number, and then make $n = 1, 2, 3$, etc., we shall have one series of figurate numbers; by giving to m every value from 0 up, we obtain in succession an infinite number of figurate series. (See FIGURATE NUMBERS.)

(3) *Polygonal and Pyramidal Numbers.*—These numbers are so named because they express the different numbers of equal spherical balls that can be symmetrically arranged so as to form certain polygonal and pyramidal figures. The polygonal numbers are formed by taking the successive sums of the terms of an arithmetical progression whose first term is 1; if the common difference is 1, we have triangular numbers; if the common difference is 2, we have square numbers; if the common difference is 3, we have pentagonal numbers; and, in general, if the common difference is $m-2$, we have m-gonal numbers. Thus,

$$\begin{cases} \textit{Arithmetical series}, 1, 2, 3, 4, 5, 6, 7, \text{etc.}; \\ \textit{Triangular numbers}, 1, 3, 6, 10, 15, 21, 28, \text{etc.} \end{cases}$$

$$\begin{cases} \textit{Arithmetical series}, 1, 3, 5, 7, 9, 11, \text{etc.}; \\ \textit{Square numbers}, 1, 4, 9, 16, 25, 36, \text{etc.} \end{cases}$$

$$\begin{cases} \textit{Arithmetical series}, 1, 4, 7, 10, 13, 16, \text{etc.}; \\ \textit{Pentagonal numbers}, 1, 5, 12, 22, 35, 51, \text{etc.} \end{cases}$$

Pyramidal numbers are derived from polygonal numbers according to the same law. Thus,

$$\begin{cases} \textit{Square numbers}, 1, 4, 9, 16, 25, \text{etc.}; \\ \textit{Square pyramidals}, 1, 5, 14, 30, 55, \text{etc.} \end{cases}$$

The last line of numbers gives the number of equal spherical balls that can be piled in different pyramids having square bases. It is a general principle, though not capable of rigorous demonstration, that any whole number is equal to the sum of 1, 2, or 3 triangular numbers, or to the sum of 1, 2, 3, or 4 square numbers, or to the sum of 1, 2, 3, 4, or 5 pentagonal numbers, etc. Thus, the number 23 is equal to 21 + 1 + 1, or to 9 + 9 + 4 + 1, or to 22 + 1, etc.

(4) *Redundant, Defective, and Perfect Numbers.*—If the sum of all the divisors of a number (except itself) is greater than the number, it is said to be *redundant;* thus, 12 is a redundant number, because $1 + 2 + 3 + 4 + 6 > 12$. If this sum is less than the number, it is said to be *defective;* thus, 10 is a defective number, because $1 + 2 + 5 < 10$. If this sum is just equal to the number, it is said to be *perfect;* thus, 6 is a perfect number, because $1 + 2 + 3 = 6$. If $(2^n - 1)$ is a prime number, then is $2^{n-1}\,(2^n - 1)$ a perfect number; thus, $2^7 - 1$, or 127, is prime, and $2^6\,(2^7 - 1)$, or 8128, is a perfect number.

(5) *Amicable Numbers.*—Two numbers are said to be amicable when each is equal to the sum of all the divisors of the other. Thus, 284 and 220 are amicable numbers, as are 17296 and 18416, and also 9363583 and 9437056.

(6) *Bernouilli's Numbers.*—These are the coefficients of the different powers of x in the series obtained by developing the expression $x\,(e^x - 1)^{-1}$. These numbers are used in the higher branches of applied mathematics, and for this reason they have been computed and tabulated. (The general forms of Bernouilli's numbers may be found on page 247 of De Morgan's *Calculus.* For a complete discussion of the theory of numbers the reader is referred to Gauss's *Disquisitiones Arithmeticæ* or to Legendre's *Essai sur la Théorie des Nombres.*)

EXPRESSION OF NUMBERS IN DIFFERENT SCALES.—The same number can be expressed in many different ways, without departing from the principles explained under the title NOTATION. If we represent any number by N, we may write the equation

$$N = ar^n + br^{n-1} + \text{, etc., } + kr + l, \qquad (1)$$

in which r is the radix of the system, and a, b, etc., k, l, are whole numbers, equal or unequal, but always less than r. The number of characters required to write any number in any system is equal to r. If $r = 2$, the corresponding system is called the *binary* system; if $r = 3$, the corresponding system is called the *ternary* system; if $r = 10$, we have the common or decimal system; if $r = 12$, we have the duodecimal system; and so on. The expression for a number may be transformed from one system to another by a few simple operations. The method of making this transformation will be illustrated by showing how a number may be transformed from the decimal to the duodecimal system, and the reverse. Since the number of characters required in any system is equal to the numerical value of the radix, we must have twelve characters to express a number in the duodecimal system. Let us, therefore, adopt the character ϕ to denote 10 units in the system, and the character π to denote 11 units. Let it be required to transform the number 6894 from the decimal to the duodecimal system. An examination of equation (1) shows us that if we divide any number by the radix of the required system, the remainder will be equal to the number of units in the first place; if we divide the quotient obtained by the radix, the remainder will be the number of units in the second place; and so on. Hence, the operation of transformation is as shown below:

Decimal to Duodecimal.	*Duodecimal to Decimal.*
12)6894	$6 \times 1 = 6$
12)574 . . . 6	$10 \times 12 = 120$
12)47 . . . $10 = \phi$	$11 \times 144 = 1584$
3 . . . $11 = \pi$	$3 \times 1728 = 5184$
	∴ 6894 *Ans.*
∴ $3\pi\phi6$ *Ans.*	

In like manner, a number in the decimal system may be transformed to an equivalent number in any other system, and the reverse.

W. G. PECK.

Num'bers, Book of, so called because it contains an account of the second census of the Hebrews, made at Sinai in the second month of the second year of the Exodus (ch. i.). It also contains (ch. xxvi.) an account of a third census, thirty-eight years later. It is the fourth book of the Pentateuch and of the Old Testament. Its contents treat largely of the history of the tribes in the journey through the wilderness. It also contains portions of the Mosaic Law. (See PENTATEUCH.)

Nu'merals [Lat. *numerus*], the characters by means of which we express numbers. Thus, in the common system the numerals are 1, 2, 3, etc.; in the Roman system the numerals are I., V., X., etc.

Nu′meration [Lat. *numeratio*], the art of reading numbers when expressed by means of numerals. (See NOTATION.)

Nu′merator, that term of a fraction which indicates the number of fractional units that are to be taken. In a common or vulgar fraction the numerator is the number written above the horizontal line; in a decimal fraction it is the number that follows the decimal point. Thus, in the fraction $\frac{3}{4}$ the numerator is 3; in the decimal .0314 the numerator is 314. W. G. PECK.

Numer′ical. The term *numerical* in analysis stands opposed to the term *literal;* it implies that the quantities considered are expressed by figures and not by letters. A *numerical equation* is an equation in which all the quantities except the unknown or the variable quantities are numerical. The *numerical value* of an expression is the result obtained by assigning numerical values to all the quantities which enter it, and then performing the indicated operations. Thus, the numerical value of $a^2b - c^2d$ is 10, when $a = 2$, $b = 3$, $c = 1$, and $d = 2$. The term *numerical* sometimes stands opposed to the term *algebraical;* thus, the numerical value of -5 is 5. W. G. PECK.

Numid′ia, that part of the northern coast of Africa which extended between Mauritania in the W. and *Africa Propria*, the ancient territory of Carthage, in the E., corresponding nearly to the modern Algeria. It was inhabited by the same race of people as Mauritania, the Moors, the ancestors of the modern Berbers, and it was divided between many different tribes. By the help of the Romans, as a reward for his support in the wars against Carthage, Massinissa succeeded in uniting the tribes and establishing an empire, several of whose rulers became famous in the Roman history; as, for instance, Jugurtha and Juba. In 46 B. C. Numidia was made a Roman province, and the Romans formed several colonies here, of which Hippo Regius was the most noticeable.

Numid′idæ [from *Numida*—*i.e.* Numidian—the generic name of the guinea-fowl], a family of gallinaceous birds typified by the well-known guinea-bird. The general form is familiar to all, and in this respect all the species of the family agree, the body being squat, with the head small and the neck comparatively long, but not as much so as in the turkeys; the head is always more or less wattled and naked; the bill moderate; the nostrils large, oval, and partly covered by a membrane; the tarsi moderately long; the hind-toe a little elevated; the tail depressed or bent downwards. The family is sustained, according to Prof. Huxley, by a number of osteological characters. It differs from all others by the absence in its representatives "of any backward process of the second metacarpal, and in the obtuseness and somewhat outward inclination of the costal processes. The acromial process of the scapula is also singularly recurved." In most other respects, however, it agrees essentially with the *Meleagridæ* and *Phasianidæ*, having the same kind of sternum, skull, etc., but slightly modified. The family is peculiar to Africa. The species are chiefly found in the woodlands, and especially along the margins of rivers, and congregate in flocks of 200 and 300 individuals, scattering along in search of food, which consists of insects (grasshoppers, ants, etc.) as well as small grains. The eggs are numerous and laid in a rude nest, generally concealed in the bush. According to G. R. Gray, there are eleven species, representing three genera, viz.: (1) *Numida*, with ten species, including the common guinea-fowl (*Numida meleagris*); (2) *Agelastes*, with one species; and (3) *Phasidus*, also with one species. These nearly average in size the domestic species. THEO. GILL.

Numismat′ics [Gr. νόμισμα, "coin"] comprehends all about coins; as such it deals with stamped pieces of metal of known weight and authoritative issue, implying as a science definite rule and civilization as opposed to barter and barbarism; and as such it tends to illustrate and confirm history. It has been usual to divide coins for purposes of study (omitting minor details) into three grand classes: (1) *Ancient*, from their earliest existence in the seventh century B. C. to the deposition of Romulus Augustulus (A. D. 476); (2) *Mediæval*, from this period to the Reformation (A. D. 1517); (3) *Modern*, from the Reformation to the present time. Each of these has its own subarrangements and characteristics, but the *ancient* and *mediæval* so far agree that their coins are mercantile rather than commemorative. In the first class scarcely any coins would answer to that we call "*medals;*" while in the second distinctive *medals* have little more than commenced.

To take first *ancient* coins: these are classed under (1) Greek, (2) Roman, (3) Græco-Oriental or Byzantine, under each of which it is customary (following the arbitrary arrangement proposed by Eckhel of Vienna) to take the countries in their order from W. to E., the cities of each country being placed alphabetically. Of the three, the Greek are unquestionably the most important. Greek coins are found in Europe in Spain, Gaul, Britain, Italy, Sicily, Thrace, Macedonia, Thessalia, Attica, Bœotia, and the Peloponnesus; and in Asia in Ionia, Phrygia, Lydia, Caria, Cilicia, Phœnicia, and Egypt. Besides these as authorities, there is Epaminondas on Bœotian, Herodotus on Halicarnassian, and Cicero on Magnesian money; sometimes, too, celebrated games—*e. g.* those of Olympia—are commemorated, as in the chariot-race types of Syracuse, or well-known myths, as that of the Labyrinth on coins of Cnossus in Crete. Maritime states are often denoted by dolphins and other fish; rivers, like the Achelous, by bulls with human heads. The material of coins is gold, silver, bronze, electrum, an alloy (sometimes natural) of silver with gold, or potin or billon, bronze or copper washed with silver. It is supposed that the metal was first formed in roundish lumps and then struck cold, but no ancient die, so far as we know, exists in any museum; the materials, however, for coining, the hammer, the anvil, and the tongs, may be seen on a denarius of the Roman family Carisia. Inscriptions on Greek coins are generally in the genitive, on Roman and Oriental in the nominative, the word νόμισμα ("coin") being in the first case understood. The finest period of Greek art scarcely lasts longer than sixty or seventy years—say, from B. C. 460 to B. C. 390—and is nearly coincident with the best period of sculpture; and, as a rule, the colonial coins of Italy and Sicily indicate great wealth and luxury, their finish being unrivalled; they are, however, surpassed in grandeur by the money of some of the parent cities. In one instance, that of Athens, the coins remain to the last rude and ugly, perhaps owing to their great commercial importance. Thus, in modern times the Chinese long refused any European coin except the Spanish "pillar" dollar, while the Abyssinians declined quite recently any type but the dollar ("thaler") of Maria Theresa of 1782. In weight, Greek coins are generally very accurate, but different countries and towns preferred the different standards of the Phœnician, Aginetæ, or Attic talent. No less than thirteen multiples or submultiples of the Athenian drachma (67.5 Troy grains) are known: and of these, 100 went to the *mina*, and 60 minæ to the talent. The double (didrachm) and the quadruple (tetradrachm) are the most usual sizes, the gold generally following the standard of the silver. Bronze coins are usually submultiples of the *obelos*, itself one-sixth of the drachma.

In point of art there is nothing noticeable in those of Spain, Gaul, or Britain; but in the first the elder have some interest, as retaining the old Celtiberian alphabet and a few words of the Basque language. British coins are copied from those of Gaul, and these again from the types of Philip of Macedon: but none of these are probably earlier than B. C. 250. On British coins are some historical names, as Cunobelinus (Shakspeare's Cymbeline), the father of Caractacus, and the towns of Verulamium and Camalodunum (St. Alban's and Colchester, respectively). In Italy we find magnificent specimens of the Greek colonial coinage at Heraclea, Metapontum, Neapolis, Pandosia, Tarentum, Terina, Thurium, and Rhegium; of very early types at Caulonia, Croton, Pæstum, Populonia, and Sybaris; of the ancient mode of writing, from right to left, on some of the earliest; and of the use of the digamma at Heraclea. The Samnite coins point to a confederacy of states and give examples of Oscan characters. The finest coins of Sicily are in like manner colonial, with some resemblance to those of Italy, the earliest ascending in date to B. C. 490 or 480. The most usual type is that of the chariot, either moving slowly or at great speed, and in many instances, as at Camarina, Catana, Messana, and Syracuse, unquestionably refer to the Olympic games; indeed, on those of Catana the goal may be noticed, and on the largest of Syracuse a suit of armor, with the word ἆθλα (the "prizes of victory") inscribed. Moreover, of Pindar's fourteen odes, it must be remembered that six refer to victories in the games won by Sicilians; while at Messana the *biga* (or chariot with two mules) refers to a victory won by Anaxilaus of Rhegium. At Agrigentum the name of the people is written *boustrophedon*—*i. e.* from right to left and from left to right, as an ox ploughs. The Syracusan decadrachms represent the largest of ancient Greek coins, and, though very fine, are not equal to the best of Greece proper; at Syracuse, too, the name of two artists, Cimon and Enænetus, have been preserved on the money. Connected with Sicily are some very fine coins bearing Phœnician inscriptions, sometimes attributed to Carthage; indeed, there is no doubt the best specimens were struck for that great city in Sicily at Panormus and other places, and by Greek artists. The beautiful coins of Philistis commemorate a lady not mentioned in history, but believed to be the wife of Hiero II., as her name is found carved on a seat in the theatre at Syracuse.

Proceeding to Greece proper, we find very early and beautiful specimens of Greek art at Abdera, Œnos, and Thasos, and in various towns of Macedonia and its neighborhood, as Acanthus, Amphipolis, Chalcidice, Lête, and Neapolis. The types in many cases refer to old and well-known myths, as the Gorgon's head at Neapolis. The lion seizing the bull on those of Acanthus confirms the story of the lions who attacked the baggage-horses of Xerxes at about the same time as these coins were struck. Two remarkable coins exist of Geta, king of the Edoni, both of which were found in the Tigris, and therefore may have been carried back to Persia after the defeat of Xerxes. Of Philip and Alexander the Great coins abound in gold and silver, but are less frequent in bronze, the former being of good art, and the latter confirming the extent of his conquests; while those of Lysimachus, king of Thrace, are noteworthy for the portrait they exhibit of Alexander himself, with the symbols of the Young Ammon. Thessaly exhibits some good specimens in the money of Larissa, with some resemblance in fabric to those of Sicily; and Epirus offers the beautiful series from Ambracia, with the noble head of its king, Pyrrhus, treated as the Jupiter of Dodona. The coins of Pyrrhus were probably struck at Tarentum or Syracuse. Corcyra, Acarnania, Ætolia, and Locri are also well represented; and in Bœotia we find a series of remarkable archaic coins (as at Tanagra and Thespiæ), and one reading ΕΠΑΜΙ, reasonably attributed to the celebrated Epaminondas. Athens naturally affords the largest series of Greek coins, but, as we have said, her money has no artistic merit; some specimens, however, are as early as B. C. 500. Those of the adjacent island of Ægina are very interesting from their antiquity, and from the tradition that Pheidon, king of Argos, first struck coins here in the eighth century B. C. In the Peloponnesus the series of the money of Corinth claims especial attention from its great extent and long-preserved excellence. Here, too, we find archaic specimens, with the old form of the κ (ϙ) preserved on them. Achaia records its celebrated league, and Sicyon is justly famous for the beauty of its money. At Elis we find the digamma on early types of the time of Xerxes, and a magnificent series of the finest period, with the head of Juno and her name, ΗΡΑ, inscribed on a bandeau over her forehead. These are as fine as any of the purely Greek coinage; and with these may be ranged scarcely less noble specimens from Trazene, Arcadia (with the head of Zeus Ætophoros), and Stymphalus—the latter possibly Cretan. Sparta naturally records her famous ruler, Lycurgus, though on a late copper coin. Mantinea and Heræa have good archaic types.

Of the islands, Crete takes the lead, and in the abundance of her fine coins gives ample evidence of her ancient wealth and of the skill of her artists. It has been thought, however, that the Cretan style is too pictorial. Local myths largely prevail in the types, as those of Europa and Minotaur, and of the Labyrinth or Maze. Very fine specimens exist of Chersonesus, Hierapytna, Phæstus, Cnossus, Gortyn or Gortyna, and of Cydonia, all in this island. On one of Gortyna we find the word σαιμα (σῆμα, "the badge"), referring probably to the actual type. Those of Phæstus are of especial beauty. Over the islands of the Archipelago we need not linger, though some of the coins of Tenos are fine, while Cyprus offers us an Oriental alphabet only slowly yielding to the genius of the decipherer.

Asia Minor to the N. has little of interest, excepting one magnificent head of Mithridates VI. of Pontus; in Mysia, we have, however, a unique series of *electrum* coins, called *staters* of Cyzicus, with other splendid trophies of Greek art, in the money of Cyzicus, Phocæa, and Pergamus. The tetradrachms of the last place are called, from their peculiar type, *cistophori*. Ilium in Troas naturally records its local traditions, placing Hector ('ΕΚΤΩΡ) on its money, and Æneas carrying Anchises and leading Ascanius. Lydia comes next, with its rude and archaic gold coins, probably, as we have noted, the really earliest specimens of Greek numismatic art, though those of Ægina could not have been much later; then comes Ionia, with its great series of Smyrna and Ephesus, and the noble coins of Clazomenæ. Of this town a very rare tetradrachm exists with an inscription on it, Θεοδοτος εποιει ("Theodotus made me"). Magnesia records its river by the type of a bull butting within the pattern, hence called "Mæander." Early coins of Phocæa exhibit the seal, whence its name; and Chios, Samos, Calymna, and Cos many very early and curious specimens. The coins of Rhodes have an importance of their own, confirming, as they do remarkably, the statements of history. In remote times the three towns of Lindus, Ialysus, and Camirus struck their own money. They then combined and built Rhodes about B. C. 450. We have no coins of Rhodes before that time, but immediately after very fine specimens, with the head of Apollo, probably the same type as was afterwards known as the Colossus of Rhodes. On the opposite coast Lycia and Pamphylia afford a remarkable series; the elder ones inscribed in the local character and language; Side in the latter province having some especially fine tetradrachms, with the pomegranate fruit (Σιδή) as their type; whence, too, the name of the place. In Pisidia we have curious locally inscribed coins at Selge, resembling those of Aspendus in Pamphylia. Phrygia offers several coins of interest of the imperial times with local myths, such as that of Deucalion and Νωε, and Cilicia some remarkable coins inscribed with Phœnician characters and struck by the Persian rulers of that district. These are called "satrap" coins. There are also some interesting types at Tarsus, bearing legends similarly written. These, and the types prevailing along the coast of Syria, at Sidon, Tyre, Aradus, and Byblus, together with the early money of the Bactrian series, might perhaps best be termed Græco-Oriental. With the well-known series of "Antiochia ad Orontem," of the Seleucid kings of Syria, of the Ptolemies in Egypt, and of Cyrene in Africa, we close our brief notice of the Greek series. The native coins of Carthage and Judæa must be called Oriental; they do not exhibit anything worthy of remark, except, perhaps, the earliest "shekels" of Judæa, which were probably struck soon after the return of the Jews from Babylon.

The second great subdivision of numismatics, the Roman, commences about 230 or 240 B. C. with a massive copper coinage, termed, technically, "*æs grave*," having the As for its largest size, and the *uncia* (or ounce) for its unit. At first, the As actually weighed one pound, and hence was called "*As libralis*," the ounce being its twelfth part; but it was soon and rapidly reduced. The leading types of the Roman As are the "*Janus bifrons*" and the prow of a galley. Other and similar coins were struck in the adjacent towns of Etrusia and in Umbria and Apulia. All were on Greek models. About B. C. 170 gold, silver, and copper coins were issued by various Roman families, who were permitted by the state to strike coins—often, too, beyond the bounds of Italy; and with Julius Cæsar commenced the imperial series, which lasted, as we have stated, till A. D. 476. The main characteristic of Roman art is individuality as opposed to idealism; faithful portraiture, often exceedingly good, as in the cases of Antonia, Nero, the Antonines, Faustinas, etc., with a remarkable permanence of religious types on the reverses. Many historical events are recorded on them, as the crowning of Ptolemy Epiphanes by Lepidus, the introduction of elephants into Rome by Metellus, the construction of the port of Ostia and of the Colosseum by Nero and Vespasian respectively, and the overthrow of Judæa by Titus.

It is probable that all the finest Roman coins were executed by Greek artists, and their chief value for study is the illustration they afford of contemporary sculpture, and the influence they have exercised over mediæval and modern art. After Julius Cæsar the senate reserved to itself the striking of the copper money, which for a long time is always marked with S. C. (*senatûs consultu*). Names for Roman coins are scarce, but we know that the earlier gold and silver coins were termed, respectively, *auræ* and *denarii*, the latter of which has been preserved through the Middle Ages as the *denier* of France. In later times the *solidus* was introduced, and this likewise has become the *sol-d'or* of France (ultimately *sou*) and the *soldo d'oro* of Italy, whence *soldato* ("soldier"), meaning the "hireling." Besides the regular coins, the Romans had also what are termed *medallions*, which in some degree resemble modern *medals*, and *contorniates*, which were probably tickets of admission to the theatres or games. Christian types, as the *labarum* or standard bearing the cross, are found from Constantine downward, and on one of Vetranis are seen the celebrated words, "*Hoc signo victor eris.*" With the imperial Roman it is usual to class the *imperial Greek* coins, struck by nearly every emperor in the Greek cities of the empire, and in some cases, as at Antioch and Alexandria, forming a series unrivalled in number and duration. Artistically, this class has no value, but it is rich in its records of ancient myths and in historical allusions.

The third, or, Græco-Oriental series, mainly consists of the coinage of the Byzantine emperors to the capture of the city by the Turks in 1453; but some writers class under the same head coins inscribed with Phœnician or other Oriental characters, and the darics of Persia, but these are best kept separate. The Byzantine series is generally supposed to commence with Anastasius in A. D. 491. The inscriptions on it are at first in Latin, thence continuously in Greek, its varying orthography showing the gradual change of the language. The Byzantine coinage is mostly in gold, and its chief interest is that it was the principal coinage of Middle and Eastern Europe till the introduction of the florins and ducats of the Italian republics; and, further, because the money of the Vandals in Africa, of the Ostrogoths in Spain, and of Nicæa, Thessalonica, and Trebizonde, was framed on Byzantine models.

Over the remaining leading divisions of numismatics, the mediæval and the modern, it is not necessary to detain the reader very long; indeed, they might well be taken together. It is necessary, however, to state, generally, that the early mediæval types are a barbaric imitation of the Roman, their art being progressively worse as they were removed farther and farther from Italy, which always retained some traces of her earlier civilization. The earliest mediæval coins are those of the Lombard and Merovingian kings and of the dukes of Benevento, and in Britain the small silver pieces called "*sceatas.*" Thence gradually arose an improved system, led by the German empire in Northern Italy, Germany, and France, and by the Scandinavians in England. In this system, which continued little changed till the revival of learning, the *denier* and the *penny-sterling* (*i. e.* "Easterling") were the common and the most important coins. Coins were (except in England, where the right of striking coins was always much restricted) issued by princes and ecclesiastics, as well as by kings, and somewhat later by free cities and corporations. The first really good coins are those of the Italian republics and of Frederick II., and henceforward they have some value in the history of art, though by no means so much as seals. In the middle of the fifteenth century medals, in our sense of the word, begin, and hold an important place in the art of Italy, and subsequently of France and Holland. The art of engraving medals, which occupied the talent of some of the greatest artists of the day, is strictly comparable with the painting and sculpture of the same period, and thus forms the true school in which the modern medallist should be trained. The last great series of medals issued are those recording the victories and other achievements of Napoleon I.

It seems unnecessary to give details here of the modern coinage of Europe and other countries, but we must state that besides the various series enumerated there exists a vast number of coins struck by different Oriental rulers from the commencement of the empire of the khalifs to the present day. These coins are worthless in the history of art, but very valuable in determining the dates of dynasties; as a rule, with the exception of the Chinese, they are written in the characters of the Mohammedan conquerors, or in some modification of the Devanâgari (or Sanskrit) alphabetic system. W. S. W. Vaux.

Nummulite. See Foraminifera.

Nunda, R. R. junction, Livingston co., N. Y. (see map of New York, ref. 5–D, for location of county), 60 miles E. of Buffalo, on the Erie, the Buffalo New York and Philadelphia, and the Lackawanna and Pittsburg R. Rs., has an academy, a fine public hall, and an academy of music. Pop. in 1870, 1189; in 1880, 1037.

Nu'ñez (Alvar), called **Cabeza de Vaca,** b. in Spain about 1490; was second in command in the expedition of Panfilo de Narvaez to Florida 1527–28. The expedition, comprising 400 soldiers and 40 knights, on four vessels, left Cuba in March and reached the American continent in April. Having landed at Cape Corrientes, they penetrated into the country for about 225 leagues; but on their return they suffered shipwreck near the mouth of the Mississippi. Nuñez escaped, however, and after wandering eight years reached Sonora 1536; was entrusted in 1540 with the government of Paraguay; after a turbulent administration of two years was sent to Spain a prisoner, and banished to Africa, but subsequently regained favor and became a magistrate at Seville, where he d. 1564. He wrote a narrative of his adventures in Florida, entitled *Naufragios* (1544), and his secretary, Fernandez, compiled a volume of *Comentarios* (1544), giving an account of his travels in Paraguay.

Nunnery. See Monachism.

Nuo'ro, town of Sardinia, province of Sassari, situated in a magnificently wooded region about 2000 feet above the sea. Its position is healthy, and the neighborhood abounds in delicious game and trout. The streets are generally paved and the buildings are mostly of granite. Among the objects of interest in the vicinity are a balanced granite boulder, or "rocking stone," of great size; twenty-four *nuraghi*, or round towers, the origin or purpose of which has been much discussed; remains of an ancient construction resembling a fortress, in which lead pipes are said to have been found, and near which are four of those huge stone sarcophagi known as *sepulturas de gigantes;* also a series of those small chambers cut in the solid granite, *virghines* or *domos de janas*, the uses of which are equally unknown. Pop. in 1881, 6212.

Nu'remberg [Ger. *Nürnberg*], town of Bavaria, on the Pegnitz, was once the wealthiest and most important of the free imperial cities of Germany, and although it suffered greatly during the Thirty Years' war, and gradually declined until in 1806 it lost its independence and was annexed to Bavaria, it is still a great and rich town. Its fortifications, consisting of a double wall and a moat, were demolished during the occupation by the Prussians in 1866, and have been transformed into promenades. Of all German cities, it is the most interesting and characteristic with respect to its architecture; its streets look like incarnations of mediæval legends. The houses face the street with their gables, and balconies profusely ornamented with carvings in stone or wood overhang the sidewalks. Also it is very rich in splendid mediæval monuments which show that its ancient fame of being the commercial, industrial, and literary centre of Germany was not vainglorious. Of its many remarkable buildings, the richest and most striking is the church of St. Sebald, a Gothic structure of perfect elegance, ornamented with paintings by Albert Dürer, and containing the famous tomb of St. Sebald executed in bronze by Peter Vischer, who with his five sons worked on it for nearly thirteen years. The town-hall, the largest building of its kind in Germany, with subterranean dungeons and torture-chambers, the castle, and the church of St. Lawrence are also fine and interesting edifices. In the *Albrecht Dürer Platz* was raised a statue of Albrecht Dürer in 1840. The principal manufactures of Nuremberg are carvings in wood, bone, and metals, children's toys, and dolls, lead pencils, chemicals and ultramarine, looking-glasses, watches, carriages, and machinery. Its trade is very extensive. Pop. 99,519.

Nurpur', town of British India, in the Punjaub, at the foot of the Himalaya Mountains, in lat. 32° 12′ N., lon. 75° 40′ E., has well-stocked bazaars and large shawl manufactures. Pop. between 6000 and 8000.

Nurse, a popular name for several sharks; *e. g.* on some parts of the New England and colonial coasts it is applied to the *Somniosus microcephalus;* in Florida, Jamaica, etc., to the *Ginglymostoma cirratum;* and in Australia to the *Cestracion Philippi*, the box or Port Jackson shark, a remarkable fish of the Pacific Ocean.

Nusairieh, Ansyreeh, or **Ansonians,** the name of a Mohammedan sect which branched off from the Shiites by adopting various Jewish, Christian, and pagan ideas. They inhabit the lower Ansyrean mountain-range between Lebanon and Antioch in Syria, and also some towns and villages along the coast. They are ignorant, superstitious, and thievish, and very little is known of their doctrines, as they keep their religious tenets concealed from all foreigners, though in other respects they are very hospitable and communicative. Their prophet, Nusair, taught that God had appeared eleven times in human form—in Abraham, Moses, Jesus, Mohammed, Ali, and the other imams—and would appear once more in Mahdi or Messiah. He also taught the transmigration of souls. Those who neglect their religious duties, and especially those who betray their religious secrets, are transformed into Jews, Mohammedans, Christians, or animals. The religious rites of the sect are said to be very licentious, but nothing definite is known of the subject.

Nut'cracker, a name applied to *Nucifraga columbiana*, a bird of the Pacific States, and to *N. caryocatactes*, its European and Asiatic representative. They are of the crow family, and approach the jays in habits. They are noisy, shy birds, feeding on seeds, pine cones, grubs, and other articles of food. The Old-World species nests like the woodpecker, in a hole excavated in a dead tree.

Nutgalls. See Gall-Nuts, Galls, Gall Insects, and Gallotannic Acid.

Nut'hatch, a genus (*Sitta*) of birds of the family Paridæ, sub-family Sittinæ. There are many species found in various parts of the world. The typical species is *Sitta Europæa.* The U. S. have *S. carolinensis* (white-breasted nuthatch), *S. canadensis* (red-bellied nuthatch), besides *S. aculeata, pusilla, pygmæa*, etc. They feed on seed, nuts, insects, grubs, etc.

Nut'meg, the kernel of the seed of *Myristica moschata*, and sometimes of *M. fatua* (long nutmeg), trees which are natives of the Eastern Archipelago and belong to the order Myristicaceæ. Besides these, several other trees of this order furnish inferior nutmegs. The true nutmeg is now successfully cultivated in India and tropical America. Nutmegs are principally used as a spice in cooking, but are employed in medicine also. They are aromatic and stimulant, with somewhat narcotic properties. The aril which surrounds the nutmeg constitutes Mace (which see). Nutmegs yield on pressure a half-solid fixed oil, called oil of mace from its peculiar flavor; they yield on distillation an abundant volatile oil which has exactly the flavor of the nutmeg.

Nutria Fur. See Coypu.

Nutri'tion [Lat. *nutrire*, "to nourish"], "that function by which the nutritive matter already elaborated by the various organic actions loses its own nature and assumes that of the different living tissues, to repair their losses and maintain their strength." (*Dunglison.*) In its widest sense, "it comprises the history of the proximate principles, their source, the manner of their production, the proportions in which they exist in different kinds of food and drink, the processes of digestion and absorption, and the constitution of the circulating fluids; then the physical phenomena of the circulation, and the forces by which it is accomplished; the changes which the blood undergoes in different parts of the body; all the phenomena, both chemical and physical, of respiration; those of secretion and excretion, and the character and destination of the secreted and excreted fluids." (*Dalton.*)

The exact manner in which the nutritive process is accomplished is not positively known. The blood is chiefly concerned in the maintenance of this function, and in order to understand it thoroughly it will be necessary to study the composition of the blood and the phenomena of the circulation. As the blood circulates in the living body it is composed of two essential parts—a thin, transparent, colorless fluid known as *liquor sanguinis*, in which float a vast number of small red bodies known as the *red blood-corpuscles*, in contradistinction to the *white corpuscles*, which are also found, but in very much smaller numbers. The human red blood-corpuscles are small, circular, biconcave bodies of a faint yellow color when viewed alone, but of a deep red, giving the color to the blood, when seen collectively; they vary in diameter from $\frac{1}{3000}$th to $\frac{1}{2800}$th of an inch. The white corpuscles are somewhat larger, and present an irregular surface. They are supposed by some to be primitive red corpuscles. When the blood has been drawn from the body and allowed to stand, it coagulates, forming at first a jelly-like mass, which after a while separates distinctly into a *clot*, which grows constantly smaller; and a fluid, known as *serum*. When the clot is examined under the microscope, it is seen to be composed of a number of fibrillæ entangling the red corpuscles. The fibrillæ are known as *fibrine*, which in the living blood is held in solution in the liquor sanguinis or *plasma*, but which begins to coagulate immediately after it is drawn from the vessels or whenever the circulation is arrested. The serum is merely liquor sanguinis deprived of its fibrine. The distribution of the constituents may be seen by the following table:

Living blood.....	Liquor sanguinis....	Fibrine, Albumen, Water, Salts,	in solution.
	Corpuscles suspended in liquor sanguinis.		
Dead blood.......	Clot.......................	Fibrine, Corpuscles.	
	Serum	Albumen, Salts, Water,	in solution.

The composition of the blood is as follows:

Water..		796.93
Solid matters:		
Fibrine..	1.95	
Corpuscles..	103.23	
Albumen..	70.75	
Extractive matters and salts............	27.14	— 203.07
		1000.00

We must now take a glance at the process of DIGESTION (which see). We have, as its result, albuminose, glucose, and fat in a state of emulsion, all in the upper part of the intestinal canal, and ready to be absorbed into the general system. The process of absorption is effected chiefly by the villi of the small intestine; these are minute conical projections, most numerous in the upper part of the intestinal canal, and gradually diminishing in number until they entirely disappear at the beginning of the large intestine. Each villus is about $\frac{1}{35}$th of an inch in length, and is composed of a network of blood-vessels—the commencing rootlets of the portal vein—through the centre of which runs a lymphatic vessel ending in a blind extremity, the whole covered with cylindrical epithelium. These blood-vessels and lacteals (as the lymphatic vessels are called) absorb the prepared ingesta by a process of ENDOSMOSIS (which see). That portion absorbed by the blood-vessels is taken immediately into the portal circulation, thence to the liver and heart; that absorbed by the lacteals is carried by them to the receptaculum chyli (a pouch situated in the back part of the abdominal cavity against the spinal column); from here it passes through the thoracic duct, and enters the circulation through the left subclavian vein, thence to the heart. The ingested materials may be recognized in the circulation shortly after they have been absorbed, but they are soon transformed into other substances, and become incorporated with the blood-corpuscles; so that we are seldom able to recognize them after the blood has passed through the lungs.

Another important change intimately connected with the process of nutrition, and which takes place in the lungs, is the aëration of the blood. The circulating fluid, in passing through the lungs, becomes changed from venous to arterial, loses carbonic acid (an effete matter which has been given up to it from the tissues during its passage through the capillaries), and absorbs oxygen, which is appropriated by the tissues for their nutrition.

Ingesta serve for the formation and maintenance of the different parts of the body, and therefore must contain all the elements entering into its composition. We have traced these through the various transformations until they were incorporated with the blood, which thus becomes enriched with all the compound principles of which the tissues are formed; and the process by which each particular tissue selects from the circulating fluid (which is brought into intimate contact with it through the agency of the capillaries) the materials necessary for its maintenance and growth is called *assimilation*. But simultaneously with this is going on a process known as *destructive assimilation*, by which the various tissues are undergoing disintegration and waste; new substances are formed, which enter the circulation, and are carried to the lungs, kidneys, skin, etc. Here they are filtered from the blood and discharged from the economy. They are known as *excretions*, and embrace urine, sweat, fæces, carbonic acid, etc. EDWARD J. BERMINGHAM.

Nut'tall (THOMAS), b. in Yorkshire, England, in 1786; was brought up a printer; came to the U. S. in youth; devoted much time to botanical and ornithological studies; travelled in nearly every State of the Union; explored the great lakes, the upper courses of the Missouri and Arkansas rivers; crossed the country to Oregon, the Sandwich Islands, and California; published, among other works, *The Genera of North American Plants* (2 vols., 1818), *A Journal of Travels into the Arkansas Territory* (1821), *A Manual of the Ornithology of the U. S. and Canada* (1832–34), and *The North American Sylva* (3 vols., 1842–49), being a continuation of F. A. Michaux's work on the same subject. Nuttall was curator and lecturer at the botanic garden of Harvard University at Cambridge 1822–28; returned to England about 1841 on inheriting an estate, and d. at St. Helen's, Lancashire, Sept. 10, 1859.

Nux Vom'ica [Lat.], an important drug consisting of the seeds of the *Strychnos nux-vomica*, a small tree of the natural order Loganiaceæ, growing in the coast-districts of India. The leaves are roundish-oblong, stalked, smooth, and with terminal corymbs. The fruit is a globular berry, about as large as a small orange, with a brittle shell and several seeds lodged in a white gelatinous pulp. The seeds are gray, disk-shaped, a little less than an inch in diameter, and about a quarter of an inch in thickness. They have a very bitter taste and are exceedingly poisonous, both these qualities depending on the presence of three alkaloids—strychnine, brucine, and igasurine. Of these, strychnine is the most powerful and important. It is a white powder, almost wholly insoluble in water, odorless, but of an intensely bitter taste. It is highly poisonous, producing in poisonous dose, within half an hour after taking, violent tetanic spasms, the body during the paroxysms being arched backward, with every muscle convulsed and stiff. The mind is unaffected. Death occurs within an hour or two. There is no certain antidote, but drugs producing motor paralysis, such as calabar bean, hemlock, tobacco, the anæsthetic ethers, etc., are useful in mitigating the severity of the spasms. Medicinally, strychnine and preparations of nux-vomica seeds are used in small repeated doses in cases of nervous debility and paralysis of various kinds, to help in restoring proper functional activity in the affected muscles or organs. EDWARD CURTIS.

Ny'ack, Rockland co., N. Y. (see map of New York, ref. 8–J, for location of county), situated on R. R. and the W. bank of the Hudson River, 28 miles from New York City, has daily connection with New York by steamers, and with Tarrytown across the river by ferry. There are manufactories of shoes, cedar pencils, tubs, churns, etc. Nyack has an efficient fire department, gas, a good supply of water, and a young men's Christian association, which has a library of 1200 volumes. Pop. in 1870, 3438; in 1880, 3881.

Nyan'za, a general word in Africa for large bodies of water, and especially applied to two great lakes in E. Equatorial Africa, the *Victoria Nyanza*, or *Ukerewe*, and the *Mwutan*, or *Albert Nyanza*. The Victoria Nyanza is a large fresh-water lake between lat. 2° 31′ S. and 0° 21′ N., and E. lon. 31° 35′ and 34° 45′. Its estimated area is 25,000 sq. m.; its height above the sea 3808 feet, and its greatest depth, as far as known by soundings taken at its northern extremity, is 275 feet. About three-fourths of its coast-line has been explored, and is irregular, being indented with small bays and openings formed by the mouths of rivers. At its south-eastern extremity there is a large gulf, about 25 miles wide, to which the name has been given of Speke Gulf, formed by a promontory, Uriwi, which stretches westward, and by the large island of Ukerewe to the W. of this promontory. The Victoria Nyanza has eleven large islands lying close to the coast-line—Ukerewe, Ukara, Ugingo, Usugura, Uvuma, Namungo, Bugeyeya, Wanzi, Lalamba, Sasse, and Bumbireh, the largest of which is Sasse—and many small ones. Whether there are other islands in the central part of the lake is not known, as it has not been explored. The lake, though of large extent, is supposed to be shallow. Its principal affluent is the river Shimiyu, which enters near the south-eastern extremity with a width at its mouth of about a mile, but which soon contracts to 400 yards. The source of the Shimiyu, and, as far as known, the remotest source both of the lake and of the Nile, is the Liwumba, a river which rises in a hilly country in about the 5th degree of S. lat., and a little E. of the 34th degree of E. lon. This stream in the more northerly part of its course is known as the Monungah. Two other rivers, the Luwamberri and the Duma, flow into it, the former from the S., and the latter from the E., and from its junction with the Duma to the lake it is known as the Shimiyu. Eight other rivers flow into the Victoria upon its E. side, the largest of which is the Ruana; and five enter it, as far as known, upon the W. and S.W. sides, the largest being the Katera or Kitangule, which, as an affluent, is second only to the Shimiyu. The outlet of the lake is at its northern extremity, in about 33° 40′ E. lon., and is known by the several names of the Somerset, the Victoria Nile, and the White Nile, the latter of which will probably be ultimately adopted. This outlet or river flows out of a bay called Napoleon Bay, and in the commencement of its course has a fall known as Ripon Falls, from whence it runs in a north-westerly direction, entering a large sheet of water found by Col. Long in descending the river in 1874, which may be either a permanent lake or simply a depression in the land subject to a temporary overflow. From thence the river continues first north-easterly, thence north-westerly, and thence due E., until, at Magunga, about 2° 25′ N. lat. and 31° 40′ E. lon., it enters the Mwutan, or Albert Nyanza, a large lake, the north-eastern part of which, from 1° to 2° 30′ N. lat., and from 31° to 31° 40′ E. lon., is alone known, but which is supposed to extend as far S. as the equator. Whether its greatest extremity, however, is in that direction or toward the W. is yet in doubt, Col. Gordon, from recent inquiries made in the vicinity, being inclined to the opinion that the latter supposition is the true one. It is assumed that a river, the Bahr-el-Gebel, which is one of the western branches of the Nile, is the outlet of this lake at its northern extremity, but the fact yet remains to be established.

The Victoria Nyanza was discovered by Capt. J. H. Speke in 1858, upon the return of the expedition in which he and Col. R. Burton discovered Lake Tanganyika. From what Speke saw he was impressed with a conviction, which subsequent explorations have confirmed, that the Victoria Nyanza was the great reservoir of the Nile. Upon that occasion he explored only a portion of the southern extremity. In 1861 and 1862, Speke, together with Major J. A. Grant, in an expedition chiefly at the expense of the British government, after many trials and difficulties, explored the country lying W. of the lake until they reached the capital of M'tesa, the king of Uganda, the country surrounding the north-western part. Their journey was around the S. W., the W., and the N. W. parts of the lake; during which, however, they were frequently in view of it, and were able to estimate its length with tolerable accuracy, and to form some conception of its general extent. They found the country W. of the lake hilly, well wooded, healthy, and exceedingly fertile, with low, swampy plains stretching as far as the eye could reach to the lake, interspersed with patches of water. These plains, they were assured, had formerly been covered by the water of the lake, when it was navigable to the base of the hills, showing that the lake had shrunk away from its original margin. In 1874, Col. Long reached the northern shore of the Victoria, and made a partial exploration of that vicinity, returning with the erroneous impression that the lake was not more than 25 miles wide. He afterward descended the White Nile, finding the large body of water or lake before referred to, and explored the river to the Karuma Falls, thereby proving its connection with Lake Mwutan (Albert Nyanza). In 1875, H. M. Stanley, at the head of an expedition the expense of which was borne by the New York *Herald* and the London *Telegraph*, after losing nearly half his men by disease and hostile attacks of the natives, succeeded in reaching the south-eastern extremity of the Victoria Nyanza from Zanzibar in the short space of 90 days, more than two-thirds of the journey being through a country wholly unknown. In a small vessel, which had been carried in separate parts by his men and put together on the lake, he carefully explored every portion of the south-eastern, eastern, and northern parts of the coast, reaching Ulagalla, the capital of King M'tesa, on Apr. 14, 1875. He found the country E. of the lake in some parts mountainous, but consisting chiefly of level, well-watered, and fertile plains, stretching far inward, and in parts densely populated.

The present opinion is that these two lakes are the principal reservoirs of the Nile, and that the remotest source of that river is the Liwumba, before referred to, in 5° S. lat. Several prominent geographers and travellers regard the great mountain-chain which lies midway between the Victoria and the E. coast of Africa, and extends from Abyssinia to about 5° S. lat., as the chief source of the streams that flow into this lake. This mountain-range is the highest land in Africa, and is capped by two great snow-crowned peaks, Kenia and Kilmanjaro. The supposition is, that the heavily-freighted etesian winds which in their course along the Nile valley deposit no portion of their moisture upon the land beneath are arrested by this great mountain-barrier, and with the clouds that break against its sides and upon its summits, aided by the melting of the snows under the equatorial heat of summer, cause in this region heavy tropical rains, which swell the water-courses, rivers, and lakes, and thus become one of the chief agents in producing the remarkable phenomena of the annual inundation of the Nile. CHARLES P. DALY.

Nyas'sa, a lake in the interior of Africa, situated in lat. 14° 15′ S., 350 miles from the coast of Mozambique, was discovered in 1861 by Dr. Livingstone.

Nyáya, the logical school. See HINDU PHILOSOPHY.

Nycticeb'inæ (from *Nycticebus*—*νύξ, νυκτός,* "night," and *κῆβος,* "monkey"—a genus of the group), a subfamily of Lemuridæ or half monkeys. They have 36 teeth, viz. M. $\frac{3}{3}$; P. M. $\frac{3}{3}$; C. $\frac{1}{1}$; I. $\frac{2}{2} \times 2$; the neural spines of the dorsal and lumbar vertebræ are inclined backwards; the tail is either short (*i. e.* always shorter than half the length of the body) or rudimentary; the hind and fore limbs are not very unequal, although the hind ones are longest; the ears in the typical forms are small, with the helix little marked, and the tragus and antitragus absent. The sub-family is composed of four genera, of which two (*Perodicticus* and *Arctocebus*) are inhabitants of Africa, and the others (*Nycticebus* and *Loris*) of the East Indies. The species are small, nocturnal, with staring eyes, live in trees, and feed on insects and small birds. THEO. GILL.

Nye (JAMES W.), b. in Madison co., N. Y., June 10, 1815; became a distinguished lawyer and political speaker, noted for humor; was governor of Nevada Territory 1861–65; U. S. Senator 1865–73. D. at White Plains, N. Y., Dec. 25, 1876.

Nyir-Egyha'za, t. of Hungary, manufactures spirits, soda, and oil, and carries on an active trade. Pop. 24,102.

Ny'kerk, or **Nieuwkerk,** t. of Netherlands, province of Gelderland, on Zuyder-Zee, has a good harbor and considerable trade in tobacco, grain, and cattle. Pop. 7428.

Nylghau. See NILGHAU.

Nymphs [Gr. *νύμφη*], in Greek and Roman mythology, a numerous class of inferior divinities, imagined as beautiful maidens, not immortal, but always young, inhabiting rivers and streams (naiads), forests and groves (dryads), etc. They were considered as tutelary spirits not only of certain localities, but also of certain races and families, and sacrifices of goats, lambs, fruit, and oil, but never of wine, were made to them. They occur generally in connection with some other divinity of higher rank, and they were believed to be possessed of the gift of prophecy and of poetical inspiration.

Nym'wegen, or **Nijmwegen** [Fr. *Nimègue;* Ger. *Nimwegen*], town of the Netherlands, province of Gelderland, on the Waal. It is an old and interesting town, fortified, and important on account of its commanding position on the Rhine and Waal, and carrying on a lively trade and extensive manufactures of beer, brandy, eau de cologne, tobacco, and cigars. A treaty of peace was concluded here between Holland and France (Aug. 11, 1678), between Holland and Spain (Sept. 17, same year), and between France and Germany (Feb. 5, 1679). Pop. 24,980.

Nypels (JEAN GERVAIS GUILLAUME), b. at Mastricht July 3, 1803, studied law at Louvain, was appointed professor at Liège in 1835, and has published *Théorie du Code pénal* (25th ed. 1860), *Le Droit pénal français* (1864), *Legislation criminelle de la Belgique* (1868–75, 3 vols.), *Code pénal militaire belge* (1870), and other valuable works.

O.

O, a vowel, stands in English for not less than four distinct sounds—those heard in *rove, nor, move, love;* while *oo* has as many as three sounds, as shown in *moon, book, blood.* In the digraphs *o* has various powers. As an abbreviation, O. stands for Ohio; O in chemical notation is the symbol of oxygen; on the mariner's compass it stands for east (orient).

Oaja'ca, or **Oaxaca,** a state belonging to the Mexican confederation, bordering on the Pacific Ocean and the Gulf of Tehuantepec. Area, 27,352 square miles. Pop. 744,222, mostly consisting of mestizoes and of the different tribes of native Indians. The surface is mountainous and the soil very fertile; when irrigated sufficiently, two crops of wheat and maize are produced annually without the use of any manure. Sugar, coffee, cotton, indigo, tobacco, and many varieties of fruits are grown here. The forests yield excellent timber and different kinds of dyewoods. Minerals are found, especially gold and silver, and cochineal is produced. The climate of Oajaca is delicious and healthful, rain frequent, and the heat seldom oppressive.

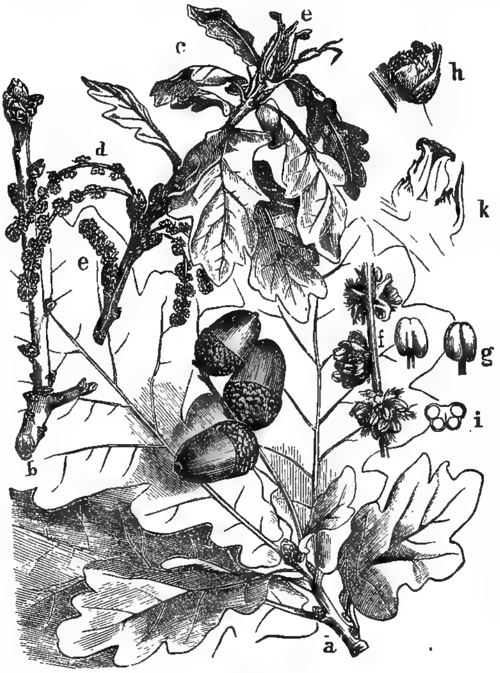
Oajaca, or **Oaxaca,** town of Mexico, the capital of the state of Oajaca, is beautifully situated and well built, its houses being surrounded by gardens, orchards, and whole plantations of cochineal. Its trade and manufactures are not important, but it has several good educational institutions, and is the residence of many wealthy families. Pop. 25,000.

Oahu. See HAWAIIAN ISLANDS.

Oak [Ang.-Sax. *ac;* Ger. *Eiche*]. The oak family, or order Cupuliferæ (a part of the great order Amentaceæ), comprising the oak, the chestnut, the beech, and the hazel, is found everywhere throughout all temperate regions. In the northern temperate zone it is abundant, and it occurs, though not in great numbers, also in the southern. A few species are found upon the mountains within the tropics, but none in the valleys. As now constituted, it is a strictly natural family. Most of the trees belonging to it are remarkable for their thick and rugged bark and for the great abundance of tannin which it contains. They have large and strong roots, penetrating very deeply or extending very far horizontally. The trunks are distinguished for their massiveness, and for the weight, strength, and, in most cases, the durability of their wood. Their branches are strong and irregular, and form a broad head. The buds are fitted for a climate with severe winters, the plaited or folded leaves being covered by imbricate external scales, and often still further protected by a separate downy scale surrounding each separate leaf. The leaves are plane and alternate, and usually supported by a footstalk, at the base of which are two slender scales or stipules, which for the most part fall off as the leaf expands. The fruit is valuable to man and animals. The fruits of the chestnut and hazel have been long cultivated on the Eastern continent, and much improved in size and quality.

The genera found in the northern part of the U. S. are the oak, the chestnut, the hazel, and the beech. The oak (*Quercus*) is found growing naturally in all parts of the northern temperate zone, and in all contributes to the subsistence of a great variety of animals. De Candolle, in the *Prodromus,* published in 1868, describes more than 280 oaks, of which 33 or 34 are found within the limits of the U. S., 90 in Mexico and Central America, 21 in Europe, 2 in Africa, 28 in China and Japan, 60 in continental Asia, 26 in Java, 14 in Sumatra, 6 in Hong-Kong, 3 in Borneo, 1 in the Moluccas. Several have since been found on the Pacific slope within the U. S.; Dr. Gray finds 16 in the Northern U. S. In Europe the stag, the roebuck, and the wild-boar winter upon its fruit. In Asia, pheasants and the wood-pigeon share it with animals of the deer kind. In our own native forests the bear, the raccoon, the squirrel, the wild-pigeon, and the wild-turkey delight in various kinds of acorns, and swine, hardly less wild, fatten upon them. In England, the tree was once prized only for the acorns, which were the chief support of those large herds of swine whose flesh formed a considerable part of the food of the Saxons. The oak is subject to the attacks of insects, causing a variety of galls, some kind being found in almost every part of the tree, and some of which were once supposed to be the fruit of the tree. (See GALL INSECTS.) The most important are known in commerce as GALL-NUTS (which see), and imported in large quantities into this and other countries from Aleppo and other ports in the Levant. Oak-galls are amongst the most powerful vegetable astringents known, and form the basis of many styptics and astringent medicines. An infusion of them is said to be the best antidote for an overdose of ipecacuanha. Galls contain a peculiar astringent principle called tannic acid, which strikes a deep purple color, gradually becoming black, with the soluble salts of iron. This property renders them a valuable dyestuff. They also form the basis of the common black ink. The bark of most species of oak contains abundance of tannin. That of the common black (*Quercus tinctoria*) is used for tanning and for dyeing. The bark of the cork oak of Spain (*Quercus suber*) furnishes cork.

Yet the great value of the oak in all countries is for its wood. It is applied to a greater variety of important uses than that of any other tree. With the exception of the teak tree, it makes the best ship-timber known, and for this purpose the American white oak is perhaps equal to the English oak, and surpassed only by the live-oak. For thorough hardness, toughness, and durability united it is unsurpassed, though each of these properties singly is found more abundantly in some other wood. It is almost indispensable in the manufacture of implements of husbandry and all kinds of wheel-work. When employed for ornamental uses the wood should be cut obliquely, to exhibit the rich reddish-silver grain.



The Oak.

The oak is distinguished from all other trees by the acorn, for which the fruit of no other tree can be mistaken. The leaves of the commoner species are larger towards the extreme end; in some they are more or less deeply lobed, with rounded or blunt lobes; in others, toothed with large round teeth; in others, deeply cut, with the divisions terminating in a long, bristle-like point. The flowers of both sexes are on one plant; the sterile, disposed in long, slender, pendulous catkins, which are in groups; the fertile flowers, in a bud-like, scaly cup. The seed-vessel of the fertile flower is divided into three compartments or cells, in each of which are two embryo seeds; but only one in one of the cells comes to perfection, whence the acorn is a one-celled, one-seeded nut, surrounded at the base by the enlarged scaly cup. The acorns of some species come to maturity in a single season, but many of the American species require two seasons to ripen. There is scarcely any seed in which the vitality is so transient. Few of them will germinate after having been kept a year, and must therefore be planted at once. Most of the American oaks must be trees of considerable height and age before they begin to bear, but they become more fruitful as they grow older, and continue bearing till the last. The rate of growth of the oak is very different in the different species. Slow in the early stages of its growth, it continues to make steady progress for many years, and requires 100 or 150 years to come to perfection. The average growth of the white oak is found to be not far from two inches in diameter in ten years after it has been growing thirty or forty years. An oak of thirty years may be eight inches in diameter and forty feet high. An easy calculation shows that, although its apparent growth after that age is less than before, the real growth of each individual tree is greater. In ten years more it will be ten inches in diameter. Two inches will have been added throughout the whole forty feet, and, as the circles of annual growth enlarge in the proportion of their diameter, the 64 of the former years will have become as 100 for the ten years' growth, and the successive additions in periods of ten years will be as the numbers 36, 44, 52, 60, etc. A tree of thirty years, therefore, will in ten years increase 56 per cent.; in the next similar period, 68 per cent.; in the third, 79; in the fourth, 93; in the fifth, 106. That is, an oak of eighty years of age grows more in ten years than it did in the first thirty; and an oak of 130 more than it did in the first forty. When, therefore, it is desirable to keep the forest for timber, the process of thinning may be continued with strict economy, as the increase of the thirty or forty trees left on the acre will counterbalance in a great degree the loss in numbers. Some acres in every large forest should be thus left for the use of the shipbuilder. Those species of oak most analogous to our white oak are known in Europe to continue to grow and flourish for centuries. There are oaks in Britain which are believed to have been old trees at the time of William the Conqueror; some are supposed to be 1000 years old. For planting, the largest acorns should be selected, and such as have grown upon the most vigorous trees. They should be sown as soon as possible and covered in light soil to the depth of an inch. The largest and most thriving plants alone should be selected for transplanting, and to secure good roots the plants should be removed before their final planting from one part of the nursery to another, after having the long tap-roots cut off. This induces a mass of fibrous roots. They should be planted out at the age of three, four, or five years. For successful planting it is safest to have pines, larches, or other trees intermingled among the oaks. George B. Emerson.

Oak Apple. See Gall Insects and Gall-Nuts.

Oakes (Gen. James), b. in Pennsylvania about 1825; graduated at West Point 1846; served through the Mexican war; made brevet captain for gallantry at Molino del Rey Sept. 8, 1847; became major and lieutenant-colonel of cavalry 1861; participated in the battles of Shiloh and Corinth; was made brevet brigadier-general Mar. 30, 1865, and colonel of 6th Cavalry July 31, 1866.

Oakes (Urian), D. D., b. in England in 1631; came to Massachusetts 1634; graduated at Harvard College 1649; became a clergyman at Fitchfield, England; was silenced for nonconformity 1662; afterward preached to another congregation; returned to Massachusetts; became pastor of the church at Cambridge Nov. 8, 1671; took charge of Harvard College Apr. 7, 1675, and was formally installed president Feb. 2, 1680. D. July 25, 1681.

Oak Galls. See Gall Insects and Gall-Nuts.

Oak'land, city, cap. of Alameda co., Cal. (see map of California, ref. 4–B, for location of county), 6 miles E. of San Francisco, with which it is connected by steamboat and rail, is on the Central Pacific R. R. The city has academies, seminaries, and graded schools, 2 libraries of 6000 volumes, street railways, a paid fire and police department, flouring and planing mills, potteries, marble and iron works, a cordage factory, tanneries, a jute-factory turning out 5,000,000 sacks annually, metallurgical works, smelting and refining works, a quartz-mill, a fruit-preserving establishment, manufactures of windmills, carriages, and other commodities. The city is supplied with water and gas. Pop. in 1870, 10,500; in 1880, 34,555.

Oakland, R. R. junction, Kennebec co., Me. (see map of Maine, ref. 9–C, for location of county), formerly West Waterville, 6 miles S. W. of Waterville. Pop. in 1880, 754.

Oakland, cap. of Garrett co., Md. (see map of Maryland, ref. 2–A, for location of county), 243 miles W. of Baltimore, on the Baltimore and Ohio R. R., has a woollen-mill, several saw-mills, and is a resort for summer tourists. Pop. in 1880, 910.

Oakland, cap. of Mason co., Wash. Ter. (see map of Washington Territory, ref. 4–B, for location of county), is situated on an inlet of Puget Sound, 25 miles N. W. of Olympia. Pop. in 1870, 59; in 1880, not in census.

Oakley (Thomas Jackson), LL.D., b. in Duchess co., N. Y., in 1783; graduated at Yale College 1801; became a lawyer at Poughkeepsie, N. Y.; became surrogate of Duchess co. 1810; a member of Congress 1813–15 and 1827–29; member of the New York assembly 1815–16; attorney-general of the State 1819; he was appointed judge of the superior court of New York City 1828, and became chief-justice 1846. D. May 12, 1857.

Oak Park, Cook co., Ill. (see map of Illinois, ref. 2–G, for location of county), on Chicago and North-western R. R., 8 miles W. of Chicago. Pop. in 1880, 1888.

Oak'um, the fibre of old tarred or untarred rope, used chiefly for calking ships. It was once always picked by hand, but several machines have been invented to perform the work. *White oakum* is made from untarred ropes.

Oakville, cap. of Live Oak co., Tex. (see map of Texas, ref. 6–H, for location of county), 85 miles S. E. of San Antonio, on the Nueces River. Pop. in 1881, 235.

Oan'nes, the man-fish god of the Babylonians, resembling Dagon of the Philistines. He is said to have issued from the Persian Gulf, and to have founded the civilization of Lower Chaldæa. As represented by art, a man's head was under that of the fish, and a woman's feet were joined to its tail. R. D. Hitchcock.

Oar, the long lever of ash, beech, or Norway fir by which vessels are rowed. Long oars for heavy vessels are called *sweeps;* those for sculling a boat are called *sculls.* The part of the oar which dips into the water is called the *blade;* the other end is the *handle;* next to this comes the *loom.* (For the use of the oar see Rowing.)

O'asis [from the Coptic word *ouahe,* a "resting-place," or simply an "inhabited place"] is a word now used as a general term denoting any cultivated or cultivable spot in a desert, but was by the ancients applied only to the four spots of this character found in the Libyan desert, along the Egyptian frontier. These four oases are—(1) Oasis Ammonia, the modern *El Siwah,* the first discovered, though the most distant from the Nile, situated in lat. 29° N., lon. 26° E., 6 miles long, 3 miles broad, and containing the ruins of the famous temple and oracle of Ammon, and the celebrated Fountain of the Sun, whose waters are "warm in the morning and evening, but cool at noon." (2) Oasis Magna, the modern *El Kargeh,* 80 miles long, 10 miles broad, stretching 90 miles W. of the Nile, from lat. 25° to 26° 6′ N., and abounding in ruins of the Greek, Roman, and early Christian period. (3) Oasis Parva, the modern *El Kasr,* five days' journey S. E. of El Siwah. (4) Oasis Trinytheos, the modern *El Dakleh,* situated in lat. 28° N., and containing several artesian wells. The history of these oases is very obscure, but is of great importance. The gigantic ruins show that they must have been inhabited very early, and attained, somehow, a prominent place in ancient civilization. They are never spoken of with indifference by the ancients. There was something about them which fired the imagination of the writers. Alexander's visit to the oracle of Ammon was considered as one of the greatest events of his life. Later, the Roman emperors used them as places of banishment—Juvenal was sent hither—and the Christians in their sectarian strifes often used them as places of refuge; Athanasius lived here, also Nestorius. At present they are possessed by a vigorous tribe of Arabs subject to Egypt, and contain several towns, of which *El Kargeh* is the most noticeable. With regard to the formation of these oases the ancients seem to have entertained very wrong ideas. They considered them as islands in a sea of sand, but they are rather lakes on a plateau. They are always formed by depressions in the surface, in which a layer of sand and clay is capable of retaining the water gathering at the bottom. Their "blessedness," although generally described with glowing colors, is comparative only. Their soil is often rich, and produces wheat, rice, maize, millet, dates, and other fruits, but as often it has a swampy character. They cannot be visited during summer and autumn, on account of the unhealthiness of their atmosphere.

Oat, or **Oats** [from the Ang.-Sax. *ata,* "food"], a genus of grasses, *Avena,* containing many species, and generally characterized by having the spikelets in loose panicles, the glumes as long as the florets, the paleæ firm and almost cartilaginous, and the outer one of each floret provided with an awn, which is twisted at the base, but this generally disappears in cultivation. The cultivated oat (*Avena sativa*) is an annual, though the genus contains several perennial species, and is characterized by a very loose panicle, spreading on all sides, having two or three fertile florets in each spikelet, but not more than one floret awned. It is probably a development of the wild oat (*Avena fatua*) found in Europe, where it is considered a weed, and now wild in California, where it often spreads over large tracts of land and yields a good hay. The wild oat is characterized by having the inner palet and the grain covered with hair, and the outer palet provided with a very long awn, twisted near the base and bent in the middle. Experiments made by Prof. J. Buckman at the Royal Agricultural College, England, have shown that seeds of this species, when gathered ripe and sown next spring, produce a grain differing considerably from the mother-grain; and when this difference is further developed a grain is produced which has a strong resemblance to certain varieties of the cultivated oat. The most remarkable of these varieties are the potato oat, the black Poland oat, the naked oat (much esteemed in Ireland), the Tartarian or Hungarian oat, etc.; but the richest and most perfect variety is probably that raised in Scotland. The oat is decidedly a northern plant, though it does not reach so far to the N. as barley. It succeeds best in the northern part of the temperate zone; when brought farther S. and raised under a hotter summer, it degenerates very rapidly. The weight of a bushel of American oats varies between 30 and 35 pounds; that of a bushel of Scotch oats, between 40 and 50 pounds. The entire production of oats in the U. S. amounted in 1880 to 355,553,684 bushels, of which 63,189,200 bushels were raised in Illinois, 33,841,439 in Pennsylvania, 37,575,506 in New York, 28,664,505 in Ohio, etc. The awn or beard of all species of oat twists or untwists hygrometrically with varying humidity or dryness. This in some long-awned species, such as *Avena sterilis* (the animated oat), produces such free and active movement that it seems as if alive. Several species of oats are useful, not for their grain, but as fodder, such as the downy and the yellow oat-grass.

Oates (TITUS, *alias* AMBROSE), b. at London, England, about 1620; educated at Merchant Taylors' School and at Cambridge; took orders in the Church of England; held benefices in Kent and Sussex; became a chaplain in the navy; was dismissed from that post on a charge of disgraceful conduct; professed conversion to Roman Catholicism; became a Jesuit; resided some months in the colleges at Valladolid and St. Omer; was expelled from both institutions for alleged misconduct; returned to England 1678, and gave information to the authorities of the existence of a "Popish plot" for the extirpation of Protestantism in England, accusing several of the Roman Catholic nobility and gentry of participation in the pretended conspiracy. The admitted zeal for Roman Catholicism displayed by James, duke of York, and the suspected inclination of King Charles II. to the same faith, gave color to the charge, and the murder of Sir Edmondbury Godfrey, the magistrate before whom Oates's testimony was taken, produced conviction in the popular mind. Oates thereupon developed his original testimony into a circumstantial account of the intended burning of London and the shipping in the Thames, a massacre of Protestants, and a landing of a French army in Ireland, adding that the pope had entrusted the government of England to the Jesuits, that the chief offices of state had already been parcelled out among the great Roman Catholic lords, that the king was to be assassinated, and that the queen was privy to the plot. An unexampled excitement was the result; the houses of Roman Catholics were searched, and extraordinary precautions taken against the supposed danger. Oates was lodged in Whitehall with a pension of £1200, and had guards assigned him. The accused Roman Catholics were put on trial Nov., 1678; several were convicted and executed; and fresh victims were added from time to time for two years. After the execution of Lord Stafford, Dec., 1680. there was a revulsion of public sentiment; the bad character of Oates was exposed; the duke of York obtained a verdict of £100,000 against him for defamation (1685), and he was imprisoned as a debtor. On the accession of James II. severer measures were taken; Oates was convicted of perjury, sentenced to stand in the pillory five times a year in as many different towns during his life, to be whipped from Aldgate to Newgate, and thence to Tyburn, and to be imprisoned for life. Public sentiment being now fiercely against him, he was mobbed and nearly killed at the first pillory, and received 1700 lashes at the whipping. After the accession of William and Mary, Parliament declared the conviction of Oates illegal, he was pardoned, received a pension of £400 per annum, and survived in obscurity seventeen years longer, dying at London July 23, 1705.

Oath [Ang.-Sax., *âdh*], in law. This is an open declaration or promise before some officer or court authorized to take it, accompanied by an appeal to the Supreme Being to attest the truth or sincerity of the declaration or promise. It is essential that the oath should be authorized by law. If not, it is termed *extra-judicial*, and has no legal validity, however it may affect the conscience. The principal distinction in this branch of the law is between oaths which assert an existing fact and oaths which are promissory in their nature. An instance of the latter is an oath of office, to the effect that the appointee will discharge its duties faithfully, or that an alien on being naturalized will support the Constitution of the U. S.

The true nature of the oath has elicited much discussion. Some jurists are of the opinion that the address to the Supreme Being is in the nature of an imprecation invoking His vengeance in case the attestation is wilfully false. Others—and apparently with more reason—maintain that it is in the nature of a warning or suggestion to man that the Deity will in the administration of His government fitly punish false swearing. Perhaps the reconciliation of the opposing views is to be found in the fact that on the institution of the oath in the early periods of the law the former view prevailed, while in its modern developed condition the latter has insensibly supplied its place.

The form of the oath varies in different states and countries. When a witness is called upon to testify in a court of justice, and he does not accept the prevailing religion, he is allowed to take that form which according to his view is the most binding upon his conscience. The rule is well expressed by Lord Starr in his *Institutes of the Laws of Scotland*: "It is the duty of judges in taking the oaths of witnesses to do it in those forms that will most touch the conscience of the swearers according to their persuasion and custom, and though Quakers and fanatics, deviating from the common sentiments of mankind, refuse to give a formal oath, yet if they do that which is materially the same, it is materially an oath." (See also the very able and luminous opinion of Chief-Justice Willes in *Omichund* v. *Barker*, Willes's Reports, 538.) Accordingly, if the witness should be a Gentoo, and should think the oath only binding on his conscience upon kissing the hand or foot of a Brahman, it should be administered in that manner. However, if the legislature should prescribe that a particular form of oath should be adopted, the direction must be followed if there be constitutional power to make the provision. Thus, where an act of Parliament required that a member of the House of Commons should take an oath "upon the true faith of a Christian," it was decided that as the plain intent of the legislature was to make that an essential part of the oath, it must be followed, even though it might exclude a Jew from sitting as a member of the House.

No one can properly take an oath unless he believes in a Supreme Being who will inflict punishment in case of wilful false swearing. There has been much diversity of opinion upon the point whether it is necessary that the belief should be in punishment in a future state. The better opinion is that this is unnecessary, and that it will suffice if there be a belief of future punishment in this world. Some courts go so far as to hold that it is enough if the punishment simply consist in the disapproval of one's conscience, though the soundness of this view is open to question. It will be assumed that the witness believes in the Christian religion unless there is some evidence to the contrary. The proper evidence is his own antecedent declaration. There are some courts that allow an interrogation of the proposed witness by the judge before he is sworn to testify. Other tribunals, with better reason, deem this proceeding inquisitorial, and not in accordance with the spirit of our institutions. If former declarations are used to show disbelief, the same kind of statements made subsequently must be allowed to prove that the condition of disbelief has ceased, and that belief has taken its place. It is maintained by some that when the person is offered as a witness, and objected to, he may then affirm that he is now a believer, and thus become competent. The objection to this view is that a declaration made under such circumstances is likely to be a mere device used on the spur of the moment and for the purpose of becoming a witness.

In some of the States there is a rule that a witness is not to be excluded on the ground of his religious belief. In New York there is the following sentence in the constitution: "No person shall be rendered incompetent to be a witness on account of his opinions on matters of religious belief." (Art. I., § 4.) It has been decided in the supreme court that this provision only prevents the exclusion on the ground specified of the person offered as a witness, and that his want of religious belief may still be used to affect his credibility before the jury, and that he may be interrogated before them for this purpose. It is open to doubt whether this construction was foreseen in the framing of the constitution, as it certainly much impairs the effect of the clause. The constitution of Michigan, as interpreted by the courts, adopts a more comprehensive rule, when it establishes the proposition that a witness can neither be excluded on the ground of religious belief nor examined with regard to it for the sake of impeaching his credibility.

It is common to provide in the statutes of the respective States different forms of oaths to meet to some extent the varying religious views of witnesses, and also modes of affirmation for those who do not think it lawful to take an oath. Thus, in New York the regular mode of administering an oath is for the person who swears to lay his hand upon and to kiss the Gospels. However, if one desires he may take the oath in the following form: "You do swear in the presence of the ever-living God," and while so swearing may or may not raise his hand at his discretion. And where a person shall declare that he has conscientious scruples against taking any oath or swearing in any form he shall be permitted to make his solemn declaration or affirmation in a specified manner.

The laws of the U. S. provide that in certain cases an oath of allegiance shall be taken in a prescribed form. These are cases where any person is elected or appointed to any office of honor or profit (1 R. S., §§ 1755, 1756), or where a person petitions to be declared a bankrupt (*Id.*, § 5018), or a person prosecutes claims as an attorney or on his own account before any of the departments or bureaus of the U. S. (§ 3478). Members of State legislatures and executive and judicial officers must declare upon oath that they will support the Constitution of the U. S. (*Id.*, § 1836). So an alien on becoming naturalized must take a similar oath, and must renounce and abjure all allegiance to every foreign prince or potentate (*Id.*, § 2165). T. W. DWIGHT.

Oaxaca. See OAJACA.

Ob, or **Obi,** a river of Western Siberia, rises in the Altai Mountains within the Chinese dominions, and flows in a northern and north-western direction, with a tortuous course of 2000 miles, into the Gulf of Obi, an inlet of the Arctic Ocean on the northern shore of Siberia. The Ob receives from the left the Irtish, 200 miles below Tobolsk, The Ob, navigable for more than 1600 miles, forms the commercial highway between China and European Russia.

Obadi'ah, one of the minor Hebrew prophets, of whom we know absolutely nothing. His book, the shortest in the Old Testament, is a fragment denouncing the Edomites. Delitsch and Keil think it the oldest of the prophetical books; De Wette and Bleek think its author was an exile at Babylon; but we have absolutely no data for forming an opinion on the time when he lived. This book contains a remarkable passage parallel to Jer. xlix. 7–22. It is impossible to say which of the two prophets made use of the other's work.

Obeid', El, town of Central Africa, the capital of Kordofan, in lat. 13° 11′ N., lon. 29° 35′ E., on the Bahr-el-Abiad, is miserably built, but has some manufactures of plated works and silverware which evince both skill and taste, and carries on a considerable trade in gums, ostrich feathers, ivory, and tamarinds. Pop. about 20,000.

O'Beirne' (THOMAS LEWIS), D. D., b. in Longford co., Ireland, in 1748; educated at the Catholic college of St. Omer, France; became a Protestant; took orders in the Church of England; was chaplain on Lord Howe's fleet at the beginning of the American war; preached at St. Paul's church, New York City, 1776; was private secretary of the lord lieutenant of Ireland 1782; received livings in Northumberland and Cumberland 1783; became chaplain to Earl Fitzwilliam; bishop of Ossory 1796; was translated to the see of Meath 1798, and d. there Feb. 15, 1823. Author of a poem, *The Crucifixion*, of a *Vindication* of the conduct of General and Admiral Howe in America, of political pamphlets, and of three volumes of sermons.

Ob'elisk [from the Greek *obeliskos*, a "spit," applied to square monolith columns terminating in a pyramidal apex and placed on a pedestal before Egyptian doorways]. Obelisks were called in Egyptian *teχen*, and capped (*benben*) with gold, copper, or iron. The material of which they were made was limestone, basalt, red granite, or syenite, and their four sides inscribed with vertical lines of incused hieroglyphs recording the titles and merits of the person by whom dedicated and of the deity to whom they were sacred. Occasionally, they were uninscribed, but they generally have one, and often three, lines of hieroglyphs on each side, besides pictures of the monarch adoring the deity on the apex and sides. Obelisks were the prototypes of the triumphal columns of the Romans, and used for the same purposes, erected, it appears, at the temples only in honor of illustrious monarchs. Small obelisks of limestone with sepulchral dedications are found in the tombs of the fourth dynasty, but none of the great obelisks are older than the twelfth dynasty, one of which, of Osortesen I. of that line, is still extant at San, the ancient Heliopolis. From that period (1800 B. C.) to the time of Hadrian (A. D. 138) obelisks were in use. The proportions of these monuments were that the base was one-tenth the breadth of the elevation up to the top of the apex, and the pyramidion at the summit had the same height. They were placed upon bases also tapering from below, and stood in pairs, one before each jamb of a doorway. The tallest remaining, that of the Lateran at Rome, is 105 feet 7 inches high, and the shortest, that of the Florence Museum, 5 feet 10 inches. The Greek and Roman writers considered that they represented a sunbeam, and mention those set up by the kings they call Mesphres, Sothis, and Ramses, one of whose, 120 cubits high, was said to have employed 120,000 men in its construction and erection, to secure which the son of the monarch is said to have been tied to the apex. The prophet Jeremiah speaks of those of Heliopolis, called in hieroglyphs "the city of obelisks," from their great number. The Egyptians were averse to the erection of obelisks by their foreign rulers, and positively refused the honor to Darius. Ptolemy Euergetes II. and his wife, Cleopatra, however, erected two obelisks at Philæ of red granite, 22 feet high, before the temple in honor of Isis. The mode by which they were erected in Egypt is not known. It is supposed that they were floated in boats or on rafts during the high Nile to their destination, and then raised by inclined planes of woodwork and ropes. The Romans built for those transported to Rome special rafts or flat-bottomed boats of great size, rowed by as many as 300 oars, and elevated them by cords, pulleys, and frames by the labor of thousands of men. The principal architects who replaced them on their pedestals at Rome in the papal times were Fontana, Antinori, Laurent Bernin, and Camerti, who used similar machinery for the purpose. The obelisk of Luxor was removed from Egypt in 1833, and set up in the Place de la Concorde at Paris in 1834 by M. Lebas. The obelisks at Catania in Sicily and at Arles in France are not Egyptian. The Assyrians also used obelisks of smaller sizes and proportions, terminating in tops step-shaped four sides. One of Assur-nazir-pal (B. C. 880), 9 feet 4 inches high, found in the palace of Kouyunjik or Nineveh, is of white stone ornamented at the sides with reliefs. Another, of Shalmaneser (B. C. 850), of black marble, found at Nimrood, the ancient *Calah*, 6 feet 6 inches high, has at the sides reliefs recording the submission of Jehu, and an inscription, the annals of thirty-one years of his reign. Fragments of others have been discovered, and obelisks were not unknown in India, some having been set up at Seringapatam in the last century. SAMUEL BIRCH.

Obelisk in Central Park, N. Y. The obelisk adorning Central Park was quarried at Assouan, in Nubia, and brought down the Nile on immense rafts and set up at the famous city of Heliopolis, in Lower Egypt. It is of syenite, or, as the French call it, rose granite—an exceedingly durable stone. From Heliopolis the Cleopatra monoliths were removed to Alexandria after having stood before the temple of the sun at the former city for over 1000 years, so the queen had nothing to do with the obelisks that bear her name. "Cleopatra's needles" are a misnomer; they were set up at Alexandria in the eighth year of the reign of Augustus, or 23 B. C., 7 years after the death of Cleopatra.

Heliopolis seems to have been literally a city of obelisks, for it has furnished nearly all that were transported to Europe, and only one is now remaining where once stood this mighty city. These obelisks were usually erected to commemorate some important event in the life of the ruling king, and were always dedicated to the gods, so that their sacredness would prevent their overthrow. The park obelisk is dedicated to the Egyptian god Ra, or the sun, as the hawk hieroglyphs at the pyramidion, or the top of the shaft, indicate. The hawk, as flying the highest, and consequently nearest to the sun, and believed to have the faculty of gazing on the orb, was especially dedicated to the sun-god, or Ra, in the ancient Egyptian. The observer will notice at intervals among the hieroglyphs long oval figures enclosing various hieroglyphical characters; these are the names of certain kings of Egypt. These ovals are called by Egyptologists "royal cartouches." They gave the first clue to the deciphering of the hieroglyphs, the name of Ptolemy Epiphanes being the first king's name that was phonetically made out. Now the names of all the kings, or "pharaohs," of Egypt are known a long way back, anterior to the time of Moses, or before Abraham entered the land.

In 1877 the khedive of Egypt signified his wish to present an obelisk to the U. S. The cost of transporting it was about $105,000, the whole of which was defrayed by Mr. William H. Vanderbilt. The entire control of the operation attending its removal was intrusted to Lieut.-Com. Henry H. Gorringe, U. S. N., who conducted the affair to a most successful termination from the moment he found the obelisk in a stonecutter's yard in Alexandria to its re-erection on its present site, a slight elevation in front of the Metropolitan Museum in Central Park in 1880. The obelisk was sheathed with planks held together by iron bands, the top band being made heavier than the others, with a loop at each angle, into which were shackled four steel wire cables, these being secured to anchors. The masonry and concrete piers on which these were to stand were commenced. Four long spars were placed in position, opposite to the angles of the obelisk, to form derricks for hoisting the pieces of the turning-structure into position. The machinery and materials shipped from America arrived in Alexandria Nov. 11, 1879. On Dec. 2 the turning-structure was placed in position, and so perfect was it that not even a bolt-hole had to be reamed. By Dec. 5 the obelisk was lifted clear off its pedestal, and the metal supports or crabs were partially disengaged. "Some anxiety was caused by the buckling of the heel beams, due to imperfect bearing on the bottom of the obelisk." In work of this delicate character, when a single accident might injure the object, the power employed to effect a purpose having been determined, there must always be used certain precautionary measures, and to the infinite care taken by Com. Gorringe is due the fact that the obelisk came to us without the loss of a single splinter of syenite. When the first attempt was made to pull the upper end of the obelisk over by tackle, it would not budge. The heel beams had bent, and the impression prevailed "that the turning-structure had settled, and was therefore inadequate to sustain the weight." A great deal of gratuitous advice was offered, and letters were received "protesting against the destruction of so valuable a monument by any further attempt to remove it." The obelisk was, however, lifted, raised clear of the crabs, and in this position it remained seventeen hours without affecting any part of the structure in which it was suspended. To remove the crabs was troublesome, because the old Roman architect had secured them in the best possible way. Rumors of a possible demonstration on the part of the foreign residents having reached Rear-Admiral Aslambekoff, of the Russian navy, who was in port with his flagship, the Minim, the officer sent a large force of unarmed men, who enclosed the ground, forming a cordon, and thus kept out intruders. On the 6th, at eleven o'clock, the governor of Alexandria being present, the lowering was commenced. The obelisk began to move, and, though there was a large crowd of Greeks, Italians, and other Europeans, "there was absolute silence and stillness." Now that the obelisk was down, to lower it to the level of the ground, and then to place it in a wooden box or cradle, were next in order. An iron truss-cradle moving on cannon-balls instead of wheels had been made in the U. S. and brought to Egypt for this special purpose. It had been Com. Gorringe's intention to move the obelisk through Alexandria to a point of shipment, about a mile, and an unofficial application was made to the governor to move the monument along the proposed route. Keeping the streets of Alexandria in proper order had been transferred to the foreign merchants. Permission to transport the obelisk through Alexandria was refused, though the author states that he guaranteed to repair all damage done to sewers or streets. It became then necessary not only to construct a pontoon, but to clear the sea of heavy blocks of granite and syenite which had fallen in from ancient times. To carry the obelisk around a neck of land added very considerably to the expense, as it was something which had not entered into Com. Gorringe's plans. But all obstacles were overcome, and, as before stated, the work of removing the obelisk to Central Park, New York, was successfully accomplished. The obelisk was covered with a coating of paraffine in 1885 to preserve it from the action of the weather.

O'ber-Am'mergau, a v. of Bavaria, beautifully situated on the Ammer, 46 miles S. W. of Munich, is celebrated for the performance of a mystery representing the passion and death of Christ, which takes place here every ten years. The custom originated in 1634, when the population made a vow to this effect if the village escaped from the plague, which prevailed in the vicinity. The performance requires 350 actors, who are chosen among the inhabitants themselves, lasts from 8 A. M. to 4 P. M., is repeated on twelve succeeding Sundays, and attracts generally very large audiences, as it is the only place in which mysteries are still performed in true mediæval style. (See Eliza Greatorex, *The Homes of Ober-Ammergau* (New York, 1873), and Holland, *Das Ammergauer Passionsspiel im Jahre 1870.*)

Oberhausen, a flourishing Prussian town and R. R. centre in the province of the Rhine, is of recent origin, and is situated 5 miles from the E. bank of the river Rhine and 20 miles N. of Düsseldorf. It has zinc-smelting works, manufactures of iron, including wire-rope, also of glass, porcelain, etc. Extensive coal-pits are in the vicinity, from which about 700,000 tons of coal are annually exported. Oberhausen was commenced in 1845, received its municipal charter in 1875, and had 16,680 inhabitants in 1880.

O'berlin, cap. of Decatur co., Kan. (see map of Kansas, ref. 4–C, for location of county). Pop. of tp. in 1880, 1196.

Oberlin, Lorain co., O. (see map of Ohio, ref. 2–G, for location of county), 35 miles S. S. W. of Cleveland, on the Lake Shore and Michigan Southern R. R., contains Oberlin College, 2 business colleges, a telegraph school, etc. Pop. in 1870, 2888; in 1880, 3242.

Oberlin (JEAN FRÉDÉRIC), b. at Strasbourg Aug. 31, 1740; early evinced a remarkable degree of benevolence; was educated at the Strasbourg University; was ordained to the Lutheran ministry; became in 1767 pastor of Steinthal or the Ban de la Roche, a wild district in the Vosges Mountains. Here, under his unselfish and wisely-directed care, the desert soon began to blossom; deep ignorance was succeeded by general intelligence; moral darkness gave place to prevalent piety, pure morals, and a remarkable improvement in the industry and thrift of the community. The Ban de la Roche was visited by great numbers of philanthropists, to whom Oberlin's work served as a model. Died at Walbach June 1, 1826. His biography has been written in France, Germany, England, Denmark, etc., and by H. Ware, Jr. (Boston, 1845).

Oberlin (JÉRÉMIE JACQUES), brother of J. F. Oberlin, b. at Strasbourg Aug. 7, 1735; educated at the Strasbourg University, where he became librarian in 1763, professor of rhetoric 1770, and professor of logic and metaphysics 1782; published works on *Roman Rites* (1774), on the *Minnesingers of Alsace* (*De Poetis Alsatiæ Eroticis*, 1786), Latin texts for schools, etc. D. at Strasbourg Oct. 10, 1806.

Oberlin College, at Oberlin, O., was founded in 1833 by Rev. John J. Shipherd and Philo P. Stewart. It was chartered Feb. 28, 1834, as Oberlin Collegiate Institute, which name it retained until 1850, when it was changed to Oberlin College. The plan was to establish a Christian school for the liberal education of both sexes, encouraging students to assist themselves by manual labor. By 1835 there were theological, college, ladies', and preparatory departments; with the addition, since 1867, of a conservatory of music. The theological seminary has an intimate but not organic relation to the Congregational churches of the land. The seminary building contains accommodations for 60 students, besides the chapel and lecture-rooms. In the department of philosophy and the arts there are (1) the classical and scientific, or "college," course, and (2) the literary. The studies of the former are so arranged that after the freshman year the student can give a classical or a scientific character to his course by a system of elections. The literary course omits all the Greek and part of the Latin and mathematics. The department of preparatory instruction embraces (1) a classical school with a three years' course, and (2) an English school. The faculty consists of the president, 16 professors, 2 principals, and 28 lecturers, tutors, and instructors. In the preparatory schools there are about 40 teachers. Graduates from theology receive the degree of B. D.; those from college, that of A. B. The productive endowment for the theological department is $64,000; for the other departments, $288,000. The charges for tuition and incidentals are $30 a year. The college library contains about 12,000 vols.: literary societies have a library of over 4000 vols. Rev. Asa Mahan was president from 1835 to 1850; Rev. Charles G. Finney, from 1851 to 1866, when Rev. James H. Fairchild was appointed. The board of trustees is a close corporation of 24 members, four of whom are elected each year and one-fourth of whom are selected on nomination of the college alumni. Colored students have always been admitted, and the attendance of students, averaging from 1200 to 1500 a year, is about equally divided between both sexes.

ALBERT A. WRIGHT. REVISED BY J. B. T. MARSH.

Obes'ity [Lat. *obesitas;* synonyms, *Polysarcia, Corpulence*], an abnormal deposit of adipose tissue under the integument and around the viscera. The amount of adipose tissue in the organism may be considerably augmented without giving rise to any inconvenience on the part of the individual in the way of encumbering his movements or interfering with the functions of the viscera, etc.; but such a condition would not come within the scope of this article. It is still a condition of health, and the term *obesity* should only be applied to those cases where the deposit of fat is so great as to incommode the patient. Of the causes of obesity we may mention, first, *hereditary susceptibility*. It is not at all uncommon to meet certain families in which most of the members are corpulent, and sometimes the tendency to become so may be traced through several successive generations. Inactivity and sedentary occupations exert a very material influence over the production of fat, especially when combined with a rich diet. In women the predisposition to corpulence exists in the first years of child-bearing, and again after the "change of life;" in men, between the ages of forty and sixty. The exciting cause is generally found to be malassimilation, due to some derangement of the digestive organs. We mostly find it in individuals who indulge in a rich diet, and especially if it contains fatty matters. Articles abounding in sugar and starch and alcoholic and malt liquors seem to favor the production of fat to no inconsiderable extent. The symptoms of obesity may be enumerated as follows: Diminution of mental and bodily activity, impeded action of the viscera, the organs of respiration, circulation, and digestion. The slightest exertion will bring on panting; the blood is comparatively deficient in quality and quantity, and, as a result, the muscles become weak and flabby. The countenance becomes bloated and sallow, and the patients are liable to suffer from a variety of affections which depend on malassimilation, as gout, rheumatism, etc. Often fatty degeneration of the heart or liver coexists, and we then have the symptoms of these maladies superadded. Mr. Harvey has shown, in his late work on corpulence, that the senses of *hearing, taste, smell,* or *sight* are often absent altogether or blunted to a very annoying extent in corpulent persons. In the treatment of obesity alkalies internally and alkaline baths have long occupied a prominent place, and even at the present advanced stage of medical science we hear physicians daily prescribing small doses of soda, potassa, etc., with a view to procure a saponification of the fat in the interior of the body. Such a course of treatment is simply ridiculous. If a jockey wishes to "condition" a horse that has acquired too great a deposit of adipose tissue, does he administer small doses of the bicarbonate of soda or bathe him in alkaline water? Certainly not. The course he adopts is a well-known one, and is pursued also by professional pedestrians, gymnasts, etc. It consists of a regulated diet and systematic exercise in the open air. The case of corpulence treated successfully which has gained the greatest notoriety is that of Mr. Banting. He adopted a regular course of dieting, in which there was an absence of fatty, starchy, and saccharine matters. This should be rigidly adhered to, and in addition no alcoholic or malt liquors should be partaken of whatever. Above all other things, both body and mind should be exercised daily. EDWARD J. BERMINGHAM.

O′bi, or **Obeah,** a form of pretended witchcraft practised by persons of African descent in the West Indies, and to some extent in the Southern U. S. Obeah men and women have often a great influence over the degraded of their race. The practice is often attended with great excesses.

Ob′iter dictum [Lat.], a remark or suggestion made by a judge or a court in disposing of a question which is not necessary to its decision, sometimes termed a *dictum*. Such a suggestion is not regarded as authoritative when the point comes up for positive decision. A *dictum* may, however, have much influence from its reasonableness or from the high reputation of the tribunal from which it emanates. Much law is generated in this manner, one court uttering dicta and another at a later date embodying them into decisions. It is not uncommon for reporters of decisions to call attention to *dicta* in the abstracts made by them of the substance of judicial opinions. The technical way of showing that the remark is a dictum is to employ the phrase "it seems." In the early reports the equivalent expression is "*Semble.*" T. W. DWIGHT.

Oblates′ [Lat. *oblatus*, "offered"], in the Roman Catholic Church, are persons of either sex associated after the manner of monks or nuns, but without solemn vows. Some oblates are secular priests; others are without orders. The institute of oblates was one of the many reforms introduced in the diocese of Milan by St. Charles Borromeo toward the close of the sixteenth century. He made use of their services chiefly in the wild and inaccessible alpine districts of his diocese. The institute still exists, and has recently been introduced in England.

Oblates of Mary Immaculate, a congregation of regular clerks, founded in 1815 by Bishop Mazenod of Marseilles. They visit the poor and the prisons.

Oblate Sisters of Providence, a sisterhood of the Roman Catholic Church, founded in 1825 at Baltimore.

Obliga′tion. The ordinary meaning of this term in the common law is a bond containing a penalty; with a condition annexed for the payment of money or the performance of covenants. It is an instrument under seal, whereby a person binds himself under a penalty to do something. The meaning of the word *obligatio* ("obligation") in the Roman law is much more comprehensive. In that system of jurisprudence it refers to the legal tie or bond which obliges to the performance of some act. According to Justinian, *Obligatio est juris vinculum qua necessitate adstringimur alicujus solvendæ rei, secundum nostræ civitatis jura.* In other words, it is the legal bond by force of which we are bound to perform an act according to the laws of the state. Such an obligation might arise either from the assent of parties according to prescribed forms, and constituting a contract, or from a delict (or wrong). This last signification of the word "obligation" sheds light upon an expression in the U. S. Constitution, "the obligation of contracts." T. W. DWIGHT.

Obliga′tion of Contracts. The U. S. Constitution (Art. I. Sec. 10) contains a clause that "No State shall pass any law impairing the obligation of contracts."

I. *What are the Contracts embraced within the Prohibition?*—All executory contracts between private individuals, whether express or implied, are clearly protected by the constitutional provision. The same is true of all grants, conveyances, and other executed contracts; and it is fully settled that statutory and other grants made by a State through its legislature or otherwise are also executed contracts, and cannot be repealed by subsequent laws. As a corollary from the general proposition, the Supreme Court of the U. S., against the strong and repeated protests of the State tribunals, has firmly established the doctrine that charters of private corporations are contracts in the nature of grants, and cannot be repealed or modified unless the power to do so has been reserved in the manner hereinafter described. This general subject of private charter involves three distinct questions: Whether the charter in its general scope, as a gift of franchises to the corporation, is a contract? Whether the special stipulations in it, not necessary to its existence, which restrict the State in the exercise of its governmental powers, are contracts? And whether any contract on the part of the State can be implied from the terms of the charter? These questions have been fully discussed and answered, and are now put at rest. In the celebrated and leading case of Dartmouth College (1819) the Supreme Court decided that such a charter is a contract between the State and the corporation, and this ruling has been reaffirmed in every subsequent judgment involving the subject-matter down to the present time. The second question has been passed upon in a no less definite manner. The collateral stipulations usually contained in charters which have received a judicial construction are of two classes—those which restrain the State's power of taxation over the newly-created corporation, and those which limit the exercise of its power of eminent domain toward that body; as illustrations, a clause in a bank-charter exempting it from taxation either entirely or beyond a specified amount, and a provision in the charter of a toll-bridge that no other bridge shall be constructed or authorized within a certain distance up and down the stream. Through a long succession of decisions the U. S. Supreme Court has uniformly upheld these collateral stipulations—has declared them contracts binding upon the State and completely protected by the constitutional guaranty. In opposition to this view it has been contended that the States cannot thus bargain away their highest governmental functions; but the dissent of the State tribunals has, for the present at least, been entirely overcome. Whether a State may alienate its police power by contract has not yet been finally determined; so far as the State courts have spoken, they have answered the question with an emphatic negative. In the third place, it is the settled doctrine that no contract can be implied from the charter; in order to be binding upon the State the agreement must plainly appear in the express language of the instrument. The following conditions, relations, and arrangements are not contracts within the meaning of the constitutional prohibition: Marriage, although often called a contract, is not, according to the decided weight of authority, protected or affected by the provision. It is also established beyond a doubt that all arrangements which are political in their nature, and to which the State is a party, are not contracts, and do not fall within the guaranty. Of these the most important are the charters of municipal corporations. Over such corporations and their charters the legislature, unless restrained by the State constitution, has complete power. Public offices, licenses to carry on particular trades, and the like, statutory permission to sue the State, grants of authority to establish lotteries, are not contracts between the State and the individuals holding the privilege, and may therefore be abolished or changed by subsequent legislation. It should be observed, however, that when the prior power to do so has been reserved by a State, it may to a certain extent interfere with contracts made while such reservation is in force.

II. *What is the Obligation of Contracts?*—The true interpretation of this phrase has been finally determined by the national court of last resort. The principal question which had been at issue was, whether the obligation includes the remedy given by the law to enforce a contract, as well as the rights and duties of performance arising from its very terms; and the doctrine is now most righteously established that it does. In a recent judgment of the U. S. Supreme Court the results of the prior decisions were summed up as follows: "These propositions may be considered consequent axioms of our jurisprudence. The laws which exist at the time and place of making the contract and where it is to be performed enter into and form a part of it. This embraces alike those which affect its validity, construction, discharge, and enforcement. Nothing is more material to the obligation of a contract than the means of its enforcement. The ideas of validity and remedy are inseparable, and both are parts of the obligation which is guarantied by the Constitution against impairment. The obligation of a contract is the law which binds the parties to perform their agreement. Any impairment of the obligation of a contract—the degree of the impairment is immaterial—is within the prohibition of the Constitution." The obligation is not simply what the parties have in terms agreed; it is the legal effect given to those agreements by the whole of the existing law applicable to the contract—the rights and duties which the law creates from the fact of the contract being made.

III. *What State Laws impair the Obligation of Contracts?*—Three general principles must furnish the correct answer to this question in each particular instance of State legislation. (1) The prohibition is not against destroying, but impairing. Destroying the obligation of course impairs it, but impairing does not necessarily destroy. (2) In order that a statute may impair their obligation it must operate upon contracts existing at the time of its passage; and so far as it purports to accomplish this result it is void. (3) When a legislature has passed laws affecting contracts, such as insolvent, exemption, stay, appraisement, redemption, limitation laws, and the like, or when it has reserved in prior general statutes or otherwise, the authority to repeal or modify the charters of corporations, the operation of such statutes, and the legislative acts done under such reservation, do not impair the obligation of contracts subsequently made or of charters subsequently granted. All laws which can impair the obligation of contracts must apply either to the very terms of the agreements, or to the remedy by which they may be enforced. With the first class there is no difficulty. They are so plainly prohibited that, with two notable exceptions, they have seldom been enacted. These exceptions are statutes providing for the discharge of insolvent debtors and those repealing or altering private charters. Insolvent laws cannot operate upon past contracts, but may be valid in respect to those made subsequent to their passage. Nothing additional need be said concerning the repeal or modification of charters. The exercise by a State of its functions of taxation, eminent domain, or police, although contracts may be indirectly affected thereby, does not fall within the constitutional guaranty, since all private rights of property are held subject to these powers. In relation to the second class of laws the following fundamental principles are now settled: Statutes which deal simply with the modes of procedure whereby the real remedy is obtained do not affect the obligation. Statutes which act upon the remedy itself—the relief given by the law when the contract was made—and take away, diminish, or render it of substantially less value, do impair the obligation; but they are valid so far as they apply to contracts made after their passage. Among such laws the most important and common are those staying execution or judgment; those requiring property to be sold on execution at an appraised value or to be accepted by the creditor at such valuation; those exempting the debtor's property from liability; those authorizing the judgment-debtor to redeem his property; statutes of limitation which do not leave a reasonable time within which to sue, and the like. These various classes of statutes, passed in aid of debtors, have been sustained by many State courts, but the principles established by the U. S. Supreme Court plainly and inevitably condemn them all so far as they purport to operate retrospectively upon existing agreements. How far the power of a State legislature extends, under the usual reservation of authority over charters, has not been fully determined. A State cannot, under color of such a reservation, impair the validity of all contracts, and thus completely evade the inhibition, nor can it abrogate agreements made between private persons and corporations, even though the latter are municipal. The franchises conferred upon a private corporation may be revoked or changed, but how much further a legislature may proceed by virtue of its reserved power of repeal and amendment remains to be determined by the highest court of the nation. JOHN NORTON POMEROY.

Oblique′. In music, the motion or onward progress is said to be "oblique" when one of the parts ascends or descends, while another part, with which it is compared, remains stationary.

O′boe, or **Hautboy** [Fr. *hautbois*], a musical wind-instrument of an elongated conical form and with a high piercing tone, ranging from C below the treble clef to G, the fourth line above the staff. It was formerly used only in military music, but is now, especially since Weber and Meyerbeer, much used in all compositions for orchestra.

Ob′olus (Eichwald) and **Obolella** (Billings), small discoidal shells of the family Lingulidæ amongst the Brachiopoda, so named from their resemblance in form to a small Greek coin. Several species of the former occur in both Upper and Lower Silurian rocks, but the latter has only been found in the Potsdam sandstone at the base of the series. EDWARD C. H. DAY.

Obolus [Gr. ὀβολός, fr. ὀβελός, a "spit"], a Greek coin, first made of iron and copper in the form of the head of a spit, but afterwards struck of silver and in the ordinary round shape. The obolus was one-sixth of a drachm, and in value equal to 1⅝*d*.

Obooki′ah (HENRY), b. in Hawaii in 1792; came on a merchant vessel to New Haven, Conn., 1809; was placed in an academy; educated for the ministry; translated the book of Genesis into Hawaiian, and d. at Cornwall, Conn., Feb. 17, 1818. He was the cause of the establishment of American missions in the Sandwich Islands.

Oboyan′, town of Russia, government of Koorsk, on the Pola, has a considerable trade in corn, cattle, wax, bristles, and hemp. Pop. 5000.

O'Brien (FITZ-JAMES), b. in Ireland in 1829; came to the U. S. in 1850; became a journalist and writer for magazines; contributed some brilliant sketches and poems to the *Atlantic Monthly*; volunteered into the New York 7th Vols. Apr., 1861; became a member of Gen. Lander's staff; displayed intelligence and courage as a soldier; was wounded in a skirmish Feb. 16, and d. in Virginia Apr. 6, 1862, from lockjaw resulting from a surgical operation.

O'Brien (Capt. JEREMIAH), b. at Cork, Ireland, 1740; settled at Machias, Me., before the Revolution, and was the leader of the party which captured the British armed schooner Margaretta in Machias Bay, May 11, 1775, the the first act of hostility by sea during the war. He received a commission as captain of privateers, and took several British vessels; was captured and confined a year in England; afterwards collector at Machias, where he d. Oct. 5, 1818.

O'Brien (LUCIUS RICHARD), b. at the family residence on Lake Simcoe, Ontario, Canada, in 1832, was educated in Upper Canada College, Toronto, studied the art of painting and became a large contributor to the exhibitions, took an active part in the founding of the art-school of the Ontario Society of Artists in 1872, and when the Royal Canadian Academy of Art was founded, in 1880, he was elected its president. He is the editor of *Picturesque Canada*.

O'Brien (WILLIAM SMITH), b. at Dromeland, county Clare, Ireland, Oct. 17, 1803, son of a baronet of ancient lineage; educated at Harrow and at Trinity College, Cambridge; entered Parliament for the borough of Ennis 1826. Though at first a Tory and warm opponent of O'Connell, he was returned in 1832 as an advanced Liberal for the county Limerick, which he represented thirteen years; was active in support of Catholic emancipation, and became a prominent leader in the agitation for the repeal of the legislative union between Great Britain and Ireland. Confined for a few days in May, 1846, for refusing to serve on committees of the House of Commons, he became identified with the revolutionary party in Ireland, where it was proposed to establish a republic; went to Paris Apr., 1848, as a representative of the Irish Confederation to solicit aid from the French republic; aided in convoking an Irish national convention (May), which was not allowed to meet; was tried for sedition in the same month, but acquitted; attempted a rising among the peasantry at Mullinahone, in the S. of Ireland, July, but was compelled to flee; was captured at Thurles Aug. 5; tried and convicted by a special commission at Clonmel, with T. F. Meagher and MacManus, on a charge of high treason (Oct. 9); sentenced to be hanged, drawn, and quartered; was transported for life to Tasmania July, 1849; faithfully observed a promise not to try to escape; was pardoned 1856; travelled in the U. S. 1859; published a manifesto to the Irish in America in favor of the seceding States 1861, and d. at Bangor, North Wales, June 17, 1864.

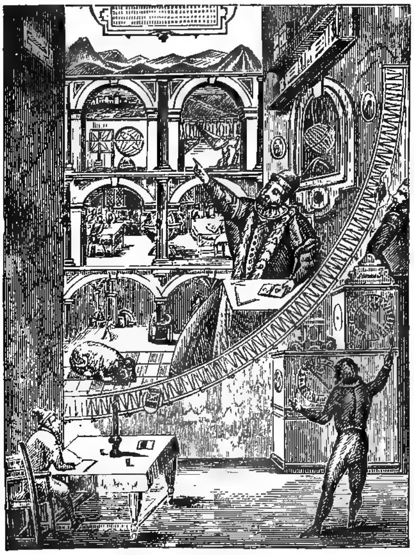
Obsequies. See FUNERALS.

Observan′tine Friars and Nuns [*Fratres strictioris observantiæ*]. The primitive rule of St. Francis, like that of many other orders of monastics, having been modified by various popes on account of the extreme severity of its discipline, there arose within the order a new party desirous of returning to the austere rule of former days.

Certain followers of the severe rule in 1368, under Paoletto di Foligno, were organized as a separate congregation, called "Brethren of the Stricter Observance," or Observantines; these are now, as they have long been, far more numerous and influential than the Conventuals, or followers of the mitigated rule. The Capuchins and other congregations follow a still severer rule, and are called "Brethren of the Strictest Observance."

Observ′atory [Lat. *observare*], **Astronomical.** By observation, in the scientific or otherwise philosophical sense, is to be understood an attentive and scrupulous notice of phenomena; and an observatory is a place fitted for making such observations. As astronomy is the oldest of the physical sciences, so astronomical observations in some form have been early in use, previously even to the device or the arrangement of any special place for making them. Among the simple instruments first employed was the gnomon—*i. e.* a perpendicular post of some determinate height, by the measurement of which, and of the length of its shadow, the sun's angular distance from the zenith was determined. Observations of some sort, and even some sort of observatories, would seem to have been early in use in China. The great Egyptian pyramids are, as is well known, so placed that the outlines of their bases mark the four cardinal points, N. and S., E. and W.; and of nine of these pyramids still existing at Gizeh, the six largest have the narrow passages by which alone they can be entered opening in their northern sides, and inclined downward at nearly the same angle in every case. From the mean of the measurements of Col. Vyse it results that this angle is 26° 47′, "and of the two pyramids of Abousseir also, which alone exist in a state of sufficient preservation to admit of the inclination of their entrance passages being determined, one has the angle 27° S., the other 26°." At the bottom of every one of these passages, therefore, the *then* pole-star must have been visible at its lower culmination—a circumstance which can hardly be supposed to have been unintentional, and was doubtless connected (perhaps superstitiously) with the astronomical observation of that star, of whose proximity to the pole at the epoch of the erection of these wonderful structures we are thus furnished with a monumental record of the most imperishable nature." (Sir J. Herschel, *Outlines of Astronomy* (319 and 320).) The star here spoken of is α Draconis, which at the epoch of the erection of the Great Pyramid must have had at its lower culmination an altitude not far from 26° 16′.

FIG. 1.



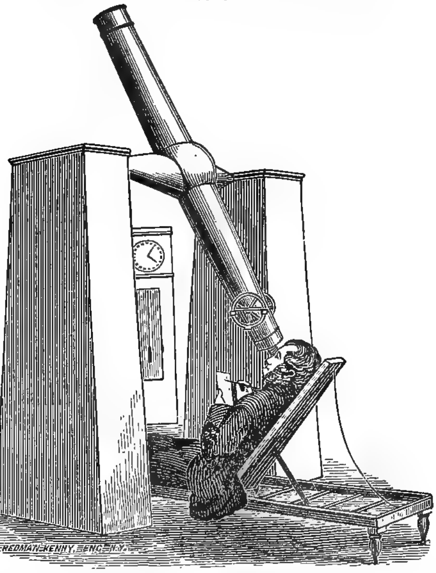
Tycho's Observatory.

After the death of Alexander the Great, Egypt, in the division of his empire, fell to the lot of Ptolemy Soter, himself an eminent patron of science. His son, Ptolemy Philadelphus, presented to the scientific men of Greece, who flocked to his kingdom, a vast edifice located at Alexandria which contained an *observatory*, and also the famous library collected, with great care and expense, by Demetrius of Phaleria. Thus was founded the Alexandrian school. Its first observers were Aristillus and Timocharis, about 300 years before the Christian era. Their observations were 150 years afterward made use of by Hipparchus in his determination of the precession of the equinoxes. These astronomers were succeeded by Aristarchus of Samos (about 281 B. C.), and he again by Hipparchus of Bithynia (about 150 B. C.), as already intimated, who would have been a man distinguished in any age. He, if any one, is regarded as the father of the veritable science of astronomy. After Hipparchus in the Alexandrian school came Ptolemy, who, in his great work, the Μεγάλη Σύνταξις—styled by the Arabs *Almagest*—has collected and discussed what seemed to him valuable in the acquisitions of his predecessors, in so far as he could attain unto them. Our space admits of but a bare mention of the ancient observatories of the Arabs and others—viz. two at Cairo; one at Bagdad; that at Meragha, under the charge of Nazir-ed-Deen; and that of Olug Beg at Samarcand.

After the revival of letters in Europe the first regular observatory, according to Weidler, was that erected by William, landgrave of Hesse, at Cassel in 1561. Under the patronage of Frederick III., king of Denmark, Tycho Brahe constructed and maintained his observatory at Uranienborg, on the island of Hveen, in the Baltic, near Copenhagen. Tycho commenced his observations there in 1582, and he continued them in the same place till 1593. Driven thence by official jealousy and interference, he afterward formed the acquaintance of Kepler, to whom he furnished the valuable observations afterward made use of by Kepler in the discovery of his famous three laws. Tycho died in 1601. The instruments which he employed were of vast size, and they were subdivided with more care than had heretofore been usual. (Tycho's observatory is represented in Fig. 1.) It was in Denmark also that was established the earliest *national* observatory of modern Europe—viz. the observatory of Copenhagen, which was commenced in 1637, though it was not completed till 1656. The first astronomer appointed to the directorship of the observatory was Longomontanus, himself the pupil of Tycho Brahe.

The telescope was invented in 1609, and in 1640 Gascoigne applied the telescope to the quadrant and the micrometer to the telescope. The Royal Observatory of Paris was constructed in 1667–71. The Greenwich Royal Observatory was established in 1675, and it began its operations in 1676. The Tusculan Observatory in Copenhagen was built in 1704 for Römer, the discoverer of the velocity of light. Peter the Great caused an observatory to be constructed at his capital in 1725; the observatory at Dorpat was in active operation in 1811; and in 1839 the observatory at Pulkowa, near St. Petersburg, was erected by the order of the emperor Nicholas. The observatory at Königsberg dates about 1813, and that at Berlin about 1834. The observatory at the Cape of Good Hope was in existence in 1821. Not to mention others here, the Royal Observatory of Edinburgh was in use about 1825; the observatory at Sydney (formerly at Paramatta) in Australia dates from 1820; the U. S. Naval Observatory dates from 1842. (Extensive lists of public and private observatories, with their geographical positions, are annually published in the English *Nautical Almanac* and in the American *Ephemeris and Nautical Almanac*.)

FIG. 2.


REDMAN-KENNY, ENG. N.Y.

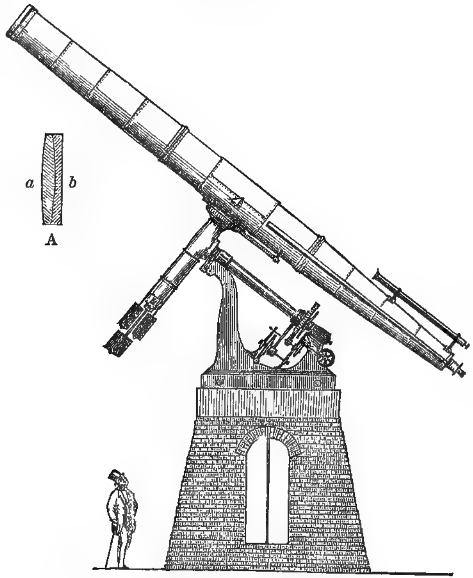
The Transit Instrument.

Among the most useful instruments employed in the modern observatory are the transit instrument, the equatorial, and, as timekeepers, the clock keeping sidereal and that keeping mean solar time. (For distinction of solar and sidereal time see article MOON.) The transit instrument is so constructed and mounted as to move accurately in the plane of the meridian. It is furnished with several levels and a circle for measuring altitudes. The front of the eyepiece of the telescope is a reticule—*i. e.* an arrangement of actual spider's-lines, or else of very fine wires or tubes (see MICROMETER), of which, commonly, at least five are vertical and one horizontal, the vertical lines or wires being placed symmetrically, so that one of every corresponding pair of them is at the same distance on the one side of the middle one that the other is on the other. The middle one of the five is adjusted to be and to move in the plane of the meridian; and the apparent transit of a heavenly body taking place, as respects the vertical pairs, at one is as much earlier as at the other it is later than the middle time, the mean of all the five times of transit should coincide with that of the middle spider-line or wire. The position of an observer while taking observation of a transit is shown in Fig. 2.

The practice of observing transits across five vertical wires was first introduced by Dr. Maskelyne, the English astronomer-royal at Greenwich, who was also the first to note transits to tenths of a second. When the altitude circle of the transit instrument is greatly enlarged, it is then known as a meridional or transit circle. Among the finest examples of this are those in the Royal Observatory at Greenwich, that in the U. S. Naval Observatory at Washington, and that in the Dudley Observatory at Albany, N. Y.

In the equatorial instrument the telescope is mounted on an axis pointing to the pole of the heavens, and in its rotation around that axis the telescope thus mounted will mark out and follow the apparent diurnal course of a heavenly body in the equinoctial (*i. e.* the great celestial equator) or a parallel to the same. Fig. 3, here inserted, is a representation of the great equatorial at Washington, the telescope of which has an aperture of 26 inches, and a focal distance of object-glass of 33 feet. The equatorial instrument at Chicago, Ill., has an aperture of 18 inches; and that of the observatory at Cambridge, U. S., has an aperture of 14.95 inches, and a solar focus of 22 feet 6 inches. The equatorial instrument, like other instruments employed in careful measurements, is armed with a micrometer, which, as its name implies, is an instrument for the measurement of small quantities—of small angular quantities when it is used for astronomical purposes. With the micrometer the angular distance of any planetary body from a neighboring fixed star of ascertained position is determined.

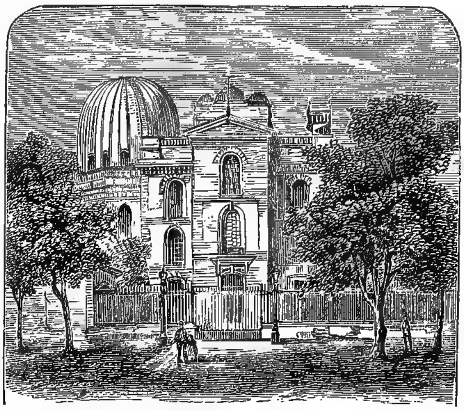
FIG. 3.



The Washington Telescope: A, section of objective; *a*, front of telescope, crown glass; *b*, flint.

For the more accurate observation of transits or other observations of a like kind, it is now not unusual to connect with the timekeeper an apparatus for alternately joining and breaking the circuit of an electro-magnet, and thus marking every alternate second on a paper band which is unwound at a uniform rate. Then the precise moment of a transit is indicated on the same band of paper by a breaking of the circuit, by means of a key under the control of the observer. This arrangement permits the second-spaces on its record to be subdivided into 100 parts, and thus observations noted to hundredths of second. And, in addition to this, the arrangement admits of a largely increased number of the parallel wires in the telescope, as was indicated by the late Sears C. Walker. This method of observation is known as the American method, it having been first introduced under the superintendence of, and in connection with, the American Coast Survey arrangements. The first attachment to a clock-pendulum for forming and breaking circuit was that devised by the late John Locke, for which he was rewarded by Congress.

FIG. 4.



Observatoire National, Paris.

Of all the various astronomical observatories, national or otherwise, that at Greenwich, as it is one of the oldest, is also one of the most, if not *the* most, memorable. The observations of its astronomer-royal, Bradley (1750–62), furnished Bessel with the material which he made use of in the determination of his *Fundamenta Astronomiæ pro anno 1755, deducta ex observationibus viri incomparibilis, James Bradley in specula Grenovicensi per annos 1750–62, institutis.* (Bradley is the well-known discoverer of aberration and nutation.) For more than half a century Dr. Maskelyne was astronomer-royal at Greenwich. His observations were mainly those of the sun, moon, and planets, and a select number of stars. When the French astronomers issued new tables of the sun and moon, a number of copies were sent to Dr. Maskelyne, who in the note of presentation was characterized as being the author of the most precious collection of observations then existing. Dr. Maskelyne died in 1811. The present astronomer-royal, Sir George B. Airy, has introduced into the observatory a practice which he began when astronomer at Cambridge—viz. that of reducing all observations as soon as they were made. Upon his recommendation the lords commissioners of the admiralty defrayed the expenses of reducing all the observations of the moon and planets made at Greenwich from 1750 to 1830. Quite recently, M. Leverrier, in his communication to the French Academy on a comparison of the theory of Saturn with observations, makes the statement that the tabular comparison which he gives is entirely based upon the Greenwich observations, the only observatory at which a series is found extending without interruption for 120 years—from 1751 to 1869.

Our limits do not permit us to speak particularly of the labors of Struve at Dorpat, of Bessel at Königsberg, and those of other astronomers. But mention should at least be made of the observations of Sir William Herschel at his own observatory at Slough, where he discovered the planet Uranus in 1781, and of his extended observations of planets, their satellites, the binary stars, and nebulæ, as also of the labors of his even more distinguished son at his station for eight years at the Cape of Good Hope, the results of which appear in his volume of *Cape Observations.* The observations of the late earl of Rosse at his observatory (now located at Birr Castle, Ireland) with his great reflector—viz. observations of clusters and nebulæ—deserve more than a passing notice. On the night of Sept. 19, 1848, an eighth satellite of Saturn was detected simultaneously (within the same hour) by Mr. William C. Bond at the Cambridge (U. S.) Observatory and Messrs. Dawes and Lassell, observing together, in Mr. Lassell's observatory at Starfield, Eng.; and at the Cambridge (U. S.) Observatory Nov. 11, 1850, Prof. George P. Bond discovered the dusky ring of Saturn. The planet Neptune was discovered at the National Observatory at Berlin by M. Galle, Sept. 23, 1846.

The U. S. Naval Observatory at Washington has always shown great activity, and the results of its labors are not only to be learned from its published observations, but also from the publications with which it has enriched the volumes of the *Smithsonian Contributions to Knowledge.* The observatories at Hamilton College, Clinton, N. Y., and that at the University of Michigan at Ann Arbor, have become noted for the discovery of minor planets, through Prof. Peters as the observer at Clinton, and Prof. Watson at Ann Arbor. S. ALEXANDER.

Observatory, Meteorological. The usefulness of automatic meteorological instruments cannot be overestimated, since it is only from the study of continuous and minute changes that the meteorologist can ever hope to discover the laws appertaining to the ever-changing phenomena of the atmosphere. A meteorological observatory, fully equipped, should be provided with instruments capable of registering the following: Pressure; temperature; moisture; direction of the wind; velocity of the wind; rainfall; evaporation. Automatic mechanism for the registration of the direction and the velocity of the wind and the fall of rain has long been in successful operation, since in all of these cases there is sufficient *mechanical* force to operate mechanism without introducing a serious error in the results. But the automatic registration of pressure and temperature is a more difficult problem, and it is only within a recent period that meteorologists have succeeded in devising methods and mechanism of sufficient delicacy to meet the demands of modern science.

Methods.—The methods of registration employed by meteorologists may be divided into four general classes: (1) Records made mechanically by force derived directly from the changing medium; (2) Continuous records made photographically on a moving sheet of paper; (3) Discontinuous records made at stated intervals by means of electro-magnetism; (4) Continuous records similarly made, together with results printed in ordinary numbers at definite intervals. For the mechanical registration of the barometer numerous devices have been contrived. In case a siphon is employed, the recording pencil is moved by means of a float resting on the surface of the mercury in the open leg, and made to press against the paper at definite intervals. All instruments of this class are simply modifications of the wheel barometer. Since the record on the recording sheet has a scale several times greater than the fluctuation of the column, the *mechanical* force controlling the pencil is less than five grains for a change of pressure of one-hundredth of an inch in a tube of one inch. Hence, owing to the friction and inertia of the float-mechanism, such machines can only give approximate results. In case a cistern barometer is employed, the tube is suspended on a lever, with the lower end resting in a fixed cistern of mercury. As the pressure varies, the lever on which the tube is balanced changes its inclination, and by attaching a registering pencil the fluctuations are recorded on a moving cylinder. The same objection as in the preceding case is applicable to this form of apparatus, since the registering point is urged forward by the weight of a section of the fluctuating column corresponding to the change to be recorded. In this case, however, the mechanical force is double that for a siphon of the same area, but the inertia is increased a hundred fold. The mechanical registration of temperature has been accomplished by the use of a metallic thermometer, consisting of a combination of brass and steel rods, a spiral composed of two metals, or a single wire of considerable length. Records from metallic thermometers, however, are of but little scientific value, since it is nearly impossible to maintain a fixed zero of reference.

Photographic Registration.—The registration of the barometer and wet and dry thermometers has been accomplished with sufficient precision by means of photography; but owing to the great labor and expense requisite for securing the records and measuring up the photograph sheets, it may readily be imagined that this method can never be generally adopted by meteorologists.

Meteorograph of G. W. Hough.—The method of registration at definite intervals by means of electro-magnetism was first proposed by Wheatstone, but was never put in practical operation by him. It has been applied, however, in various ways by meteorologists to the registration of nearly all atmospheric phenomena. The following diagram (Fig. 1) exhibits the method of Prof. G. W. Hough of Albany for registering the barometer and thermometer on a single sheet. D is a revolving drum, six inches in diameter and seven inches in height, covered with a sheet of ruled paper; L is an iron bar, 24 inches in length, mounted on an axis, passing through the point *c*; P is a steel pen attached to the end of the lever, projecting over the centre of the drum; P′ and P″ are platinum wires attached to the lever 3 inches on either side of the axis *c*; P′ is over the shorter leg of a siphon barometer, and P″ passes into the end of an open mercury thermometer. Now, if L be elevated at the end P, the wire P′ will touch the top of a float in the shorter leg of the siphon barometer. If, then, a battery B and electro-magnet E be arranged as in the diagram, when contact is made with the float the circuit will be closed, and E will operate. At this moment a blow struck on the pen P by a hammer unlocked by E will indicate the height of the barometer. When the lever L is depressed till P″ touches the surface of the mercury in the thermometer, the circuit will be again established, and the pen P will record the thermometric height. The thermometric record cannot be as accurate as that of the barometer, since the magnetic circle is not so certainly completed when platinum touches fluid mercury as when it touches polished platinum. However, in a thermometric scale of two or three inches for 100° F., the error will ordinarily be only a small fraction of one degree. The diagram above represents a meteorograph constructed for the U. S. Signal Service, which registers hourly the barometer and wet and dry bulb thermometers.

FIG. 1.

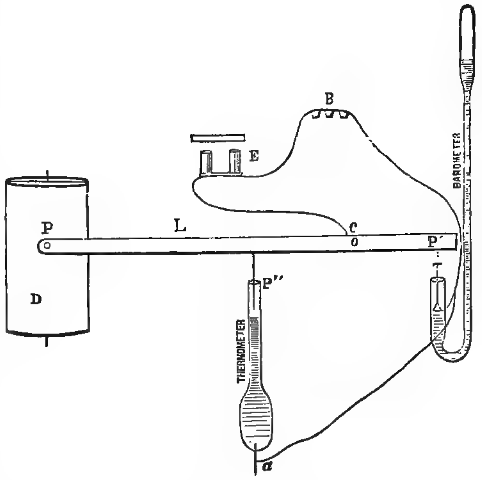
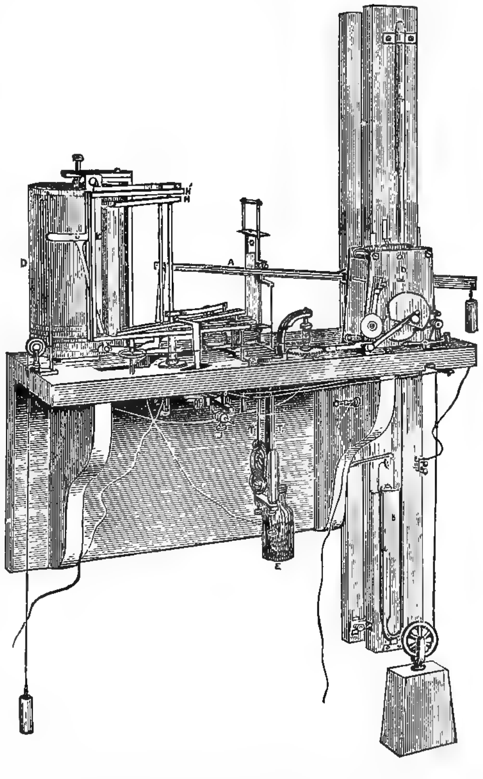


FIG. 2.



The ingenious meteorograph constructed by Father Secchi of Rome records on ruled sheets of paper the indications of the following instruments: On one sheet the barometer, thermometer, direction and velocity of the wind, and the time and duration of rain; on another the barometer, wet and dry thermometers, and the quantity of rain. Besides the records on the sheets, the total wind, as well as the total for different directions, is indicated by dials. The whole apparatus is about 8 feet high, 3 feet wide, and 6 feet in length at the base. The barometer is a steel tube of large cross-section, contracted in the middle portion, and suspended on a lever arm over a fixed cistern of mercury. A pencil connected with the arm is continually pressed against the moving sheet and traces the fluctuations of the column. The thermometer is a brass or composition rod about 0.2 inch in diameter and 60 feet in length, attached at one end to the outside of the building and at the other to a bent lever, and extended by means of a heavy weight suspended from an arm of the lever. By suitable mechanism the changes in the length of the rod are transmitted to a pencil pressing on the sheet and tracing the fluctuations of the temperature. The psychrometer consists of two mercury thermometers of the same dimensions, open at the top. A sliding bar holding two platinum wires, which enter the open ends of the tubes, is attached, by means of a fine brass wire, to a carriage carrying a recording electro-magnet. Every fifteen minutes the clock gives motion to the carriage sufficient to cause the platinum wires to descend from the top to the bottom of the tubes and return. So soon as the wire touches the mercury in the dry thermometer, the circuit is closed and a pencil begins to trace a line on the sheet, which continues until the second wire touches the mercury in the wet thermometer, when the circuit is opened by causing it to pass through a relay magnet, thereby interrupting the record of the pencil. The length of the line, therefore, will indicate the difference between the wet and dry thermometers. The time of the beginning of rain is shown by causing the circuit through a recording magnet to be closed and broken by the revolution of a small water-wheel placed under the eaves of the building, while the total amount of water is measured and recorded by receiving it in a cylindrical vessel, in which is inserted a float in connection with the recording pencil. The direction of the wind is shown by the markings of four electro-magnets placed side by side, indicating respectively N., S., E., W. The frequency of the markings made by any two of the magnets indicates approximately the true direction. The velocity of the wind is shown on the sheet by the distance traversed hourly by a recording pencil in magnetic connection with Robinson's anemometer. A seconds pendulum clock of large dimensions, including a striking train, gives motion to the recording tables and psychrometer carriage. The electro-magnets are operated by 60 cells of the sulphate of copper (sand) battery.

Prof. Hough has also devised a variety of meteorological instruments designed to print periodically, in common type, records of the barometer, the thermometer, the anemometer, and the evaporator and rain-gauge. Descriptions of these varieties of apparatus may be found in full in the publications of Dudley Observatory at Albany. The printing barometer gives hourly the barometric pressure to a thousandth of an inch. It gives also a record of the total disturbance or fluctuation of the column for two entire days and for each hour successively, and curves of pressure, showing the changes in the height of the column continuously. The printing thermometer prints hourly the thermometric record to the tenth of a degree F., and gives also a continuous curve of temperature. The evaporator gives hourly the height of the water in the evaporating vessel, and indicates changes to one thousandth of an inch in its height. The anemograph gives the direction and the velocity of the wind for every hour. Besides these recording meteorological instruments, others have been devised by Mr. Hipp of Neufchatel, Switzerland; Mr. Gros-Claude of Geneva; Messrs. Hasler and Escher of Berne, Switzerland; J. Salleron of Paris; Prof. Wild of Berne; Dr. J. Gibbon of the U. S., and many others. These inventors have generally confined themselves to particular instruments, the barometer, thermometer, or the wind-gauge, but some have combined several instruments in the same apparatus.

George W. Hough.

Obsid'ian [Gr. ὀψιανός], a volcanic rock belonging to the trachyte group, and composed of alumina and 80 per cent. of silica. When pure it is a perfect volcanic glass of dark color, and in this form is much used by savage races for the manufacture of stone implements; it also occurs porphyritic from an admixture of crystals of minerals. When the same kind of lava from which obsidian is formed becomes very vesicular, it gives rise to *pumice*.

Edward C. H. Day.

Obstet'rics, Obstet'ricy, or **Tocol'ogy** [Lat. *ars obstetricia, ob* and *stare*, to "stand before;" Gr. Μαιεία; Fr. *art des accouchements, science obstétricale;* Ger. *Geburtshülfe, Entbindungskunst*], the branch of medical science embracing the knowledge of the processes accompanying the reproduction of the human species, the assistance to be rendered the mother before, during, and after labor, both natural and irregular, and the care to be taken of the child during the first weeks of its life; also called **Midwifery** [Sax. *mid*, "with," and *wif*, "wife"], particularly in Great Britain. Although nature has adapted woman to bring forth children without any other assistance than that afforded her by her own inherent powers, still, from the very earliest ages, it has been found agreeable and beneficial to a woman in labor to offer her sundry more or less important services in her hour of need, by which present discomforts might in a measure be removed or possible future accidents averted. The earliest records which we find of such assistance show it to have been rendered exclusively by women. Thus, the Jews employed women, called *mejelledeth;* the Greeks first made use of old female nurses, who lived in the house and took care of the children. These nurses were called *mæa* (grandmother, nurse), and subsequently, when their practice rose to the dignity of a profession, they were known as *mæeutriæ.* A special tutelary divinity (Eileithypia or Arthemis) protected the art. These women appear, however, to have been unlucky in their practice, for at an early period a law was passed in Athens prohibiting women from practising physic in any of its branches. As early as the time of Hippocrates (about 400 B. C.) we therefore find men (*mæeutai, mæeuteres*) called in as assistants in difficult cases; and somewhat later, Herophilus is mentioned as a teacher of obstetrics at Athens. In the writings attributed to Hippocrates is found the first evidence of scientific research into and rational understanding of the phenomena of childbirth. Among the Romans, women (*obstetrices*) likewise assisted in confinements; but the emperor Augustus is reported to have called the physician Antonius Musa to attend the empress Livia in a difficult labor, and this precedent has been followed in many countries even to the present time. At the time of Pliny the royal law (*lex regia*) already provided for the performance of Cæsarean section after the death of women during pregnancy and labor. Celsus and Rufus Ephesus, during the first century of the Christian era, and Galen, Ætius, and Paulus Ægineta some 500 years later, wrote works on obstetrics. During the Middle Ages medical science remained at a stand-still in Europe, but among the Arabs and Persians considerable progress was made in obstetrics, which was practised by women alone, physicians being called in only as consultants. The writings of Rhazes of Bagdad (A. D. 800), Avicenna of Ispahan (A. D. 900), and Abulcasem (A. D. 1100) became celebrated and were generally accepted throughout Europe as well as in the East. Up to the sixteenth century very indefinite ideas had existed as to the shape and capacity of the bony canal (pelvis) through which the child has to pass in order to be born; in 1543 Andrew Vesalius gave the first correct description of the normal pelvis, and 200 years later (1754) Levret in France and Smellie in England (1751) completed the description by stating the exact dimensions of the various diameters of the pelvic cavity. The great surgeon Ambroise Paré (1550) was, however, the first actual exponent of modern scientific obstetrics—"the famous restorer and improver of midwifery," as Smellie aptly calls him. He first recommended turning the child by the feet. His successors Guillemeau, and especially Mauriceau, worthily developed and improved on the teachings of Paré. That most valuable of obstetrical instruments, the forceps, was discovered by an Englishman, Paul Chamberlen, about 1647; it has since been greatly modified and improved. In Germany the first scientific work on obstetrics was published by Eucharius Rösslin in 1513; and in 1690, Justine Siegemund, court-midwife at the electoral court of Brandenburg, became celebrated through her book on midwifery. Although numerous careful observations and studies had been made by Smellie and Ould (1742) in England, who described the manner of the entrance of the child's head into the pelvis, by Levret (1747), Solayrés de Renhac (1771), Baudelocque (1781), Madame Lachapelle (1795) in France, and Boër (1791) and Schmitt (1804) in Germany, Naegele the elder (1819) was the first to give a clear, systematic, and tolerably correct explanation of the mechanism of labor; that is, of the manner of passage of the various parts of the child through the pelvic canal. From him dates, in a great degree, the present elevated condition of obstetrical science; for on the accurate comprehension of this mechanism depends in a large measure the correct appreciation of the means to be employed in abnormal cases. Among the more important improvements in the art and practice of obstetrics during the present century are the following: The use of the ear (auscultation) to detect the presence of a living child in the womb; the perfection of the knowledge of the mechanism of labor; the induction of premature labor; the more frequent use of the forceps and the less frequent employment of craniotomy (perforation of the child's head); the substitution of turning and extraction by the feet for forceps and craniotomy in many cases of pelvic deformity; the employment of chloroform in natural labor. Obstetrical science and practice have long been taught at all medical universities, and in some countries (Austria) physicians are required to take degrees as master or doctor in obstetrics in addition to the ordinary degree of doctor in medicine and surgery. Hospitals for the accommodation of women during the lying-in state—so-called lying-in hospitals—have been instituted in many cities of Europe, and in a less degree in the U. S. They are almost invariably connected with medical schools, and afford excellent opportunities for the study of the obstetrical art. The largest lying-in hospital at present is in Vienna, in which about 10,000 women are confined annually; others are at Paris, Berlin, Dublin, etc. Societies devoted solely to the advancement of the department of obstetrics—obstetrical societies—exist in London, Berlin, Edinburgh, Dublin, New York, Philadelphia, Boston, and other cities. Journals containing only articles on obstetrical topics are published in Germany, France, Great Britain, and the U. S. On the European continent, and to a certain degree in Great Britain, women in labor are attended only by midwives (*sâge-femmes, Hebammen*), who are taught in special schools to perform the minor duties of an obstetrician, such as to separate the child from the mother by tying and dividing the umbilical cord, removing the afterbirth, and caring for the comfort of the mother and the child. Physicians are called in only in difficult cases. In the U. S., however, and among the better classes of Great Britain, the safer plan is followed of entrusting every confinement, whether natural or abnormal, to the care of an educated physician, who is assisted by a competent nurse, and who, in case of need, may be able to foresee and prevent accidents which the superficial and inferior teaching of a midwife would incapacitate her from perceiving or avoiding. At the present time an obstetrician, in the true sense of the word, can no longer be a simple looker-on at a process which Nature is entirely competent to complete herself, or a mere mechanical assistant to that process: he must be a man of scientific education, well endowed with physical and moral power, patience, and determination, thoroughly conversant with the physiology and pathology of the function which he is called upon to superintend. On his wisdom alone often rest the lives of two persons and the happiness of a family; he must be both physician and surgeon, and his intellectual culture and ability must be on a par with the important relation which his department holds to society. Among the men who have become prominent as teachers and writers or as practitioners of obstetrics during the past generation may be mentioned: in the U. S., Dewees, Meigs, Hodge, Eliot (all died within a few years), Barker, Goodell, Thomas, Isaac E. Taylor; in Great Britain, Sir James Simpson (d. 1870), Mathews Duncan, McClintock, Leishman, Churchill, Braxton Hicks, Barnes; in France, Cazeaux, Dubois, Depaul, Pajot; in Germany, Scanzoni, Credé, Martin, Carl Braun, Spiegelberg, Schroeder, and many others.

The study of obstetrics is divided into three chapters: 1, The anatomy of the organs taking part in the process of reproduction in the female; 2, the functions of those organs during reproduction: their physiology; 3, the disorders and diseases affecting these and other organs during the same period: their pathology.

1. *Anatomy.*—In the bony receptacle (pelvis) at the end of the trunk are situated the female generative organs, viz. the two ovaries, containing the female germs or ova; between them the womb or uterus, to which they are attached; on either side also the two Fallopian tubes, opening into the uterus; finally, the vagina or passage leading from the mouth of the womb to the external organs. The breasts, although coming into function only after the birth of the child, are generally included in this list.

2. *Physiology.*—The functions of these organs are menstruation, conception, gestation or pregnancy, labor or parturition, and lactation. They are limited to a certain period of life, generally beginning with the twelfth to the fifteenth year and continuing till the forty-fifth or forty-eighth year. The youngest authentic case of parturition on record occurred at the age of nine years, the oldest at fifty-four years. Menstruation and reproduction are generally coincident, although cases are reported in which repeated impregnation took place without menstruation having ever occurred. Conception having taken place, the impregnated ovum passes through one of the Fallopian tubes to the uterus, where it becomes attached and grows and develops (its nourishment being derived from the mother through a convolution of vessels called the afterbirth or placenta, from which a cord of vessels, the umbilical cord, runs to the abdomen of the child), until at the end of a period varying from 275 to 280 days it is ready to be expelled by the contractions of the powerful muscular fibres of the womb (labor-pains). In occasional rare cases the term of pregnancy may be prolonged to 300 or 306 days; but most statements of this kind by women are not reliable and usually depend on errors of reckoning. The signs of pregnancy are manifold. The chief symptoms are: Cessation of the menses, nausea, particularly in the morning, enlargement of the abdomen and the breasts, discoloration of the space around the nipple; later, the movement of the child (or fœtus) and the pulsations of the child's heart, audible only to a practised ear applied to the abdomen. A physical examination of the abdomen and genital organs will at all times reveal the state of affairs; still, only in exceptional cases is it possible to decide upon the existence of pregnancy before the beginning of the third month. Enlargement of the abdomen from dropsy, ovarian and other tumors, may simulate pregnancy. The part of the child presenting itself at the mouth of the womb during pregnancy or labor is called the presentation. During pregnancy the child frequently changes its position voluntarily; during labor, however, the part originally presenting generally remains. The most frequent position of the child in the womb is the longitudinal, corresponding with the long axis of the mother, and by far the most common presentation is that of the head (96 in 100), generally the crown or vertex, seldom the face (1 in 200); much less frequent is the presentation of the other extremity of the child, the breech or feet (3 in 100). A transverse presentation, when the long axis of the child crosses the long axis of the mother, is met with about once in 200 labors, and always requires artificial rectification. Labor or parturition is the act of delivery of the fœtus and its appendages (the placenta and the membranes enclosing the child) through the natural passages. It may be divided into three stages: 1. From the first pains till the complete dilatation of the mouth of the womb; 2. The birth of the child; 3. The expulsion of the afterbirth and membranes. *First stage.*—At the end of pregnancy labor is ushered in by so-called premonitory pains, resulting from the commencing contractions of the womb and lasting an indefinite time, several hours or days. A mucous, slightly bloody discharge accompanies these pains, which gradually become more severe; the mouth of the womb becomes fully dilated, and the bag of waters (in which the child floats) is protruded. *Second stage.*—The bag ruptures, the waters are discharged, the pains become still more severe, the presenting part of the child passes through the pelvic canal, always adapting its longest diameter to the longest one of the pelvic cavity, and is expelled through the external orifice, being rapidly followed by the remainder of the child's body. The *third stage* comprises the delivery of the placenta and membranes, which generally takes place within thirty minutes. The average duration of labor in first confinements is twelve hours, although eighteen to twenty-four hours would not be considered abnormal; women who have had children are generally delivered more rapidly, within six or eight hours. After labor the lying-in state commences, during which the function of lactation is inaugurated, and the womb gradually returns to its natural size and configuration before conception, which latter event ordinarily takes place within six weeks. The child, having been separated from its connection with the mother by the ligation and division of the umbilical cord, is washed, dressed, and applied to the breast as soon as the mother has recovered from her exertions. By an early application of the child the febrile excitement known as "milk-fever," ordinarily occurring on the third or fourth day, with the flow of milk into the breasts, is in a great measure avoided. The period which a woman after labor is confined to her bed varies in different countries: while in civilized communities seven to ten days is considered the proper time, in the East and among savage races the mother resumes her daily avocations immediately after delivery, and among the lower classes in Europe and this country puerperal women very frequently leave their beds on the third or fourth day without evil consequences.

Pathology.—Pregnancy does not always last the stated time of 280 days, but is often interrupted at an earlier period, either by causes depending on disease of the mother or of the fœtus and its appendages, or by accident or intention. Such interruptions may occur at any time, and during the first six months are called abortion or miscarriage, during the last three premature delivery. A fœtus born before the twenty-eighth week is ordinarily not viable, although several instances have occurred in which children born as early as the twenty-sixth week were by extraordinary care raised to maturity. The danger to the life of the mother from abortion may at times be great, either from uncontrollable loss of blood or from inflammation of the uterus or bowels (peritonitis). This is particularly liable to be the case when the abortion has been forcibly induced, as by sudden shock or with a criminal purpose. Tardieu relates thirty-four cases of criminal abortion, in which the death of the mother resulted in twenty-two. The danger is greatest during the third, fourth, and fifth months; during the first two months the impregnated ovum often escapes almost unperceived. A common cause of abortion is disease of the placenta. The physiological discomforts of pregnancy, such as nausea, neuralgic pains, constipation, may occasionally become so aggravated as to be actual sources of danger, and the pregnant woman is liable to dropsy, hemorrhoids, congestion of the kidneys, and numerous other complaints. Occasionally the impregnated ovum does not pass into the uterus, but becomes attached in the Fallopian tube or drops into the abdominal cavity and develops there. This condition is called extrauterine pregnancy (tubal or abdominal), and generally ends fatally about the third or fourth month by rupture of the tube or peritonitis. In rare cases the child has been retained until term and removed by operation alive or dead, or it has died and been discharged piecemeal through the bowel, vagina, etc.

Labor is either natural or preternatural—natural when nothing occurs to mar the progress of the unaided birth of the child and appendages, preternatural when the assistance of art, either manual or instrumental, is required. The causes of preternatural labor may lie either in the mother or the child. *The mother.*—Deformities of the pelvis or of the soft genital organs, rupture of the uterus, vagina, or the external parts (perineum), flooding (either during labor, when the placenta is situated over the mouth of the womb and is detached during dilatation of that orifice—placenta prævia—or after labor from the open vessels of the normal placental attachment), convulsions, inversion of the uterus. *The child.*—Too large size, monstrosity, abnormal presentation, transverse or oblique (requiring manual or instrumental interference), compression and protrusion of the umbilical cord (dangerous to the life of the child, but not to the mother, and not impeding delivery), too firm attachment of the placenta. The operations which may become necessary during pregnancy or labor are: The induction of abortion, when the preservation of the life of the mother renders it imperatively necessary that the pregnancy be interrupted, and of premature delivery, when the birth of a fully-developed child at term is impossible on account of pelvic deformity; Cæsarean section, the removal of the child and appendages through an incision in the abdomen and uterus, in cases where the pelvic deformity is so aggravated as to preclude the natural or instrumental delivery of even a mutilated child by the natural passages; the child is generally born alive, the mother usually succumbs (62 per cent.), but cases are on record in which the operation has been successfully performed on the same woman as often as four times; the extraction of the child with the forceps; version or turning, and manual extraction by the feet, when it is desired to change the position of the child and accomplish rapid delivery; craniotomy, the perforation of the head and removal of the brain of the living or dead child to enable the passage of the diminished head through the contracted pelvis, thus sacrificing the child for the sake of the mother, etc. Of the dangers which assail the woman after delivery the most frequent are sore nipples and inflammation of the breasts—the most dangerous and fatal, childbed or puerperal fever. The latter is an inflammatory, infectious disease, the exact nature of which is still a matter of dispute. The mortality from it is greater than from all other puerperal accidents combined. The general mortality during parturition has decreased during the last thirty years from year to year, in consequence of the improvement in the study and practice of obstetrical science. According to a compilation by Winckel (*Path. and Therap. of the Puerperal State*, 1869) from more than a million labors, it averages about 6 in 1000 cases in private practice, and 30 in 1000 cases in lying-in hospitals, the large mortality in the latter institutions being mainly due to the epidemics of puerperal fever breaking out in them from time to time, the disease being rendered particularly virulent by the generally poor physical condition of the patients and the necessary crowding to which they are more or less subjected. PAUL F. MUNDÉ.

Ocala, R. R. centre, cap. of Marion co., Fla. (see map of Florida, ref. 2-E, for location of county), 5 miles from Silver Spring, has repair-shops and is the centre of the orange belt of the Peninsula. P. in 1870, 600; in 1880, 803.

O'Cal'laghan (EDMUND B.), M. D., LL.D., b. at Mallow, Ireland, about 1804; studied two years at Paris; went to Quebec 1823; was admitted to the practice of medicine 1827; became a member of the provincial assembly cf Lower Canada 1836; editor of the Montreal *Vindicator* 1834–37; figured in the revolutionary movement of 1837, in consequence of which he removed to New York; became a diligent student of the early history of New York, especially of Dutch and French sources; published a valuable *History of New Netherlands* (2 vols., 1846–48), edited the *Documentary History of New York* (4 vols. 4to, 1849–51), *Documents relating to the Colonial History of New York* (11 vols., 1855–61), and numerous other translations from MSS. in foreign languages or reprints of rare historical documents. For some years he was employed in the office of the secretary of state at Albany. D. at New York City May 29, 1880.

Oc'cam (or **Ock'ham**), WILLIAM OF, a Scholastic philosopher, b. at Occam in the county of Surrey, England; d. in Munich, Bavaria, in 1347, at an advanced age. He was educated first at Oxford, and, after he became a Franciscan, in 1319, at Paris under the famous Duns Scotus. He rejected the realism of his master, and became the most eminent of Nominalists. Throughout his life, consistent with the strictest tenets of his order, he strenuously contested the pretensions of the pope to political power and secular possessions, first taking the side of Philip the Fair against Boniface VIII., and subsequently opposing John XXII., by whom he was summoned to trial before an ecclesiastical court at Avignon, whence he took refuge in 1328 with the emperor Louis of Bavaria, just then in the midst of his struggle with the pope. He promised his pen in support of that monarch in return for his own protection ("*Tu me defendas gladio, ego te defendam calamo*"). Toward the close of his life he became desirous of making his peace with the pope, but he never signed the recantation demanded by him. No other scholar since the days of Abelard had applied himself so zealously to logic. His skill in handling logical weapons, his acuteness in making distinctions, his fertility in inventing reasons, gave him the name of *Doctor invincibilis*. His careful discrimination between the logical, real, and grammatical significance of terms enabled him to silence his opponents. The hypostatic entities of the Schoolmen before him were disposed of by his doctrine of the subjective nature of thought. His favorite principle was, "Entia non sunt multiplicanda præter necessitatem." In his *Centilogium Theologicum* the greater part of his hundred demonstrations attempt to prove that theological dogmas, such as the existence, unity, or infinity of God, the Trinity, creation, incarnation, transubstantiation, etc., involve contradiction of logical principles, are irreconcilable with reason, and to be accepted only by faith. This doctrine struck a fatal blow at Scholasticism. That form of philosophy had arisen solely out of the necessity which was felt of proving the rationality of the dogma. If the objects of faith could not be proved by philosophy, nor even reconciled with reason, Scholasticism had no task to fulfil except the negative one of destroying what illusions it had already created. Its decline was rapid. The chief works of Occam are—(*a*) *Tractatus Logices*, (*b*) *Quodlibeta Septem*, (*c*) *Super quatuor libros Sententiarum*, (*d*) *Expositio Aurea super totam Artem Veterum*. Besides these there were commentaries and polemics. WILLIAM T. HARRIS.

Occa'sional Caus'es, Doctrine of, was invented by the Cartesians to explain the action of mind and matter upon each other. Their theory was that God, the First Cause, on the *occasion* of certain volitions within the mind, produces certain actions or motions of the body; since, said they, the soul, a thinking substance, cannot act upon matter, which is pure extension. This doctrine was first fully set forth by Geulincx.

Occipital Bone. See OSTEOLOGY, by PROF. E. D. COPE.

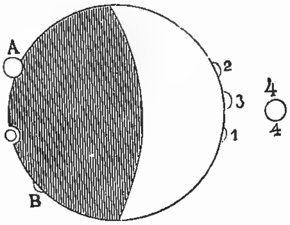
Oc'com, or **Occum** (REV. SAMSON), a celebrated Presbyterian Indian preacher of the Mohegan tribe, b. in New London, Conn.; educated at the Rev. Ebenezer Wheelock's Indian school at Lebanon; in 1766 accompanied Rev. Nathaniel Whitaker, D. D., who was sent on a mission to Scotland, England, and Wales to raise funds for the establishment of schools for the education and christianization of the North American Indians. Being the first preacher of these aboriginal tribes who had visited Great Britain, he created a sensation, and drew large audiences everywhere. He officiated in George Whitefield's chapel in Tottingham Court before an immense audience, and greatly contributed to the success of Dr. Whitaker's mission. The projected school subsequently became Dartmouth College, N. H. After his return to America he continued in the ministry, preaching chiefly to the Indians, until his death, probably in 1792. He wrote an account of the Montauk Indians, published by the Massachusetts Historical Society (1st series, x. 106); and wrote the Hymn, *Awaked by Sinai's Awful Sound.* A. H. STEPHENS.

Occulta′tion [Lat. *occultare,* "to conceal"]. So far as the etymology would indicate, the word occultation might be applied astronomically to designate the concealment of any heavenly body, but usage has confined its application to the eclipse of planets or of fixed stars, the moon being in most cases the eclipsing body. Very rarely a *planet* occults a star; and the occultation of a planet by another planet is almost unexampled in the history of astronomy. Yet Mercury was occulted (or, we might rather say, eclipsed) by Venus May 17, 1737, and we have reports of similar concealments of Mars by Venus Oct. 3, 1590, and of Jupiter by Mars Jan. 9, 1591; but as these were before the invention of the telescope, the supposed eclipses may have been only near appulses. No little interest attaches to the careful observation of occultations, whether of stars or planets, by the moon, inasmuch as from the phenomena presented at the immersion or emersion of the star or the planet some indication may be looked for either of the existence or else of the absence of a lunar atmosphere; *i. e.* of an atmosphere of sufficient density or extent either to refract or to absorb light. With respect to a *diminution of light,* Mr. Ramage of Aberdeen says that "previously to his observation of the occultation of Jupiter, Apr. 5, 1824, there were several occultations of fixed stars of the seventh and smaller magnitudes, which instantly disappeared on coming into contact with the dark limb of the moon; one of them, however, on entering upon the extreme edge of the cusp, very near to the juncture of light and darkness, and on *reappearing twice* from between the tops of lunar acclivities, presented an evident diminution of light." (*Memoirs of the Royal Astronomical Society,* vol. ii. p. 87.) The effect of the glare of moonlight would seem in this instance to have been nearly excluded, so that there is some probability of the diminution of light being real. The telescope employed was a 25-foot reflector. (For occultations of Saturn and Uranus, see the *Memoirs* quoted, vol. vi. p. 187, vol. ii. p. 91; and of five stars, vol. iii. p. 335.)

Next as to the phenomenon of *an apparent projection* of a star or some portion of a planet on the moon's disk (as if between the moon and the earth), or that of *a seeming adhesion* to the disk, at the time of immersion or of emersion. In the third volume of the *Memoirs of the Royal Astronomical Society,* Mr. (afterwards Sir James) South has specified and tabulated a variety of instances of these phenomena. At the close of his statement he remarks that "on referring to this table it will be seen that upwards of twenty stars have from time to time been observed as exhibiting peculiarities at or on the moon's limb prior to immersion behind it or emersion from it; it will be found also that the anomalies are not confined to stars of a certain magnitude or color, nor are they governed by any particular age of the moon." The tabulated arrangement here referred to has been largely extended and classified by Prof. (now Sir George B.) Airy as follows:

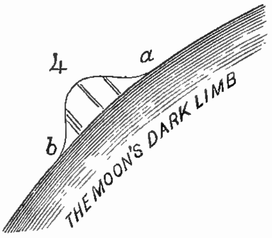
A. Where there is a distinct record of observed projection; B. Where there is a record of hanging on the limb in a form which negatives projection; C. Where there is a distinct record of no projection or hanging; D. Where accounts at the same place or in the same vicinity are contradictory, some being of Class A or B, while others are of Class C (*Memoirs,* vol. xxviii. p. 176). Prof. Airy's list extends to 233 occultations. The following are among very curious instances of projection: At the occultation of Jupiter, already alluded to as observed by Mr. Ramage of Aberdeen, Apr. 5, 1824: "On the approach of Jupiter's satellites no diminution of their light was perceptible. On coming into contact with the moon's limb they did not disappear instantly, like fixed stars, but formed an indentation or notch in the limb, as if imbedded in it, but at the same time *separated from it by a fine line of light.* This indentation continued visible till about half their diameters were immersed, when it disappeared. All the satellites presented this phenomenon, which is represented in the figure" (which is here reproduced with a part of another figure combined), "but the fourth and third with the greatest distinctness. On Jupiter's approach, no difference in his light or shape was perceptible; after the contact had taken place, he appeared to exhibit no deficiency of disk, but, on the contrary, presented a complete figure, as if placed between the moon and earth (see Fig. 1, A): this appearance continued for a few seconds. When nearly altogether immersed, his retiring limb was seen considerably elongated, as if forming a segment of a much larger sphere" (as seen at B). "When Jupiter's satellites are viewed through this reflector" (25-foot reflector), "even with low magnifying powers, they always exhibit planetary disks, and thus allow a short time for observing any phenomena of the above kind; whereas a fixed star, appearing only as a point of light, vanishes instantly on coming in contact with the moon's limb." Observation of the occultation of Jupiter by Capt. (afterward Sir John) Ross: "Capt. Ross, who, from the state of the weather, could not distinguish the immersion, was fortunate enough to observe the emersion, of the planet, which put on the several appearances represented (at 1, 2, 3) in figure." The following is from Mr. Compfield of Northampton, England, describing the occultation of Jupiter (telescopes Newtonian and Gregorian; apertures, between 7, 8, and 9 inches respectively): "The appearance was evidently an elongation of Jupiter when in apparent contact as nearly as I can delineate in this form, which I should not have mentioned had it not been recently affirmed positively that the moon has no atmosphere: *a* and *b,* Fig. 2" (reproduced here), "were evidently adhesions or prolongations of the light of Jupiter at the points of contact; and when nearly disappearing behind the moon, the figure of the section was elongated, so as to deviate greatly from a circular of the same diameter as the planet." These last three accounts of observations are all from the *Memoirs,* vol. ii., pp. 87–89.

FIG. 1.



1, When first seen; 2, A few seconds after; 3, When half the diameter became visible; 4, When wholly seen.

FIG. 2.



In view of these and similar anomalies, E. Neisson, Esq., in his discussion of the limit of a possible lunar atmosphere (*Monthly Notices of the Royal Astronomical Society,* Nov., 1873), says: "There can be no question but that the main circumstance limiting the density of any possible atmosphere is the refraction of the rays of light it would cause. From what we know on the subject, as there can be no doubt but that it must be of comparatively small density, it is evident that we have only to deal with the horizontal refraction, as the refraction must practically vanish for any beyond very low altitudes." Regarding the different values given by the telescopic and occultation determination of the semi-diameter of the moon as affording the process best adapted to detect the horizontal refraction, from an elaborate investigation founded on such data, he concludes that the horizontal refraction of the moon's atmosphere has different values in accordance with the great vicissitudes of temperature to which the moon is subjected and the action of her feeble gravity. (See MOON.) The mean value of Mr. Neisson's results for the horizontal refraction does not differ much from one second. Mr. Neisson, moreover, remarks that "it will also be apparent that for the density of the supposed atmosphere no distortion of a star could possibly occur, and the same applies to the occultation of a planet such as Jupiter or Saturn; the maximum effect would be to increase the size of the planet by about one-thousandth, but in no case to distort it." He makes, moreover, the maximum effect of irradiation to be 0.5″. The very short duration of the effect of the lunar refraction also comes in, and that would render that effect in such a fashion the more difficult to observe. An atmosphere of great rarity, controlled in its extent by a feeble gravity, and often of very low temperature—itself would *therefore* be the more extensive, and its existence under those circumstances be consistent with some absorption of light, such as was observed in the instances of the fixed stars. Along the rough edge of the moon, moreover, the phenomena of diffraction and other effects must take place on an extensive scale, and the *angular* displacement due to them be sensible even at the distance of the earth. The peculiar action thus arising, as to its influence on the light of the body occulted, may be *specific,* arising especially in some peculiarity of the light as it *issues from its source.* Guided by what we know of the changes which may be experimentally made in the exaltation or degradation of luminous vibrations, we may well conceive of this difference at the very origin of the light at the surface of a star, or even also of that which comes from near the border of the sun's disk in *annular or in total eclipses of the sun.* The action in this latter case seems to be analogous to that on the light of the fixed stars or that of the planets, after the manner already specified. Accordingly, the author of this article, in his memoir presented at the hundredth anniversary of the American Philosophical Society in May, 1843, referred what are styled "the Baily beads" to an action similar to that which produces *the projections and adhesions* of stars in occultations, the rounded, bead-like portions being the result of so many *projections*, and the filamentous connections of those portions indicative of intermediate *adhesions*. Then the projections were themselves referred to an action producing a bending of the *starlight* the *negative* of that which would be due to refraction, denominated by the author *the distortion inward;* but local and efficient on light (starlight or border sunlight; *i. e.* light from near the border of the sun's disk), which light was *specifically* subject to such action, from a cause (as heretofore stated in this article) originating at the surface of the star, or near the border of the sun's disk. That the action was specific is confirmed by the various observations of the annular eclipse of Sept. 18, 1838, the peculiar phenomena in question being manifest when viewed with screens of some particular color, and especially so when viewed through the red screens.

When the time of immersion or that of emersion has been carefully observed, and the corrections dependent on the moon's distance and the hour of the day have been applied (for parallax), the difference of that time and that ascertained by computation, for the first meridian, gives the longitude of the place of observation.

STEPHEN ALEXANDER.

Oc′cupancy, in law. This is one of the modes of obtaining title to property, both real and personal. The notion that title can be obtained in this manner is derived from the Roman law. In that system it was supposed that occupancy was a mode of ownership derived from the law of nature, and was particularly applicable to those things which by general rules belong to no one (*res nullius*), but are open to all. It was deemed to be natural that the things which God had created for particular persons, and which had not as yet passed into the possession of anybody, should belong to those who were the first to discover and make use of them. Accordingly, those who first entered into lands which were not inhabited, and took possession of them, became justly masters of them. So if fish were taken from the sea and birds from the air.

The theory of the Roman law, that the rule of occupancy is to be derived from the law of nature, has not only had its effect upon the private law of modern times, but has exercised great influence in forming the rules of international law. The rule that capture in time of war gave title to the captor is probably to be referred to the idea that the belligerents stood towards each other in a state of nature, when the one, being under no duty to respect the property of the other, could lawfully retain whatever he could seize upon and had sufficient power to hold. But its leading effect is to be found in the recognition by the nations of modern times of the principle that the discovery of uninhabited lands, or of what was deemed equivalent, inhabited only by savages, gives sovereignty to the nation to which the discoverer belongs, provided the discovery is followed up by exploration and settlement. Here, again, the notion seems to have been that the respective nations were related to each other as individuals would be in a "state of nature" and outside of the pale of society. However convenient this assumption may have been, it would seem to be a pure fiction. Mr. Maine in his work on *Ancient Law* has made it highly probable that the earliest form of ownership was that held by village communities, and was not of an individual, but of a corporate nature, and that it was only after a course of experience that separate ownership of property emerged from the common ownership of the village or corporation. It is impossible to deny that the development of the theory of the Roman jurists has led to great confusion and uncertainty. It has been extremely difficult to determine what kind of occupancy gave a secure title to the nation of the discoverer, and how completely and how soon it must be followed by exploration and settlement. (See Maine's *Ancient Law*, ch. viii.)

When reference is had to individual title to land within the boundaries of any particular nation, it may be observed that there was but little room for the theory of title by occupancy after the feudal system had become fully established. (See FEUDAL SYSTEM.) Under that system the title to land was supposed to be vested in the king, who parcelled it out to inferior owners upon certain conditions, who in turn, by the process of subinfeudation, could parcel it out to others. The entire land of the state thus became vested in ownership, and there was in general no mode of acquiring it except from the former owner, unless by the doctrine of "adverse possession" or "disseisin." (See DISSEISIN.) This is not to be confounded with title by mere occupancy. In the latter case the title is acquired in vacant property instantly and by the mere fact of occupancy. Adverse possession requires a peaceable and notorious possession for a *length of time*, is urged against an existing owner, and is founded upon rules of public policy to promote security in titles. In this country the king was supposed before the Revolution to be the owner of the land, and titles of individuals were obtained by grants from him. Since the Revolution the title is derived either from a State or the U. S. government. The courts will take no notice of any title to land not originating in the act of one of these governments, or at least not sanctioned by one of them. Even though the land be in one sense owned by Indians, their ownership is not inconsistent with a title on the part of the government within whose jurisdiction the land is situated. The right of discovery, as recognized by the various civilized nations, is understood to give to the U. S. the exclusive right to acquire from the Indian tribes all the lands belonging to them, and not embraced within grants already made by the U. S. or sanctioned by treaty or otherwise, and not within the territory belonging to the original thirteen States. This proposition does not deny that the Indian tribes are owners, but affirms that they can only sell to the U. S. Any rule which would permit them to convey to any other nation would be fraught with danger to our government, and would be plainly subversive of the recognized rights depending upon discovery and settlement.

Owing to these considerations, titles to land by occupancy can only arise in special cases. One of these is that of accretion or gaining land from the ocean or a lake or a navigable stream, where the soil left bare by the water may be regarded as an incident to the principal ownership of the upland. When an island arises in the ocean or in a navigable stream it belongs to the state. The same result follows in cases of addition to the mainland, where the increase is sudden and perceptible. The rule of accretion, as applying to the adjoining owner, refers to increments gradually made, so that the rate of increase is imperceptible to the eye.

Another instance in which the title to land may still be gained by occupancy, if there be no statute to the contrary, is one depending upon an imperfect rule of common law as to the devolution of legal estates in case of an owner's death. The case is an estate granted to A for the life of B. Should A die before B, intestate, the law provides no one upon whom the unexpired portion of the estate shall devolve. It cannot pass to the heir of A, since it is not an estate of inheritance or fee (see FEE); it cannot belong to the executor (see EXECUTOR), since it is real estate; it cannot revert to the grantor until B dies, since he cannot derogate from his own grant. The law having thus provided no owner, the estate may be seized by any person who may be able to take possession of it. Such a person is called a "general occupant." In some instances the grant, instead of being made to A for the life of B, is made to A and his *heirs* during the life of B. In that case the heirs take the unexpired residue, not as *heirs* (for the estate is not inheritable), but because they are specially named, and are thence called "special occupants." These rules are in a number of the States changed by statute. It is sometimes provided that the unexpired portion of A's estate shall be regarded as a chattel, and shall pass to his personal representatives.

Passing to the subject of personal property, it is to be noticed that there are still several instances in which title by occupancy takes place. One is that of property taken from an enemy in time of war. According to the law of nations, this property belongs to the sovereign of the state of which the individual captor may be a member. It is, however, quite usual for the state to provide rules whereby the captors may be rewarded for their exertions by giving them a portion or the whole of the captured property. A distinction is taken between booty (property taken on land) and prizes taken at sea. In the case of property taken at sea the practice of the law of nations now demands that there should be an adjudication by a competent prize court organized under the authority of the belligerent claiming the property. In the case of booty no such adjudication is necessary. Undisturbed possession for a brief period is sufficient to confer a title. There may be cases, however, where prize and booty are so intimately blended that a prize court will have jurisdiction over both. (See remarks of Lord Mansfield in *Lindo* v. *Rodney*, Douglas Reports, 592.) There is some reason for believing that at an early day questions concerning booty were brought before the now obsolete court of the "constable and marshal" of England. (2 Knapp, Privy Council Rep., pp. 149, 151.) The present mode in which booty is distributed in England among the actual captors is to refer their petition to the lords of the treasury, who commonly recommend that a grant be made of it to trustees appointed by the Crown, who after receiving it distribute it according to principles submitted to them by the officials of the treasury. The scheme prepared by the trustees must receive the royal assent. (2 Phillimore, *Int. Law*, 185.)

Another instance of title by occupancy is that of finding property upon land. (See FINDING.) Blackstone places under this general head also the case of accession, or the addition of value made by one person to the goods of another. (See ACCESSION.) Confusion may also be ranked under this head of title. The theory of title by confusion is that where a wrongdoer, with intent to commit a fraud, mingles his goods with those of another so that they cannot be distinguished, the innocent party becomes the owner of the entire subject-matter. The law will not compel him to separate the goods of the wrongdoer from his own, but will require that act of the defrauder; and as by the hypothesis the separation is impossible, the title to the goods is acquired by the fact of occupancy. The same writer refers the title to works of literature and art to the same source. Perhaps it would be more exact to say that they are cases of property acquired by one's own art or power of origination. (See LITERARY PROPERTY.) The property in trade-marks (see TRADE-MARK) is an instance of title acquired by occupancy. A person using a word or device to mark his ownership of goods or of a business becomes the owner of the so-called "trade-mark" itself. The title to wild animals (see FERÆ NATURÆ) is also gained by occupancy. The property or ownership in this case having once been gained remains imperfect so long as the animal has the capacity to resume its original wildness. Should it escape without any disposition to return (*animus revertendi*), the ownership is lost, and the law of title by occupancy may again be called into requisition in favor of one who may first take possession. On the other hand, if all capacity to escape had been lost, the ownership gained by occupancy would be absolute.

T. W. DWIGHT.

Occupa'tion. In Roman law this word was used of the act of taking possession. The possession thus acquired, if the law allowed, could end in full ownership. Thus, *occupaticius ager*, in one of the old Latin grammarians, denotes land deserted by its own cultivator and occupied or taken possession of by another. The principal objects which could by Roman law be thus taken possession of were, (1) wild animals, which in their free state were held to be without an owner, and wherever taken belonged to the *captor*. If, after being taken, they recovered their freedom, they again became without an owner and could belong to a new *captor*. (2) Things abandoned by an owner with the intention of giving up his ownership and without intending to transfer his right to another. (3) Treasure-trove belonged by Roman law to the finder in certain cases only, as where it had been hid in an unusual way and so long that the owner was not to be discovered. Where it was found by a man on his own ground or on ground without an owner, it belonged wholly to him. Where it was found on the ground of another, it went half to the finder, half to the proprietor of the soil; to the state if the land was public. (4) In war the foe was looked on as without rights, and thus his property was without an owner and capable of acquisition. Things taken from a public enemy during war, however, went first to the state, which could give rights over them to others, as to the captors.

There is a kind of military occupation, which international law has to do with, and which presents to us some peculiar difficulties. For those which arise out of the public actions of the occupant during his occupation, in case he afterwards relinquishes his hold on the place or district occupied, we refer to vol. ii., page 1254, col. 1, and to Phillimore, there cited. A question, however, may be asked to which we will attempt to give a succinct answer —namely, What is occupation of a country or a district by an invading belligerent? Such occupation, then, implies the termination of all political or municipal authority on the part of the former holders of power, except so far as such authority is consented to by the occupant invader. This is a result of military power and a fact. But it is not necessary that every part of the district should be held in control by a force on the spot; all that is necessary seems to be that the army should be so distributed as to have direct communication between its parts and detachments, and to have sufficient force to put down any insurrection within the district. Occupation must be effective, like blockade; but as a blockade may be raised by a superior force from without or run through by stealth, so, in the same way, the objects of an occupation may be defeated by an attack from without, or the lines be broken through by even a weak force where they are weakest. An occupied district is under military law exercised by the commander of the invading army (comp. sec. 1 of the instructions for the government of armies of the U. S. in the field), who may, if he sees fit, allow the ordinary laws of the land to take their course under control and supervision of military officers of his appointment. What proceedings within the occupied district on the part of discontented inhabitants should be punished with severity it is not easy to define by general rules. Thus much, however, may be said— that guerilla warfare by parties who have no uniform, or who put on and take off a uniform at pleasure, and are without any connection with the national army, is, and on account of the atrocity and insidiousness with which such warfare is apt to be carried on ought to be, punished with severity.

T. D. WOOLSEY.

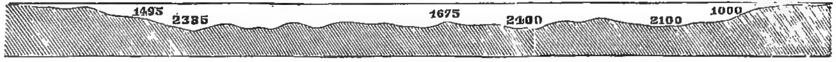
O'cean [Lat. *Oceanus;* Gr. Ωκεανός]. The waters of the sea are divided by the solid lands into a few large basins or oceans, which are the counterpart of the continents. The Pacific, the Atlantic, and the Indian oceans correspond to the three worlds, and separate them from one another. Each of them is again subdivided into a northern and southern basin, except the Indian Ocean, which, on this account, is only a half ocean. The Arctic Ocean is properly a continuation of the Atlantic, but, surrounded as it is by the coasts of the three northern continents, it has a physiognomy of its own. As to the Antarctic Ocean, being bounded by no lands, it may be considered less as an ocean by itself than as the common root from which they all radiate. The three great oceans have a wide opening toward the south, and become gradually narrower toward the north, just the reverse of the continents. But they differ in general form. The Pacific Ocean is an oval, nearly shut up in the north, where the opposite coasts approach each other, so as to leave between Asia and America only the narrow passage of Behring Straits, by which it communicates with the Arctic Ocean. The Atlantic Ocean has been likened by Humboldt to a long valley with parallel sides, the projecting body of Africa fitting into the vast recess of the Gulf of Mexico and the Caribbean Sea, as South America and Cape St. Roque into the Gulf of Guinea. It is the only ocean widely open at the north, stretching from pole to pole, the only ready channel for the exchange of the polar and equatorial waters. The Indian Ocean has the form of a triangle, the vertex of which is turned to the north, but without communication with the northern waters. The Pacific Ocean contains more than one-half of all the waters of the sea. It is pre-eminently the great ocean. Its extent, its compact form, the direction of its longer axis from east to west, make it the counterpart of the Old World. The Atlantic has only half the size of the Pacific, and one quarter of all the water surface; by its narrow and slender form, its direction from north to south, it corresponds to the New World, as the Indian Ocean to Africa.

The Bed of the Ocean.—The basins of the oceans are depressed below the face of their waters as the continents are elevated above the same surface level. As they form nearly three-quarters of the relief of the earth's crust, a knowledge of their configuration would be of great interest, but very little is known on this subject. Numerous soundings, however, made in the shallow seas along the coasts of the continents for the wants of navigation, deep-sea soundings taken in the heart of the ocean from purely scientific motives, and recently similar observations for the laying of telegraphic cables across the Atlantic and the Mediterranean, have given us an approximate idea of the nature of the beds of these two seas which are the best known. The main feature of the Atlantic basin seems to be a deep valley which runs, with an average depth of 20,000 feet or more, along and parallel to the coasts of the New World. A large swell over 10,000 feet higher, bearing, perhaps, the islands of Tristan da Cunha, St. Helena, Ascension, and in the North Atlantic the Azores, separates it (as seen in Fig. 1, *b*) from another valley only 15,000 feet deep, which stretches along and close to the coast of Africa. Both valleys rise northward, and are confounded in one basin on the so-called telegraphic plateau between Newfoundland and Ireland, whose average depth is about 12,000 feet, and the greatest 2400 fathoms, or 14,000 feet, as seen in Fig. 1, *a*. Toward the northward the depth is gradually reduced to 8000 and 9000 feet, between Greenland and Iceland, while on the European side the depth averages hardly 1500 feet. In the Arctic Ocean the depth is still less considerable, but very irregular. In the neighborhood of the continents the seas are often shallow for a long distance, and their bottom seems only the continuation, by gentle slopes, of the continents which border them. Thus, from Newfoundland, along the line of the cables (Fig. 1, *a*), the submarine plain extends for 140 miles before reaching the depth of 1000 feet, but beyond it falls rapidly within a few miles to a lower terrace of 9000 feet. By another rapid step a still lower plain is attained, having a depth varying from 12,000 to 14,000 feet, and stretching with inconsiderable variations through 1700 miles, across the whole basin of the Atlantic. This is the so-

Fig. 1.—Sections across the Basin of the Atlantic Ocean.
Depth in Fathoms.

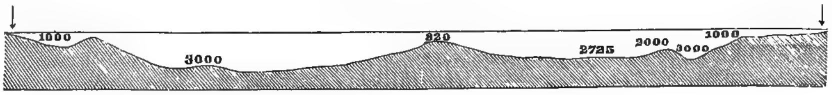
a. From Newfoundland to Valentia Island on the line of the Telegraph Cables.

Newfoundland. Length 1850 Miles. Valentia Island.



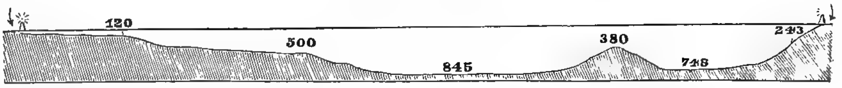
b. From Cape St. Roque, Brazil, to Cape Palmas, Western Africa.

Cape St. Roque. Length 1860 Miles. Cape Palmas.



c. From Sand Key to Havana.

Sand Key. Length 83 Miles. Havana.



called telegraph plateau. At about 230 miles from the coast of Ireland it ascends again, by similar steps, to the border of the submarine plateau on which rest the British Isles. A similar structure is found in other parts of the basin. From Cape Race, Newfoundland, southward for 200 miles across the Great Bank, the depth of the sea never exceeds 100 fathoms, when it plunges suddenly by two terraces into the deepest part of the North Atlantic, where the soundings give from 25,000 to 30,000 feet. From the New Jersey shore, according to the observations of the Coast Survey, the slope of the bottom of the sea is only 5 feet in a mile, but beyond 100 miles it descends suddenly 400 feet in a mile. About 114 miles from the coast a submarine plain begins at the depth of 6000 feet, and another, 12,000 feet deep, at a distance of about 300 miles. These facts, and the absence of any oceanic island other than volcanic or coralline, disprove the idea, often advanced, that the bed of the oceans is, like the surface of submerged continents, full of valleys and mountain-chains. It seems far more uniform. Extensive plains and huge table-lands predominate. True mountain-chains are only found near the continents, as parts of their structures, and when reaching above the surface form chains of continental islands. But these submarine plains and plateaus are gigantic compared with those above water. Nowhere on dry land do we see plateaus of 15,000 to 20,000 feet above the surrounding plains.

The Bed of the Pacific Ocean is much less known than that of the Atlantic. In the absence of soundings, which are few, its average depth has been inferred from the velocity of the tide and earthquake waves which often cross it from E. to W., this velocity depending upon the depth of the basin in which the waves move. From this kind of evidence Prof. Bache, superintendent of the Coast Survey, makes the depth of the Pacific between Japan and the coast of California from 12,000 to 14,000 feet. Prof. Hochstetter, using the waves raised by the great earthquake of South America in 1868, calculated the depth between the coast of South America and the Chatham Isles in the South Pacific at 11,500 feet. Both results agree with the soundings. The central axis of the ocean, free from islands, is probably deeper; some uncertain soundings exceed 40,000 feet. Similar depths are given for the Indian Ocean.

The inland and border seas properly belong to the continents. Around the British Isles and in the German Sea the depth rarely exceeds 600 feet, and is often much less. The continent of Europe is here prolonged in the form of a submarine plateau. The Baltic Sea, being a simple depression in the continent, is only a few hundred feet deep. The border-seas of Asia, inside of the chains of continental islands, hardly exceed a few hundred feet, while outside, the rapid slopes and deep ocean begin. The Mediterranean and Gulf of Mexico, being in the zone of broken lands, are much deeper. The first is divided into two basins by a high neck stretching between Sicily and the African shore, at the slight depth of 50 to 500 feet. The western basin has a depth of over 9000 feet, and the eastern, S. of the Ionian Sea, even 13,000 feet. The Gulf of Mexico, as shown in Fig. 1, *c*, has a depth of over 5000 feet. The Caribbean Sea averages 6000 feet, and reaches near Darien at least 10,000 feet. Still, outside of the Lesser Antilles the basin of the ocean proper sinks to 18,000 feet and more. The greatest depths of the ocean have been observed in the South Atlantic. West of St. Helena James Ross found no bottom with a line of 27,600 feet. West of the island of Tristan da Cunha, Capt. Denham touched the bottom at 46,000 feet. Captain Parker found even 50,000 feet in the same region. But from the difficulty of such measurements those figures can hardly be accepted as correct. On the whole, the ocean basins become less deep toward the north pole, just as the lands become lower toward the same region. A. Guyot.

Oceana, cap. of Wyoming co., W. Va. (see map of West Virginia, ref. 6–C, for location of county). Pop. in 1880, 107.

Ocean Grove, Monmouth co., N. J. (see map. of New Jersey, ref. 4–E, for location of county), on R. R. and the sea-coast, 6 miles S. of Long Branch, is a noted watering-place under M. E. control. Pop. in 1880, 620.

Ocea'nica, the name given by modern geographers to all the islands or groups of islands situated between the south-eastern shore of Asia and the western shore of America, and consisting of the Malay Archipelago, Australasia, and Polynesia.

Ocean Navigation. See Navigation.

Ocel'lus Luca'nus, a Greek philosopher, b. in Lucania, Italy, probably in the fifth century B. C. Of his life nothing is known, and it has been much disputed whether the treatise Περὶ τῆς τοῦ Παντὸς Φύσιος ("On the Nature of the Whole"), written in the Ionic dialect, is a genuine work by him or not.

O'celot [Aztec, *ocelotl*, from *oça*, "to paint"], a name applied to the *Felis pardalis*, one of the handsomest of the cat family, found in America from La. and Tex. S. to Patagonia. It is some three feet long, extremely agile and graceful, and nocturnal in its habits. Its skin is prized. It is gray, marked with black and fawn-colored lines. The painted ocelot (*Felis pictus*) and the gray ocelot (*F. armillata*) are South American animals of similar size, habits, and appearance. Still other species or well-marked varieties are known.

Ochino (Bernardino), b. at Siena, in the Papal States, 1487, joined the strictest branch of the Franciscan order, and afterward the still stricter order of the Capuchins, and acquired a great reputation as a preacher. Paul III. chose him for confessor, and other honors were heaped upon him; but in Naples he became acquainted with the Spanish mystic Juan Valdez, with Peter Martyr, and others. He began to preach of justification by faith, of the futility of indulgences, etc. Suspicions arose with respect to his orthodoxy; and when, in 1542, he published his *Dialogi VII. Sacri.*, he was summoned to Rome to explain and retract. Fully aware of the danger, he fled to Geneva, where he published six volumes of Italian sermons (*Prediche*, 1542–44), of which a selection (25) were translated into English (1548). From Geneva he went to Augsburg, and thence to Strasburg, London, Zurich, Cracow, etc., publishing a number of books, but leading a somewhat erratic life. D. at Schlackau, Moravia, 1565. In the first works he published after his flight from Italy he advocated Calvinistic views, but in the later Socinianism becomes more and more apparent, especially in his catechism, published at Basel in 1561. (See his *Life* by Benrath, Leipzig, 1875; translated into English, New York, 1877.)

O'chre. Clays colored by hydrated peroxide of iron in variable proportions, and thus yielding shades of yellow from pale yellow to deep orange, are largely used as pigments in the arts under the name of ochre, but the term is also more broadly applied to any clay richly colored by peroxide of iron. "Reddle," or "red chalk," is a variety of ochre consisting of decomposed *hematite*. In mineralogy, earth varieties of *hematite* or iron-peroxide, if bright tinted, are known as "red ochre," whilst argillaceous and decomposing *limonites*, or hydrated peroxides, give rise to "brown ochre." The term is moreover used in that science, in combination, to express the earthy, pulverulent, decomposing oxides of other elements.

Ocklawaha River, a navigable branch of the St. John's River, rises in the lakes of Orange and Sumter cos., Fla., and traverses Marion and Putnam cos., in a northward course. It has regular steam navigation.

Ock'ley (Simon), b. at Exeter, England, in 1678; studied at Queen's College, Cambridge, distinguishing himself by his attainments in the Oriental languages; took orders in the Church of England; became vicar of Swavesey, near Cambridge, 1705; published a Latin *Introduction to the Oriental Languages* (1706), a *History of the Jews* (1707), translated from the Italian of Rabbi Leon of Modena, with an original *Supplement concerning the Caraites and Samaritans*, and several translations from Oriental manuscripts; became professor of Arabic at Cambridge 1711; issued the first volume of his great work, the *History of the Saracens*, in 1708, and the second in 1718. D. at Swavesey Aug. 9, 1720.

O'Cle'ry (Michael), b. at Kilbarron, near Ballyshannon, Ireland, about 1575; entered the Franciscan order as a lay brother; resided during much of his life in the Irish convent at Louvain; was sent to Ireland to collect materials for Hugh Ward's *Lives of the Irish Saints*, and spent fifteen years in accumulating antiquarian documents. With the aid of Conary O'Clery, Cucogry O'Clery, and Forfeasa O'Mulconry, he compiled the *Annala Rioghachta Eireann*, or *Annals of the Kingdom of Ireland*, a valuable work usually known as *The Annals of the Four Masters*. (See O'Donovan, John.) O'Clery published an Irish dictionary and other works, and d. at Louvain in 1643.

Ocmul'gee River rises in the central part of Georgia by several head-streams, flows in a generally S. S. E. course, and above Colquitt joins the Oconee to form the Altamaha River. Small steamboats ascend to Macon. Its lower course is through sandy pine woods; its upper, through a granite region, where its many rapids might be utilized for water-power. It is 300 miles long.

Oconee River rises in Morgan co., Ga., and flows S. by E. Below Colquitt it unites with the Ocmulgee to form the Altamaha. Steamboats have ascended in high water to Milledgeville.

O'Con'nell (Daniel), the great Irish agitator, was b. at Carhen, county Kerry, Aug. 6, 1775, the son of a gentleman of small estate, but of ancient family; was educated at St. Omer and Douay, and in 1794 began to study law at Lincoln's Inn: in 1798 was called to the bar; rose at once to distinction as a barrister, and very soon became prominent in Irish politics, addressing himself to the work of the emancipation of the Roman Catholics and of Ireland. In 1815 he was challenged by Alderman d'Esterre of Dublin, whom he mortally wounded; and a duel with Mr. Peel was soon after prevented by the police. In 1828 he was chosen to Parliament from county Clare, but was excluded by the Test oath, but in 1829 the Roman Catholic emancipation took place, and O'Connell entered the House of Commons. His life-work was one of agitation, both among the people and in the House of Commons, for the repeal of the Union. In 1842 he began to hold "monster meetings" in Ireland, and in 1843 he was arrested on a charge of conspiracy and sedition, convicted, and fined heavily; but the Lords reversed the judgment Sept. 7, 1844. In 1845, when it was shown that O'Connell, who had long received a large yearly income from a popular subscription, was also acting as a middleman and collecting money from the tenants of another, his influence began to decline, and in 1846 his support of the Whig ministry tended to the same end. In 1847, enfeebled by overwork and by anxiety for Ireland, where the famine had broken out, he started to make a pilgrimage to Rome, but d. at Genoa May 15, 1847. (See *Life and Speeches of Daniel O'Connell*, by his son, John O'Connell, London, 1846, 2 vols., and *The Liberator, his Life and Times*, by L. F. Cusack, London, 1872.)

O'Con'nor (Gen. Arthur), b. at Bandon, near Cork, Ireland, July 4, 1767; was admitted to the bar 1788; sat in the Irish Parliament 1789–96; entered into the conspiracy of the United Irishmen; became one of the five members of their Directory; was imprisoned six months for publishing a so-called seditious pamphlet; went to France with Lord Edward Fitzgerald to negotiate an alliance for Ireland against England; concerted with Hoche the French invasion of Ireland; was arrested in England Feb. 27, 1798, tried for high treason at Maidstone, Kent, but acquitted May 22; rearrested in the court-room on another charge; kept five years a prisoner in Fort George, Scotland; was released June, 1803, on condition of perpetual exile from Ireland; went to Paris; was appointed by Napoleon general of division Feb. 29, 1804; sent to the coast of Scotland in command of the Irish brigade; married, in 1807, Elisa de Condorcet, only daughter of the philosopher; withdrew from the French army 1815; was naturalized as a French citizen 1818; edited with Arago the works of Condorcet (Paris, 12 vols., 1847–49), and wrote a number of controversial pamphlets. D. at Bignon Apr. 25, 1852.

O'Connor (Feargus Edward), b. at Dangan Castle, county Meath, Ireland, in 1796; entered Parliament for Cork 1832; took part in the socialistic agitations, making addresses at many places in England; edited a newspaper of violent tone, the *Northern Star;* was for a time regarded as the leader of the "Chartist" party, which elected him to Parliament from Nottingham 1847; visited the U. S. soon afterwards; became insane in 1852, and d. at Nottinghill, near London, Aug. 30, 1855.

O'Connor (Michael), D. D., b. at Cork, Ireland, Sept. 27, 1810; studied at Queenstown, and in 1824 entered the Propaganda, and in 1833 received the doctorate; became in 1838 president of the Roman Catholic seminary of St. Charles Borromeo, Philadelphia, Pa.; was consecrated bishop of Pittsburg in 1843; translated to the see of Erie, Pa., in 1853, but was referred to his former diocese in 1854. In 1860 he resigned the bishop's office and entered the Society of Jesus. D. at Woodstock College, Md., Oct. 18, 1872.

O'Connor (Roderick), popularly called Rory, the last independent king of Ireland, b. in Connaught in 1116; succeeded to the throne of Connaught on the death of his father, Turlogh O'Connor, 1156; disputed the supremacy for several years with the O'Neals and the O'Briens; assumed the title of king of Ireland 1166; assembled a parliament of lords and clergy at Athboy 1167; aided in the expulsion of Dermot, king of Leinster, 1168; defeated the English invaders under Strongbow in several engagements, but subsequently came to terms with them and reinstated Dermot in his kingdom; afterward carried on war with the English with varying success, until in 1175, after an interview with Henry II. of England, he acknowledged that monarch as lord paramount of Ireland, retaining for himself his ancestral kingdom of Connaught. His sons having revolted against him, Roderick retired in 1186 to a monastery, where he d. in 1198.

O'Connor (William Douglas), b. at Boston, Mass., in 1833; was educated for an artistic career; became associate editor of the Boston *Commonwealth* 1853, and of the Philadelphia *Saturday Evening Post* 1854–60; became clerk of the lighthouse board at Washington 1861, chief clerk 1873, librarian of the treasury department 1874; assistant general superintendent of life-saving bureau; has written poems and tales for magazines, and published romance, *Harrington* (1860), *The Good Gray Poet* (1866), being a vindication of Walt Whitman, and *The Ghost* (1867).

Oconom'owoc, city, Waukesha co., Wis. (see map of Wisconsin, ref. 7–E, for location of county), on the La Crosse division of the Chicago Milwaukee and St. Paul R. R., 30 miles W. of Milwaukee, is noted for its numerous beautiful lakes, fine drives and mineral springs, and the excellence of its hotels. It is called the "Saratoga of the West." Pop. in 1870, 1408; in 1880, 2174.

A. D. Harger, Ed. "Times."

O'Con'or (Charles), LL.D., b. in New York City in 1804, son of an Irish gentleman of education; received a common-school education; was admitted to the bar 1824, and by his untiring industry made his way to the leadership of the legal profession in that city, which he long held, having been retained in many of the most important cases after 1840. The first case which made his name more widely known and finally established his reputation was that of the fugitive slave Jack, in which his powerful argument before the supreme court of the State, and before the court of errors, gained every point (1835). Among his other cases the most celebrated were the Lispenard will case (1843) and the Forrest divorce case. His last appearance in the trial of a jury case was as the defender of young Walworth when the latter was tried for the shooting of his father. Always a Democrat, he never held office except that of district attorney for a few months during the administration of Pres. Pierce, and that of member of the constitutional convention of 1864. In 1868 he was nominated for the Presidency by the extreme Democrats, and received complimentary votes in several States. D. May 12, 1884.

Ocosin'go, a considerable town in the state of Chiapas, Mexico, 70 miles S. E. of Ciudad Real, chiefly noted for extensive ruins resembling those of Palenque, described by Dupaix and by John L. Stephens in his *Central America, Chiapas, and Yucatan.* Pop. about 5000.

Oconto, city, cap. of Oconto co., Wis. (see map of Wisconsin, ref. 4–F, for location of county), on Green Bay and the Chicago and North-western R. R., 30 miles N. of Fort Howard, has a public library, a paid fire department, a public park, etc. It owes its prosperity to the lumber trade. Pop. in 1870, 2655; in 1880, 4171.

Ocracoke Inlet, a passage from the Atlantic to Pamlico Sound, between two of the long low coast-islands of North Carolina. It lies 23½ nautical miles S. W. of Cape Hatteras. On its N. side stands a brick lighthouse 65 feet high; lat. 35° 6′ 28″ N., lon. 75° 58′ 51″ W. It admits only light-draught vessels.

Octahe'dron [Gr. ὀκτώ, "eight," and ἕδρα, "base"], a solid bounded by eight triangular planes. If regular, its faces are equilateral. It has twelve edges and six solid angles, each formed by four equal plane angles. Its solid contents are equal to the cube of one of its edges multiplied by .4714045.

Octane, C_8H_{18}, the eighth of the marsh-gas series, a liquid, sp. gr. 0.7032, at 17° C.; boiling-point, 119° to 125°. It occurs naturally in American petroleum. It may be produced by the dry distillation of the lime-soap of menhaden oil, by passing the vapor of the thirteenth of the same series, tridecane, $C_{13}H_{28}$, through a red-hot tube, and also from octyl iodide, phthalic acid, indigo blue, acenaphthene, etc. By long-continued fractional distillation it may be separated into two hydrocarbons, having different boiling-points, but the same composition. E. WALLER.

Oc'tarch, the principal of the kings of the heptarchy, was called *Rex gentis Anglorum.* Hengest was the first octarch (455), and Egbert, a descendant of Cerdic, was the last (800). Some authors persist in declaring that the English heptarchy should have been called the *octarchy.*

Oc'tave [Lat. *octavus;* Fr. and Ger. *octave*], in music, an interval eight degrees above or below some other on the scale, as from C to the next C, or F♯ to F♯, etc. Also, the series of notes included in such an interval, as when we speak of a voice or instrument having a range of so many octaves and fractions of octaves.

Octa'via, sister to Augustus, was first married to C. Marcellus, and after his death to Mark Antony. She was a woman of perfect beauty and great accomplishments, and her life shows an almost heroic nobleness of character. She bore to Marcellus two daughters and a son, and to Antony two daughters. Of the latter, the elder was married to L. Domitius Ahenobarbus, and became the grandmother of Nero; the younger was married to Drusus, and became the mother of Claudius and the grandmother of Caligula. In 32 B. C., Octavia was formally divorced by Antony. Her son, M. Marcellus, was adopted by Augustus, but died young. She also educated the children of Antony by Fulvia and Cleopatra. She died in 11 B. C., and was buried with the highest honors by the state.

Octene, C_8H_{16}, **Octylene,** or **Caprylene,** the eighth of the series of olefines. The name was proposed by Hofmann in 1863. Boils at about 118° to 120°; is prepared by the distillation of pelargonic and other fatty acids with lime. Octene is a mobile liquid, insoluble in water, very soluble in alcohol and ether; burns with a bright smoky flame, and is violently attacked by nitric acid, yielding nitro compounds. E. WALLER.

Octo'ber [Lat., from *octo,* "eight"], the eighth month of the year, established by Romulus, but the tenth in the Julian and Gregorian years.

Octop'oda [from ὀκτώ, "eight," πούς, ποδός, "foot"], a sub-order of cuttle-fishes (class *Cephalopoda*) of the order Dibranchiata, in which the body is sacciform, the head united with the body by a broad cervical band and surrounded by eight fleshy arms; the arms are furnished with sessile cup-like suckers destitute of horny rings; the eyes fixed in the skin and incapable of rotation; the gill chamber longitudinally divided by a muscular partition; the siphuncle entire; oviduct double; no rudimental gland developed, and there is no true shell. The sub-order is exhibited in four living families: (1) *Octopididæ;* (2) *Cyrotupidæ;* (3) *Philonexidæ,* and (4) *Argonautidæ.* The first two are chiefly represented by species inhabiting the shallow waters or near the coast, and the last two by those living in the open sea. The males of all the species are distinguished by a peculiar generative economy; the males and females differ little from each other in general appearance, but in the former one of the eight arms becomes developed in a peculiar manner, supplied with semen, and, in fact, modified as a copulatory organ, and capable of performing the generative function. It then becomes detached from the animal, and may lead for a time an independent life, but at length, in some cases, it is received by a female, and serves to impregnate her. This function was for a long time unknown, and the arm so modified and detached was supposed to be a peculiar parasitic worm, and named *Hectocotylus.* The arm in question is not always the same, in some species one arm being so developed and in others another. The arm so modified is known as a hectocotylized arm. It is periodically renewed and detached. THEO. GILL.

Octopod'idæ [from the generic name *Octopus*], a family of Cephalopods of the order Dibranchiata and suborder OCTOPODA (which see). The body is oval and generally destitute of fins; the mantle separated by fleshy bands; the arms with two rows (rarely one) of cups and united at the base by a slight or moderate web, with or without distinct equiferous cells between the bases of the arms. The family includes the common cuttlefish of the European coasts, and one representative is found in deep water off the eastern N. American coast. Some of the species attain a very large size, and exaggerated accounts may be found of their ferocity and size in many popular works. THEODORE GILL.

Octroi' [Fr., remotely from the Lat. *auctoritas,* "authority"], a toll in money or in kind levied upon farm and garden produce at the gates of some European towns.

O'Cur'ry (EUGENE), b. at Dunahu, near Carrigaholt, county Clare, Ireland, in 1796; received a liberal education; was employed in the archæological department of the ordnance survey of Ireland 1834–41; was then engaged by the Royal Irish Academy and the corporation of Trinity College, Dublin, in cataloguing and transcribing their ancient Gaelic MSS.; discovered and deciphered valuable remnants of the ancient Brehon laws, which he with Dr. O'Donovan was commissioned to edit and translate by the Brehon law commissioners 1853; became professor of Irish history and archæology in the newly-established Roman Catholic university at Dublin 1854; contributed to the *Transactions* of learned societies; edited works for the Celtic Society and the Irish Archæological Society, and published *Lectures on the Manuscript Materials of Ancient Irish History* (1861). Prof. O'Curry's labors constituted the foundation of Sir H. S. Maine's *Lectures on the Early History of Institutions* (1875). D. at Dublin July 30, 1862.

Odd Fel'lows, Independent Order of, a secret benevolent and beneficial association which had its origin in London, England, about 1745. The character attributed to the earliest societies or lodges of Odd Fellows is that of assemblages mainly for social purposes, having an initiation ceremony, and a collection being made to aid needy members.

About the year 1800 the lodges in London and Liverpool were known as "The London Order." In 1809 a member of a London lodge removed to Manchester and introduced the order into that city, where it was so favorably received that several lodges were speedily organized, and in 1814 the lodges in Manchester and vicinity were consolidated under the title of "The Independent Order of Odd Fellows of the Manchester Unity." A grand lodge, composed of those who had filled the chair of noble grand (the presiding officer) a regular term in a subordinate lodge, was organized and assumed supervision of the subordinates. The London associations and other lodges throughout the country refused to acknowledge the authority of the Manchester organization, and several other "Unities" sprang into existence. The Manchester adherents attained greater prosperity than any of their rivals, and the increase of lodges in Great Britain determined the Manchester authorities to organize an "annual movable committee" to take the place of the local grand lodge, the first meeting of which was held at Hanley in the Potteries, Staffordshire, May 19 and 20, 1823, and was attended by 98 deputies, representing the several subordinate lodges. The early laws were crude and imperfect, the receipts being inadequate to meet the authorized disbursements. The annual movable committee eventually established a system of rates based on the experience acquired, which enabled the subordinates to meet the relief requirements and accumulate a reserve fund ample for all probable demands.

The condition of the Manchester Unity, the largest and most important body of Odd Fellows in Europe, is exhibited in the following statement, made Jan., 1883: Lodges, 4251; members, 565,368. In 1881 the receipts were £761,695, the payments £531,335, and the capital was £5,291,891.

In England there are a large number of minor orders. Accurate statistics of the other Unities cannot be obtained, but it may be safely assumed that the various branches in Great Britain aggregate 5000 lodges and 700,000 members. The Manchester Unity has organized lodges in England, Scotland, Wales, Ireland, France, Turkey, Africa, North and South America, East and West Indies, and Australasia.

Societies or lodges of Odd Fellows were organized in New York and other cities in the U. S. as early as 1806, but had a brief existence. On Apr. 26, 1819, Thomas Wildey and four others, who had been members of Odd Fellows lodges in England, organized a lodge in Baltimore, Md., calling it Washington Lodge No. 1. A member of a lodge at Preston, England, visited this self-instituted body in the latter part of the year 1819, and on his return to his home procured from the Duke of York's Lodge of the Manchester Unity, located at Preston, a document dated Feb. 1, 1820, clothing the American organization with the powers of a grand as well as a subordinate lodge, under the title of "No. 1, Washington Lodge, the Grand Lodge of Maryland and of the U. S. of America." This action of a subordinate was subsequently confirmed by the grand committee of the Manchester Unity. On Feb. 22, 1821, Washington Lodge surrendered the English charter to a "body of past grands," and "the Grand Lodge of Maryland and the U. S." was regularly organized, the members of Washington Lodge receiving a subordinate charter from the new grand lodge. In 1823 the self-instituted lodges in Philadelphia, New York, and Boston were induced to recognize the Maryland organization, and that body immediately forwarded charters to the subordinates, as well as grand lodge charters for Pennsylvania, New York, and Massachusetts. On Apr. 15, 1824, it was deemed advisable to separate the powers of the national from the State organization, and the project was consummated Feb. 22, 1825, when the first meeting of the Grand Lodge of the U. S. was held. In 1826, Thomas Wildey, the presiding officer of the Grand Lodge of the U. S., known as the "grand sire," visited England and obtained from the grand committee of the Manchester Unity an independent charter, granting to the Grand Lodge of the U. S. authority "to conduct the business of Odd Fellowship *without the interference of any other country*, so long as the same is administered according to the principles and purity of Odd Fellowship." Intimate relations between the two grand bodies continued for several years, but in 1842, after fruitless efforts on the part of the heads of the order in England and the U. S. to reconcile, by correspondence, vital differences in the work which had arisen, James L. Ridgely, grand corresponding and recording secretary, and Isaac D. Williamson, grand chaplain of the Grand Lodge of the U. S., were commissioned as special deputies to the Manchester Unity to adjust the matters in dispute. The commissioners attended the meeting of the annual movable committee at Wigan May 16, 1842, and after a conference continued through several days found that their efforts for harmonious co-operation were futile. The commissioners presented an elaborate report of their proceedings to the Grand Lodge of the U. S. in Sept., 1842, and that body adopted a series of resolutions on the subject. The hostilities of the Manchester Unity, threatened in 1842, and consummated in 1843 by their attempt to institute lodges in the U. S., resulted in an entire severance of the existing relations.

The objects of American Odd Fellowship are "to visit the sick, relieve the distressed, bury the dead, and educate the orphan." It seeks "to improve and elevate the character of man, imbue him with proper conceptions of his capabilities for good, enlighten his mind, enlarge the sphere of his affections, and lead him to a cultivation of the true fraternal relation designed by the great Author of his being." The motto "Friendship, Love, and Truth" was known and used in connection with the order in 1775. The organization for attaining these objects has two branches, closely connected, yet entirely distinct—lodges and encampments.

To become a member of a lodge under the jurisdiction of the Grand Lodge of the U. S. the applicant must be a free white male of good moral character, who has arrived at the age of twenty-one years, and who believes in a Supreme Being, the Creator and Preserver of the universe. Five or more members holding withdrawal cards granted by legal lodges may apply to the grand lodge of the State or Territory in which it is proposed to locate, for a charter for a lodge; and when instituted, such subordinate is invested with the power to initiate and confer the five degrees on persons regularly proposed and elected residing within the district assigned to it. No one but a member who has attained the fifth or scarlet degree in a lodge is eligible to membership in an encampment, and can remain a member of the encampment only so long as he continues in good standing in his lodge. An encampment confers three degrees; and seven or more members, having the third or Royal Purple degree and holding legal withdrawal cards, may petition the grand encampment of the State or Territory in which it is proposed to locate, for a subordinate encampment. Application for a lodge in a State or Territory in which no grand lodge has been organized must be made to the Grand Lodge of the U. S., and the same rule applies to a petition for an encampment. On the petition of ten or more lodges the Grand Lodge of the U. S. will issue a warrant for a grand lodge of the State, Territory, or province in which the petitioning lodges are located, or for a grand encampment on a similar application by five or more subordinate encampments. A grand lodge or encampment is composed of the past presiding officers of its subordinates, and the representatives of the several grand bodies constitute the U. S. Grand Lodge. Lodges and encampments have the power to regulate the fees for initiation, degrees, and weekly dues, and may determine the amounts to be paid for weekly benefits to sick or disabled members, funeral benefits, etc.; but such amounts must not be less than the minimum prescribed by the grand body having jurisdiction.

The statistics from 1830 (previous to which they are incomplete) to 1884 are as follows: Initiations, 1,318,225: members relieved, 1,096,950; widowed families relieved, 144,805; members buried, 106,922; receipts, $98,227,589.60; paid for sick and funeral benefits and the care of widows and orphans, $36,742,136.75. According to the returns of 1884, the following is the present condition of the order in the U. S.: grand lodges, 54; subordinate lodges, 7703; lodge members, 505,871; grand encampments, 43; subordinate encampments, 1906; encampment members, 90,852; receipts, $4,804,748; members relieved, 51,876; widowed families relieved, 5743; members buried, 5189; paid for relief of members and widowed families, burial of dead, education of orphans, $2,015,832.52.

The Grand Lodge of the U. S. has organized grand lodges in every State and in most of the Territories of the U. S., the provinces of Canada, Switzerland, Australia, Chili, S. A., and a grand lodge of the German empire, which has five grand lodges under its jurisdiction. Subordinate lodges have been organized in the Sandwich Islands, Peru, S. A., and London, England. Grand and subordinate encampments have been instituted in nearly every locality where lodges are established. Nine monthly and twelve weekly periodicals in the interest of the order are published—twenty in the U. S. and one in Germany.

THEODORE A. ROSS.

APPROVED BY JAMES L. RIDGELY, *late Grand Corresponding and Recording Secretary R. W. G. L. U. S.*

Ode [Gr. ᾠδή, fr. ἀοιδή, a "song"], in the modern use, signifies a lyric piece of more dignified character than the song, and usually one in which profound feelings are expressed. The ancients originally included under this name all kinds of lyric verse. Pindar, Alcæus, Anacreon, Sappho, and Simonides among the Greeks, and Horace among the Romans, were the chief writers of odes.

Odebolt, Sac co., Iowa (see map of Iowa, ref. 4–D, for location of county), on Chicago and North-western R. R. Pop. in 1880, 637.

Odell', Livingston co., Ill. (see map of Illinois, ref. 4–F, for location of county), on R. R., 82 miles S. W. from Chicago. Large quantities of corn are shipped from this point. Pop. in 1870, 739; in 1880, 908.

O'denheimer (WILLIAM HENRY), D. D., b. at Philadelphia, Pa., Aug. 11, 1817; graduated at the University of Pennsylvania 1835; took orders in the Protestant Episcopal Church 1838; became rector of St. Peter's, Philadelphia, 1840, and bishop of New Jersey Oct. 13, 1859. Author of *Jerusalem and Vicinity* (1855), etc. D. Aug. 14, 1879.

O'denkirchen, town of Rhenish Prussia, has cotton-spinning and silk, linen, and cotton-weaving factories, and large dyeworks. Pop. 8778.

O'dense, town of Denmark, on the island of Fünen, is an old but prosperous city, with good educational institutions and an active trade. Hans Christian Andersen was born here. Several large sugar-refineries and iron-foundries are in operation. Pop. 20,804.

O'denwald, a mountain-region of Germany, occupying the southern part of Hesse-Darmstadt, and extending for a distance of about 45 miles from the Neckar, which to the S. separates it from the Black Forest, to the Main, which to the N. separates it from the Spessart Mountains. Its western declivities towards the plain of the Rhine are abrupt, but to the N. it slopes down through several terraces, and to the S. E. it gradually disappears in the level plains. Its highest peaks rise to about 2000 feet, but its general character is very friendly and inviting. It is covered with pine, oak, and beech, and its valleys with orchards and vineyards. Besides its natural beauty, it has great historical interest on account of its many remains from the Roman period and from the Middle Ages.

O′der, a river of Germany, rises in Moravia at an elevation of 1000 feet above the sea, enters Prussian Silesia, where it becomes navigable at Ratibor, traverses the provinces of Brandenburg and Pomerania, and, after a course of 550 miles, empties through the Stettiner Haff into the Baltic. Its navigation is difficult, and along its lower course expensive embankments are required to protect the surrounding country against inundation; as a route of commerce it is of great importance.

Oder′zo [anc. *Opitergium*], town of Northern Italy, province of Treviso, about 14 miles N. E. of the town of Treviso. It is a place of very active traffic, and contains some fine palaces with elegant gardens. Some of these palaces are rich in pictures by Bassano, Paris Bordone, Palma il Giovine, etc. The Villa Colfrancui contains many interesting antiquities, inscriptions, architectural fragments, bas-reliefs, cippi, etc., which have been disinterred in the neighborhood. *Opitergium* is mentioned by all the early Latin historians, and they state that 1000 young soldiers from this town belonging to the army of Cæsar, having fallen into the hands of Pompey, slew themselves rather than remain prisoners. The population at its most flourishing period is said to have reached 50,000, and the beautiful objects in gold, ivory, bronze, etc. which have been found here confirm the story of its former importance. Its later Roman and mediæval history is full of vicissitudes, and its modern fortunes have been those of Venice. The first bishop of Oderzo was Epodius of the fifth century. Pop. in 1881, 6668.

Odes′sa, town of Russia, government of Kherson, is situated in lat. 46° 29′ N., lon. 30° 44′ E., on a bay of the Black Sea, midway between the mouths of the Dnieper and Dniester. The Turks had here only a small fortress, but after the cession of the territory to the Russians by the Peace of Jassy, Catharine II. founded the present town in 1794. Alexander I. made it a free port for thirty years in 1817, and under the wise administration of its governor, the duke of Richelieu, it increased rapidly, and ranks now as the third commercial town of the Russian empire, and as the first port of the Black Sea, communicating by regular steamship lines with Constantinople, Trieste, Marseilles, Barcelona, Lisbon, Bordeaux, Havre, Antwerp, and London. It stands on a plateau about 200 feet high, which sinks abruptly towards the sea, leaving only a very small belt of shore, occupied by barracks, bathing establishments, and shipping facilities. Along the edge of the plateau runs a very elegant boulevard, planted with trees, lined with palatial houses, and communicating with the beach by a magnificent flight of granite steps. The city is generally well built, with broad and straight streets, and the immediate neighborhood contains many orchards and vineyards, while the plateau farther behind is a sterile steppe. Its benevolent and educational institutions, among which is a university founded in 1865, are numerous and good. It has also important breweries, woollen-mills, and manufactories of sailcloth, cordage, soap, candles, etc. But it is especially as a commercial place that the town has acquired importance. Its harbor is spacious, convenient, safe, and frozen only for a very short time during midwinter; the anchorage is excellent, and the inner harbor, formed by two immense moles, can accommodate 300 vessels at its quays. About 1300 vessels, of about 800,000 tons burden, enter and clear its harbor annually, importing goods to the value of about $40.000,000, and exporting goods to the value of about $35,000,000. The principal articles of exportation are grain, timber, tallow, and wool. Odessa is the outlet of the rich wheat-producing region of Russia, the value of wheat exported amounting to about $30,000,000 a year. Pop. 193,513, containing many Greeks, Armenians, Tartars, Italians, Germans, and Jews. Odessa is defended by a strong citadel on the south-eastern side and by batteries along the shore. It was bombarded by the allied fleets in 1854. (See BOMBARDMENT.)

Od′ic Force, a term originally applied by Reichenbach to a peculiar iridescence which some people could see about the arms of a magnet. It has been the favorite catchword of humbugs, and applied to everything mysterious. It has received the synonym *psychic force* from Crookes, who performed several startling experiments with Home, the spiritualist, Sergeant Coxe, and others. A lever 36 inches long was fastened at one end to the wall, and upon this a heavy man sat. Home held the tips of his fingers against the distal end of the board, and the board retained its horizontal position, meanwhile supporting the person who sat upon it. Several equally wonderful performances were shown to a number of intelligent and honest people, who authenticated the report of Crookes and others. It is difficult to believe that any such force exists—at any rate, no general attention has been paid to the subject; and it may safely be considered a humbug till some reasons can be given for its physical production.

ALLAN MCLANE HAMILTON.

O′din, the Old Ger. *Wuotan*, the Saxon *Wotan*, occupies in the Scandinavian mythology the same position as Zeus in the Greek. He is the creator of the world, the father of the gods, and, being possessed of the deepest wisdom, he holds the highest power. In battle he gives the victory and sends forth the Valkyries; in council he gives the decision and the expedient; in every-day life he makes the field fertile, the wind and the waves favorable, etc. Behind and above the special gods he is the supreme ruler. The peculiar features under which he was imagined by his worshippers are often vague, sometimes even childish, but generally not without a certain suggestiveness. He had only one eye; the other he had pledged to Mimer, of whose fountain he drank wisdom. Two ravens sat perched on his shoulders—Huginn, the mind as perceiving, and Muninn, the mind as retaining; they flew every day through the world, and whispered in his ear what they saw. But the general idea of him as the god of the heaven, the sky, the wind, riding through space on his eight-footed horse, wrapped in his cloud mantle, and holding the lightning in his hand, is as magnificent as that of the serene Zeus enthroned in brightness, and as characteristic of the climate and the race. He never reached that perfect individualization which distinguishes Zeus, perhaps because the Scandinavian mythology was broken off in the middle of its course without ever ripening into maturity, perhaps because its ideas by their very nature were unfit for a thorough artistic development. But the attempts of mythologists to analyze the myth-forming process, and extract the materials which entered from reality into the mythical creation, may prove more successful with Odin than with Zeus. Of the artistic representations of Odin only a very few have any value; most of them are influenced by the Greek ideas of Zeus.

Odin′ (JEAN MARIE), D. D., b. at Ambierle, France, Feb. 25, 1801; joined the Lazarists in his youth; came to the Lazarist community of the Barrens, Mo., in 1822, and soon afterwards became a priest. In 1842 was made bishop of Claudiopolis *in partibus infidelium* and vicar-apostolic of Texas. In 1847 was translated to the see of Galveston, and in 1861 became archbishop of New Orleans. In 1869 repaired to the Vatican Council, but by reason of infirm health was excused from attendance. D. at Ambierle, France, May 25, 1870.

Od′ling (WILLIAM), M. D., F. R. S., b. at Southwark, England, Sept. 5, 1829; studied medicine at Guy's Hospital and at the University of London; became lecturer on chemistry at St. Bartholomew's Hospital 1863, professor of the same science at the Royal Institution 1868, and at the University of Oxford 1872; author of a *Manual of Chemistry* (1861), *Lectures on Animal Chemistry* (1866), and of various scientific memoirs on chemical theory, of which he is regarded as one of the ablest living exponents.

Odoa′cer, king of Italy from 476 to 493 A. D., was educated in the camp of Attila, but entered afterwards the service of the West Roman empire, and held a high position in the imperial guard when (in 475) Orestes, commander-in-chief of the army, deposed the emperor, Julius Nepos, and placed his own son, Romulus Augustulus, on the throne. The army, consisting of barbarian mercenaries, now demanded of Orestes that one-third of the soil of Italy should be given up to them for permanent settlement; and when Orestes refused, the soldiers chose Odoacer for their leader, and a war broke out which ended with the defeat and death of Orestes and the abdication of Romulus. Aug. 25, 476, the Roman senate declared the West Roman empire dissolved, constituted the kingdom of Italy, and gave the crown to Odoacer, the first barbarian who wore it. He was acknowledged by Zeno, the Byzantine emperor, took up his residence at Ravenna, and governed with energy and moderation. For several years Italy enjoyed peace. The laws and institutions were maintained, the Church was respected, and several campaigns in Dalmatia and Noricum were successfully carried through. Meanwhile, Theodoric, the king of the Ostrogoths, crossed the Alps, instigated and perhaps supported by Zeno, and in three great battles Odoacer was defeated, and finally shut up in Ravenna. Here he held out for more than two years, but capitulated on the condition that he and Theodoric should rule as joint kings. The agreement was confirmed by a solemn oath, but a few days afterwards Theodoric had Odoacer put to death, Mar. 5, 493.

Odom′eter, or, more correctly, **Hodom′eter** [Gr. ὁδός, a "way," and μέτρον, "measure"], an instrument by means of which the distance travelled by a carriage or other vehicle, or even a person walking, is registered.

O'Don′nell (Leopold), Marshal, duke of Tetuan, count of Lucena, and captain-general in the army of Spain, b. Jan. 12, 1809, at Santa Cruz in Teneriffe, was the son of Lieut.-Gen. Carlos O'Donnell, a descendant of an Irish gentleman exiled with James II.; entered the army; became a colonel, and for his services against the Carlists at Lucena (1839) was made a grandee and lieutenant-general. In 1840 he abandoned the cause of Espartero, his patron, by whom he was twice driven into exile; but in 1843, after Espartero's fall, he was made captain-general of Cuba, where he became moderately wealthy. In the insurrections of 1854 he took a prominent part; was for the time reconciled with Espartero, and thenceforth often war-minister and a leading conservative politician at Madrid. In 1859–60 he commanded in Morocco; captured Tetuan Feb. 6, 1860; retired from public life in July, 1866. D. at Biarritz Nov. 5, 1867.

O'Don′ovan (John), LL.D., b. at Atatcemore, county Kilkenny, Ireland, July 9, 1809, son of a small farmer; was employed about 1830 in the historical department of the ordnance survey of Ireland, with the object of settling the orthography of places on the ordnance maps by the testimony of Gaelic MSS. and local traditions; repeatedly visited every county in Ireland in executing this commission; was called to the bar 1847, but never practised law; published a *Grammar of the Irish Language* (1845); edited *The Book of Rights* (1847), the superbly printed work *The Annals of Ireland by the Four Masters, from the Earliest Historic Period to A. D. 1616, consisting of the Irish Text from the Original MS., and an English translation*, etc. (Dublin, 3 vols. 4to, 1848–51; 2d ed. 7 vols., 1856; see O'Clery, Michael); became professor of the Irish language, history, and archæology at Queen's College, Belfast (1849), with a salary of only £100; aided Prof. Eugene O'Curry in editing the Brehon laws (1853); was editor of several curious works for the Irish Archæological and Celtic societies. D. at Dublin Dec. 9, 1861. A work prepared by him for the press, O'Clery's *Martyrology of Donegal, a Calendar of the Saints of Ireland* (Dublin, 1864), has been issued since his death.

Odontaspid′idæ [from *Odontaspis*—ὀδούς, ὀδόντος, a "tooth," and ἀσπίς, a "buckler"—the typical genus], a family of sharks most nearly related to the mackerel sharks; the body is, however, in shape more like that of the ordinary sharks, the tail being much prolonged backwards; the head is depressed, oval, and with the snout pointed; the eyes have no nictitant membrane; the nostrils are simple and remote from the mouth; the mouth inferior and with a wide gap; the teeth are nail-like and with basal cusps in both jaws, and in the upper jaw on each side, near the symphysis, are small ones; the opercular apertures are of moderate width, five in number, and all in advance of the pectorals; minute spiracles are persistent and far behind the eyes; the dorsal fins are two, the first in advance of the ventrals, the second at least partly anterior to the anal; the caudal has a small inferior lobe; the tail has no pits at the root, and no lateral keels. The family has but few, and perhaps not more than two, living species, *Odontaspis ferox*, an inhabitant of the Mediterranean Sea, and *Eugomphodus litoralis*, a denizen of the east coast waters of the U. S., and, according to Günther, also represented at the Cape of Good Hope and in the Tasmanian seas. The American species is popularly known as sand-shark. Theodore Gill.

Odontoglos′sa [from ὀδούς, ὀδόντος, "tooth," and γλῶσσα, "tongue"], a group of pectinibranchiate gasteropods, of the sub-order Rhachiglossa, distinguished by the dentition. The radula or lingual ribbon has three longitudinal rows of teeth, the central of which is narrowest and fixed, and the lateral, also fixed, are broad and armed with numerous denticles. It includes the families *Fasciolariidæ* and *Mitridæ*. Theodore Gill.

Odontol′ogy [from ὀδούς, ὀδόντος, "tooth," and λόγος, "discourse"], that branch of zoology which treats of the structure and development of the teeth arming the mouth of vertebrate animals. (See Teeth.) Theo. Gill.

Odontop′teris [Gr. ὀδούς, "tooth," and πτέρις, "fern"], a genus of fossil ferns occurring in the Carboniferous rocks, so called from the tooth-like form of their pinules. Their fronds are usually bipinnate, the pinules adherent by their entire base, without midrib, and supplied with nerves which spring from the rachis along the entire base.
J. S. Newberry.

Odontor′nithes [ὀδούς, "tooth," and ὄρνις, "bird"], an extinct group of birds with teeth, as yet known only from the Cretaceous of Kansas, where their remains have been found in excellent preservation. These birds are divided into two well-marked orders—Odontotormæ and Odontolcæ, from the Greek word for tooth combined with τόρμος, "socket," and ὁλκός, "furrow" or "groove." The Odontotormæ have the teeth small, compressed, and pointed, directed more or less backward, and set in distinct sockets. The order contains, as far as known, only two genera. The first and best-known genus is *Ichthyornis*, so named from the vertebræ, which, even in the cervical region, have their articular faces biconcave, as in fishes. The wings are well developed, and the scapular arch and bones of the legs conform closely to the true bird-type. The sternum is keeled, and has elongated grooves for the expanded coracoids. The sacrum, as in living birds, is composed of a large number of co-ossified vertebræ. The length of the tail is unknown. These birds were carnivorous and probably aquatic. *Ichthyornis dispar*, Marsh, was about the size of a pigeon, and *Apatornis celer*, Marsh, was about as large, but of somewhat more slender proportions. The Odontolcæ have the teeth in grooves. This group is represented by the *Hesperornis regalis*, Marsh, a large bird measuring between five and six feet from the bill to the toes, and in many points of structure closely resembling the loons of the present day. It was not, however, a flying bird, as the wings were small or rudimentary, and the sternum was destitute of a keel. The pelvis resembles in a side view that of the cassowary, but is much more slender. The ilium, ischium, and pubis are separate at their posterior extremities, and the acetabulum is closed internally by bone, except a foramen that perforates the inner wall. The vertebræ are of the ordinary bird-type, but those of the tail are provided with elongated and flattened transverse processes, and the flattening even includes the terminal co-ossified vertebræ, so that there is no true ploughshare-bone. The tail was not long, but may have been of use in swimming, as in the beaver. No other birds are known to possess teeth, as the supposed teeth of *Archæopteryx*, upon the slab containing that fossil, belonged, as stated by Owen, to a fish; and the *Odontopteryx*, described by that author from the Eocene clay of London, has only serrations on the bony jaw. similar to those found, in a less degree of development, in the jaws of the merganser and other living birds.
O. C. Marsh.

Œcolampa′dius (Johannes), whose true name was Hans Hussgen, b. at Weinsberg, Suabia, in 1482; studied first jurisprudence at Bologna, then theology at Heidelberg, subsequently Greek under Reuchlin at Stuttgart, where he also learned Hebrew from a Spanish Jew, and received an appointment as teacher in 1516 at Bâle, where he assisted Erasmus in his *Annotations* on the New Testament. Luther's writings immediately made a very deep impression on him, and for some time he lived in the castle of Ebernburg as chaplain to Franz von Sickingen. In 1522 he returned to Bâle as preacher and professor in theology, and after the disputations at Baden (1526) and Berne (1528) he succeeded in introducing the Reformation in Bâle and Ulm. In the controversy between Luther and Zwingli concerning the Lord's Supper he gradually adopted the views of Zwingli, which he maintained in his *De Genuina Verborum Domini, "Hoc est Corpus meum," Expositione* (1525), and in his disputation with Luther at Marburg in 1529. He was an accomplished scholar, and a character of great gentleness, which procured for him the name of the "Swiss Melanchthon." He was married, and d. at Bâle Nov. 24, 1531. Besides the above-mentioned dissertation he wrote *De ritu paschali; Epistola canonicorum indoctorum ad Eccium*, and several commentaries and introductions to the books of the Old Testament. There are biographies of him by Hess (Zurich, 1791), Herzog (Bâle, 1843), and Hagenbach (Elberfeld, 1859).

Œcumenical Council. See Council, Œcumenical.

Œde′ma [Gr. οἴδημα, "swelling"], in pathology, a term denoting a puffed and swollen state of any tissue or organ, most commonly caused by the exudation of fluids into the œdematous tissue. If œdema is caused by obstruction to the circulation, by a watery state of the blood, resulting in disturbed relations between the tissues and the blood in respect to osmotic action, or by any other than a strictly local cause, it is called passive œdema; if associated with local inflammation, it is active œdema.

Oe′denburg, town of Western Hungary, near the Lake of Neusiedl, 37 miles S. E. of Vienna, with which it communicates by railway. Its old fortifications have been demolished with the exception of a huge watch-tower, the highest in Hungary; remains of the Roman time are also found, and the town is generally well built. P. 23,222.

Œd′ipus, in Grecian mythology, a son of Laius, king of Thebes, and Jocasta, was exposed by his father on account of an ill-boding oracle, but was saved by a shepherd and brought to Corinth. Misunderstanding another oracle, he left Corinth and went to Thebes: on the way he unawares slew his father, and at Thebes married his mother. She bore him two sons, Eteocles and Polynices, and two daughters, Antigone and Ismene; but the hidden horrors of his life were subsequently revealed to him. Jocasta hanged herself; between Eteocles and Polynices there was a deathly hatred, and they slew each other; Œdipus put out his own eyes and wandered blind, guided by Antigone, from Thebes to Colonus in Attica, where he died in the grove of the Eumenides. The legends of Œdipus, of which the two baneful oracles and his meeting with the Sphinx, whose enigma he unriddled, form the mystical but singularly suggestive centre, were often treated by the Attic tragedians, and there still exist two tragedies on this subject by Sophocles, *King Œdipus* and *Œdipus at Colonus*.

Œ'gir, in Scandinavian mythology, the god of the ocean, did not belong to the Asa family, nor did he live in Asgaard. He descended from the dark ages before Odin slew Ymer, and was a jotun himself, but he stood in friendly relation to Odin.

Œh'lensläger (Adam Gottlob), b. Nov. 14, 1779, at Frederiksberg, a suburb of Copenhagen, where his father was steward of the royal summer palace; received a rather desultory education; tried various occupations; studied jurisprudence for some time under the direction of his friend, A. S. Oersted, and adopted finally poetry as his calling. In this he was not mistaken. His first publications, *Digte* (1803), a collection of poems, containing the dramatic sketch *St. Hans Aften Spil*, and *Poetiske Skrifter* (1805, 2 vols.), containing *Vaulundurs Saga* and *Aladdin*, made a deep impression on his countrymen. The young generation received an awakening and inspiring influence from these books, and it soon became evident that with them a new period was inaugurated in Danish literature, in Danish civilization. With a stipend from the government he travelled from 1805 to 1809 in Germany, France, Switzerland, and Italy; lived for some time at Halle with Steffens, at Weimar with Goethe, at Coppet with Madame de Staël; and wrote some of his finest tragedies, *Hakon Jarl*, translated into English by F. C. Lascelles (1874), *Palnatoke*, *Correggio*, translated into English by Theodore Martin (1854). On his return to Copenhagen he was appointed professor in æsthetics at the university in 1810. Meanwhile, a controversy between the old rationalism of the eighteenth century and the new romantic school broke out on almost every field of spiritual life in Denmark, and by degrees it formed itself into a contest between Baggesen and Œhlensläger, which grew very hot and lasted for several years, till Baggesen left Denmark in 1820. Œhlensläger did not take part personally in the controversy. He wrote during this period *Helge*, *Hroars Saga*, and *Nordens Guder* (1819), one of his principal works, a cycle of ballads representing the Scandinavian mythology, translated into English by W. E. Frye (1845). But he suffered much, and of his numerous and varied productions (twenty-four tragedies) written after 1820, none can compare with the works of his youth. But his disciples carried farther, with great success, what he had begun. (See Danish Literature and Language.) He d. at Copenhagen Jan. 20, 1850. A complete edition of his works was published at Copenhagen in 32 vols. (1857–65). Selections from his works are very numerous.

Oels, town of Prussia, in the province of Silesia, on the Oelse. It has manufactures of linen and cotton fabrics, leather, and tiles, and flax of a superior quality is extensively cultivated in its vicinity. Pop. 10,157.

Œnan'thic E'ther and **Acid.** Œnanthic ether was a name given by Liebig and Pelouze to an ether existing in all wines, giving them their characteristic odor. It remains behind as an oily liquid when large quantities of wine are distilled; obtained in larger quantities by distilling wine-lees after mixing with half their bulk of water. Thus prepared, it is an oily liquid with a strong vinous odor, of a gravity of 0.862, very soluble in alcohol and ether, boiling between 225° and 300° C. According to Liebig and Pelouze, the constitution is $C_{18}H_{36}O_3$; Delffs considers it identical with ethyl pelargonate, $C_9H_{17}(C_2H_5)O_2$. The vapor density rather favors the former views. By treating œnanthic ether with an alkali and decomposing by sulphuric acid, an acid is obtained, which solidifies at 13° C. to a buttery mass above that temperature, being of an oily consistency and soluble in alkalies, ether, and alcohol. Pelouze and Liebig assigned the formula $C_{14}H_{28}O_3$, and called it œnanthic acid; and while Delffs claims that it is pelargonic acid, Fischer claims that it is a mixture of capric and caprylic acids. (Pelouze and Liebig, *Ann. Ch. Pharm.* xix. 241; Delffs, ibid., lxxx. 290; Fischer, ibid., cxv. 247.) A solid substance called œnanthic ether, which is manufactured in Bavaria and used for flavoring inferior wines, was exhibited in the International Exhibition of 1862. (Hofmann's *Report*, p. 113.) E. Waller.

Œnop'ides (Οἰνοπίδης), a Grecian astronomer and philosopher of Chios, who is commonly supposed to have been a contemporary of Anaxagoras; is named among the Greeks who visited Egypt and became acquainted with the learning of the Egyptians; is said to have claimed the discovery of the obliquity of the ecliptic; invented a cycle for bringing into agreement the solar and lunar year, which invention he inscribed on a brazen tablet and set up at Olympia. He proposed also a theory of the rise and fall of the waters of the Nile, and an explanation of the Milky Way as the original pathway of the sun. H. Drisler.

Œnothera. See Primrose.

Oe'rebro, town of Sweden, at the influx of the Swartelf into the Hjelmar Lake, manufactures carpets, waxcloth, woollen goods, and guns. Pop. 11,785.

Oer'sted (Hans Christian), b. at Rudkjöbing, in the Danish island of Langeland, Aug. 14, 1777. His father was an apothecary, and in the shop he made his first studies and experiments. In 1794 he repaired to the University of Copenhagen, together with his elder brother, Anders Sandöe (b. Dec. 21, 1778; d. May 1, 1860), who became a celebrated jurist and a statesman of great influence in Danish politics. In 1799 he took the degree of doctor of philosophy, on which occasion he wrote the *Architectonics of Natural Metaphysics*. After travelling from 1801 to 1803 in Holland, Germany, and France, he was appointed extraordinary professor in natural philosophy at the University of Copenhagen in 1806, and his lectures soon attracted attention on account of their lively and popular form, and their latent though omnipresent enthusiasm. To awaken the interest of his countrymen for the study of nature, and to spread among them some knowledge of this science, were the aim of his life, and he succeeded in establishing a polytechnic school in Copenhagen, of which he was director from 1829, and in introducing natural science as an element of instruction in the Latin schools. During a scientific journey in Germany in 1812 and 1813 he wrote an essay on the identity of chemical and electrical forces, in which he for the first time shadowed forth his ideas of the unity of electricity and magnetism which he had entertained since 1800. But his great discovery on this point was not made until 1819, and was communicated to the world in a little pamphlet in 1820: *Experimenta circa efficaciam Conflictus electrici in Acum magneticam.* The discovery was immediately accepted, and honors were showered on the discoverer. His other writings comprise a large number of minor essays, most of which were translated into German, and two larger works, *Naturlärens mechaniske Deel* ("Manual of Mechanical Physics") and *Aanden i Naturen*, which latter has been translated into English by Miss Horner under the title *The Soul in Nature.* It contains many details of great logical sharpness and delicate poetical sense, and as a whole it makes a refreshing impression of clearness and repose. D. in Copenhagen Mar. 9, 1851.

Oe'sel, an island of Russia, in the Baltic and belonging to the government of Livonia. Area, 1200 square miles. Pop. 46,000. Wheat, rye, oats, and barley are raised, cattle, sheep, and horses are reared, and considerable fishing is carried on. It belonged to Denmark until 1645, when it was ceded to Sweden, which again ceded it to Russia in 1721. The population is originally Wendish.

Œsoph'agus [Gr. οἰσοφάγος], the gullet, that part of the alimentary canal that leads from the pharynx to the stomach. In the adult man it is nine inches long, extending in a nearly vertical line from the fifth cervical vertebra through the posterior mediastinum and through the œsophageal foramen of the diaphragm, ending in the cardiac orifice of the stomach. It has an outer or muscular coat, containing an outer layer of longitudinal muscle-fibres, and another of similar annular fibres, the upper fibres being chiefly striped and partly voluntary in the upper part, but entirely involuntary and non-striated in the lower portion. The middle or cellular coat abounds in glands which open by a long duct. The innermost or mucous coat is lined by scaly epithelium. In calibre the œsophagus is the smallest part of the alimentary tube. In the lower animals the œsophagus has several modifications, the most remarkable of which is that singular dilatation which is called the *crop*, and which is observable in gallinaceous and vulturine birds, etc. Most articulate and many molluscous organisms have also a so-called œsophagus.

O'Fallon (Col. John), b. at Louisville, Ky., Nov. 23, 1791; served under Gen. Harrison in the war of 1812; was severely wounded at Tippecanoe; became a merchant at St. Louis, Mo.; acquired great wealth; endowed the

O'Fallon Polytechnic Institute with property worth $100,000, and was a liberal benefactor of Washington University and other educational and charitable institutions, having spent more than $1,000,000 in this manner.

Ofan'to, the ancient *Aufidus*, a river of Southern Italy, rises 6 miles E. of Monte Marano, enters the Adriatic 4 miles N. W. of Barletta, after a course of 75 miles. The battle of Cannæ was fought on its right bank near its mouth.

Of'fa, king of Mercia, succeeded Ethelbald 757, after defeating his rival Beornred; defeated Cynewulf, king of Wessex, thereby annexing the districts of Oxford and Gloucester; conquered the "Welsh march-land," between the Severn and the Wye, 779, which he peopled with Saxon colonies, and constructed for its protection the celebrated dike, 100 miles long, known by his name, which for several centuries was the boundary between England and Wales; established an undisputed suzerainty over the Heptarchy; murdered Ethelbert, king of East Anglia, and took possession of his kingdom 792; founded the abbey of St. Alban's; drew up a code of laws. D. July 29, 796.

Of'fenbach, town of Germany, grand duchy of Hesse-Darmstadt, on the Main. It has extensive manufactures of carriages, musical instruments, jewelry, carpets, hosiery, paper, tobacco, and pipes. Pop. 28,449.

Offenbach (Jacques), b. at Cologne June 21, 1819, of Jewish parentage; studied from 1835 to 1837 at the Conservatory of Paris; played afterwards the violoncello in the orchestra of the Théâtre Comique; became in 1847 leader of the orchestra of the Théâtre Français: established in 1855 the Bouffes Parisiens, and composed a great number of burlesque operas and scenes, of which *Barbe bleue, Orphée aux Enfers, La Belle Hélène, and La Grande Duchesse*, were the most applauded. D. at Paris, Oct. 4, 1880.

Of'fenburg, town of Baden, Germany, on the Kinzig, carries on a considerable trade in grain and wine, and has 7274 inhabitants. In 1853 a statue of Sir Francis Drake was erected here in commemoration of his introduction of the potato into Europe.

Office, in law. This consists in the right and obligation of one or more persons to exercise the duties of a place of public or private trust, and to receive the compensation attached to it. An office is either judicial or ministerial. The one requires the exercise of judgment and discretion; the other involves obedience to the direction and judgment of others. The two classes of duties are sometimes combined, so that the office may be partly judicial and partly ministerial. A ministerial office of a public nature may be in England the subject of ownership: the office of high sheriff may thus be hereditary. In this country no such view prevails. An office is deemed to be held for the benefit of the public, and it has in it no element of property. Unless protected by the Constitution, it may be abolished by the legislature, so as to displace an existing incumbent, and he will have no legal remedy. There is an important distinction between judicial and ministerial offices in the matter of acting by deputy. In the former class of cases official acts must be performed personally. A judge, even though for the time being incapable of acting, cannot summon a member of the bar, however learned and experienced, to take his place. The public have stipulated for his personal skill and judgment. In the case of ministerial offices a different rule prevails. The duties of a sheriff or of a clerk of a court are largely discharged by deputy, the principal officer remaining responsible for a proper discharge by the deputy of his duties. This doctrine cannot be extended so far as to permit the sheriff or other ministerial officer to make a sale of the office. This is not only contrary to the policy of the common law, but was at an early day prohibited in England by statute, followed in some of the States of this country. It is important to distinguish accurately between such a sale and the act of creating a deputy. In a strict sale the officer would place the purchaser in possession of the office, who would act in his place and in his own name. On the other hand, as it would usually be impracticable for such an officer as a sheriff to perform personally all the duties pertaining to his office, he is allowed to select subordinate officers, called under-sheriffs, deputies, or jailers, who will act in his stead, and perform duties in his name. They are merely instruments for the performance of his duties. If the high sheriff dies or is removed, his deputies cease to have an official existence except so far as statutes may otherwise provide. (See Sheriff.) The law does not even allow the office of a deputy to be made the subject of sale by the principal officer. Thus, to continue the illustration from the same office of sheriff, that official would not be allowed, in general, to farm out the office of deputy sheriff for a fixed sum, though he might take a percentage of the profits or returns, except that if the compensation of the deputy was itself fixed by law, the sheriff could not lawfully, in making an appointment, stipulate to receive a portion of it. The test is whether the fees belong to the sheriff before any selection of a deputy is made. If they do, he may lawfully agree for a percentage of them. As an appointment to public office involves considerations of importance to the State, the law will tolerate no contract looking to the employment of irregular influences for obtaining it. Any secret agreement whereby the emoluments are to be divided between the officer and a person who may procure or solicit the appointment is deemed to be a fraud upon the appointing power, and accordingly void as between the contracting parties. In some instances an office is held by a number of persons, and this may be true whether it be public or private. It is the common rule, in a public office, in this case, that all must meet for deliberation, while a majority may act; while in the case of a private office, all must both meet and concur in a conclusion. The rule is sometimes modified by statute. Thus, in the case of a court consisting of a number of persons, it is frequently provided that a majority shall form a quorum, and of the number present a majority may decide a cause. The common law rule is found in many instances to be too rigid for the purposes of practical convenience. There was a special rule in the common law designed to secure an impartial and intelligent administration of justice in the courts. It provided that no judicial office should be held in reversion (or to commence at a future day), nor should it be created for a term of years, but at most for life or during good behavior. The reason of these rules is sufficiently obvious. If a judicial office were to commence hereafter, there would be no certainty that competency to perform its duties would then exist. If an office of this kind were granted for a fixed time, the incumbent might die before the fixed period had elapsed, and the residue of the term would pass to executors, etc. who might not have the requisite qualifications. However, this last difficulty may be readily obviated by a provision that the term of years shall not exceed the life of the appointee. The judges of the highest courts in some of our States are chosen in this way by the people. The present tenure in New York is fourteen years, limited by the life of the incumbent, as well as by his attaining the age of seventy. The question of the incompatibility of offices is sometimes important. The same person may seek to hold an office both under the State and Federal government, or two or more offices under the same government. There are some cases in which it is plain that both offices cannot be held at the same time by one person. One cannot be both judge and sheriff; an acceptance of one office would be an implied resignation of the other. In other cases the legislature have power to declare that the holding of one office is inconsistent with the enjoyment of another. It may accordingly declare, where constitutional provisions do not conflict, that a person holding an office under the U. S. government shall not hold a State office, or that the acceptance of one office under a State government shall preclude an appointment to another. There are instances in which State constitutions provide that all votes cast for the higher judges of the courts by the legislature or at a State election for any office of trust and profit other than judicial shall be inoperative and void. Though this provision in form operates upon the electors, in substance it disqualifies the judge from accepting while in office any other office of trust, etc. (For other topics affecting this subject see Officer, Information, Quo Warranto.)

T. W. Dwight.

Office Found. See Inquest of Office.

Officer, in law, one who holds an office. (See Office.) The subject will be considered under the following divisions: I. The different kinds of officers, including officers *de facto* and *de jure;* II. The mode of appointment, including official oaths and bonds and removal; III. Tenure of office; IV. The effect of their acts, including liability for misconduct; V. Compensation.

I. While the various powers of government are either legislative, executive, or judicial, it is common only to consider those as officers who attend to judicial and executive duties. Members of the legislature are not in general called officers. Thus, sec. 4 of art. ii. of the U. S. Constitution, which provides that all "civil officers" of the U. S. shall be removed from office on conviction upon an impeachment, does not apply to members of the legislature. However, if the intent be sufficiently plain, it is not to be doubted that members of the legislature may be designated by this term. The word "officers," as used in this article, will only include persons having executive and judicial duties to perform. A distinction is frequently taken between officers *de facto* and *de jure*. By the latter expression is meant one who is rightfully in office; by the former, one who actually fills the place, although he may be a usurper. A person is with a certain looseness of expression sometimes called an officer *de facto* who is rightfully an officer and has all the evidences of lawful appointment, but who has committed an act whereby his office may be forfeited. It is, however, conceived that the correct term then is an officer *de jure* having a defeasible title. No one can raise a question as to the act of forfeiture except the State by an appropriate legal proceeding. It may waive the forfeiture, whereupon the officer's tenure is indefeasible and absolutely perfect. On the other hand, when an office is usurped it originates in a wrong and can have no element of right in it, even though some statute of limitation may prevent its rectification. The acts of an officer *de facto* are upheld as far as the public or third persons are concerned, although, as between him and the true officer, they may be nugatory; so, when an officer *de facto* is plaintiff and suing for property in his official character, he might be precluded from all recovery on account of the vice or infirmity in his appointment. But it would be plainly contrary to public policy and subversive of the ends of justice to maintain that the acts of an officer *de facto* should be wholly nugatory. It would, then, happen that the acts of a judge who happened to have received a certificate of an election to office, when in fact he was not elected, would be so completely nugatory that all judgments which he had rendered would be absolutely void, and all criminals who had been imprisoned or executed under his order would have been unlawfully bereft of liberty or murdered under forms of law. No such doctrine could, of course, be tolerated. If, however, a legal controversy takes place between an officer *de facto* and *de jure* as to the lawfulness of the former's title, the whole question of the right to the office must be considered as though he had never exercised official functions. This may take place by an appropriate legal proceeding, such as a writ of *quo warranto* or an information in the nature of a *quo warranto*.

II. The general mode of selection of officers in use in this country is either appointment by the U. S. or State executive, or election by the people or some part thereof. Under the U. S. Constitution, it is provided that the President shall nominate, and with the advice and consent of the Senate appoint, ambassadors, other public ministers and consuls, judges of the supreme court, and all other officers of the U. S. whose appointments are not in the Constitution otherwise provided for and which shall be established by law. To this direction there is a qualification to the effect that Congress may by law vest the appointment of such inferior officers as they think proper in the President alone, in the courts of law, or in the heads of departments. There is thus a distinction taken between "inferior" officers and those of another and superior class. The Constitution, however, points out no mode of distinguishing between the two. It is certainly reasonable to consider that all those specially named in the clause referred to—viz. ambassadors, public ministers, etc.—are not inferior officers, and, accordingly, Congress has no power to affect the mode of appointment by the nomination of the President and the advice of the Senate. It will be observed that in the case of the so-called "inferior" officers Congress can only vest the appointment in one of three agencies pointed out in the Constitution—either in the President alone or in the courts of law or in the heads of departments. It follows that it would not be lawful to provide for an election of these officers by the people directly. The theory of the Constitution is to adopt for the selection of judicial and administrative officers the mode of appointment rather than of election. On the other hand, under the State constitutions, a different theory is in general adopted. The plan of election of officers either by the entire people of the State or by a certain portion of them, as represented in city, village, and town organizations, usually prevails. In many of the States this is true even of judicial officers of the highest grade. It is commonly required that officers should take an oath of office before entering upon their duties. (See Oath.) In many instances, particularly where the receipt and disbursement of money are involved, or where the acts of the officer may be such as to affect the persons or property of individuals so as to give them a right of action, an official bond is required. There has been much discussion upon the point whether those acts are of such a nature as to precede the vesting of the powers and duties of the office, or whether the office vests before they are performed, and a failure to fulfil these requirements of the law is to be regarded as a ground of forfeiture. On this latter view the appointee would have the office, but would hold it by a defeasible title, subject to legal proceedings for a forfeiture. The decision of this question will depend much upon the language of the statute creating the office. If an officer was prohibited from *holding* the office before taking the oath or filing the bond, those acts would be vital to his existence as an officer; but if the language is that before he enters upon the duties of his office he must give a bond, etc., he will be an officer, though liable to have his office withdrawn by appropriate proceedings.

The power of removal from office is closely connected with that of appointment. The exact nature of its connection is a matter of great magnitude under the provisions of the U. S. Constitution, as there is no specific mention of the power of removal. It is clear that, as to all officers whose term of office is not explicitly mentioned in the Constitution, there is a power somewhere vested to remove them at pleasure. The only point of difficulty is as to the branch of government invested with its exercise. Is the power of removal vested in the President alone, or is it in him in conjunction with the Senate? As to the "inferior" officers already referred to, so far as Congress has power to regulate the mode of appointment, it may prescribe the term of office as well as the manner of removal. But in the absence of authorized legislation the stress of the inquiry is whether the sole power of removal is vested in the President alone, or in the President in conjunction with the Senate. It can scarcely be said that this question is as yet definitely determined. It has been claimed, on the one hand, that the power of the President to nominate, and with the advice of the Senate to appoint, involves the power to remove, and that this power of removal is vested solely in him. It is argued that removal is in its nature an executive act, and that it is indispensable to the right administration of public affairs that the President, who is responsible to the country for the proper management of the various departments of government, should be able to displace at once men who have proved incapable or unfaithful. Without this power of removal he cannot be held responsible for the misconduct of his subordinate; with it, the people may directly fasten upon him the consequences of mismanagement or corruption. If it be said that too vast a power is thus conferred upon him, the answer is that he is under the check of impeachment and removal from office, and that of public opinion acting promptly and efficiently by reason of our system of frequent elections. On the other hand, it is urged that the power of the President to *nominate* does not include the power to remove, and that this latter power can only be implied from that of *appointment*. Any implication of removal derived from that power would include the Senate, since the appointment is not complete by the action of the President alone. If this view be correct, wherein the power to appoint is vested in the President, by and with the advice and consent of the Senate, removal can only take place by the action of the President with the same advice and consent. The former view prevailed in the time of Washington in both houses of Congress by a narrow majority; in the House of Representatives by a vote of thirty-four members against twenty, and in the Senate by the casting vote of the Vice-President. It is a matter of recent history that this question led to a great struggle between the houses of Congress and President Andrew Johnson. It is not necessary to enter into the details of the contest. Prior to the accession of President Grant (Mar. 2, 1867) an act was passed by Congress regulating the tenure of certain civil officers. (See also the act of Apr. 5, 1869.) These statutes are in substance re-enacted in the *Revised Statutes of the U. S.*, §§ 1767–1775. These sections provide that every person holding any civil office to which he may be appointed with the advice and consent of the Senate shall be entitled to hold the office for the term for which he was appointed, unless sooner removed with the same advice and consent. This general rule is qualified by the further provision that (with the exception of the judges of the U. S. courts) there may be, during the recess of the Senate, a suspension by the President of any civil officer appointed as before stated until the end of its next session, and in the mean time some other person may be designated by the President to perform the duties of the suspended officer. Within thirty days after the commencement of the session the President is to nominate persons to fill the place of all officers suspended; and if the Senate, during the session, shall refuse to advise and consent to an appointment in the place of any suspended officer, then, and not otherwise, the President shall nominate another person as soon as practicable to the same session of the Senate for the office. The President has power by the Constitution and laws to fill all vacancies which may happen during the recess of the Senate by reason of death or resignation or expiration of term of office, by granting commissions which shall expire at the end of the next session. Nominations to permanently fill these offices should regularly be made to the Senate for confirmation within thirty days after the commencement of the next session after the vacancy is filled. If no appointment is made during that session, the office remains in abeyance, without any salary, fees, or emoluments. The same rule is applied to all the offices in question vacant at the commencement of the session and not filled by temporary appointment. (*Revised Statutes*, § 1769.) The power of removal by the executive of a State is to some extent regulated in the State constitutions. It is impossible to refer to these provisions in detail. As to the large number of State offices which are filled by election for a definite term, the governor would not in general have any power of removal unless for good cause, and the officer would have a right to be heard by way of defence. As to those which are directly filled by appointment of the executive, with the advice and consent of the State senate, the same general questions as to the power of removal might be presented as have been referred to in connection with the office of the President of the U. S. Removal from a private office, such as that of a president of a university, is governed by different considerations. Such an appointment may assume the form of a contract, and may be governed by the rules upholding the obligation of contracts. (*Allen* v. *McKeon*, 1 Sumner's Reports, 276.)

III. When the term of office is fixed by the constitution, it cannot, of course, be reduced by the action of legislative bodies. It has also been decided that if the constitution declares an office to be elective, but leaves the length of the term to the discretion of the legislature, and this is subsequently fixed and an officer elected, his term of office cannot be extended by legislative act, since for the extended period he would not hold by election. (*People* v. *Bull*, 46 New York Reports, 57.) In other cases the term is in the discretion of the legislature. There are but few offices under the U. S. Constitution in respect to which the term is prescribed. The judges of the supreme and inferior courts hold during good behavior. This is not true of the territorial judges. Territorial courts, not being provided for in the Constitution, but being established by Congress, are not protected by the constitutional provision. The practice has been to appoint them for a term of years. All offices specifically created by the U. S. Constitution not being judicial in their nature are established for a term of years. The same term is usual in the State constitutions, and is largely made applicable even to judicial offices. Where no term is fixed by a constitution, the whole subject is under the control of the legislature, which may at any time abolish the office without making compensation to the officer. So it may enlarge official functions without making an increase of compensation.

IV. The duties of a public officer of course depend upon the law under which he is created. It is not within the scope of this article to state the various requirements of the statutes. It is only of importance to refer to general principles of law governing official conduct. The presumption of law is that official duties have been rightly performed. There is in general a presumption of authority, and not of usurpation. If a statute gives an officer discretionary power to be exercised by him upon his own opinion of certain facts, the prevailing rule of construction is that the statute makes him the exclusive judge of the existence of the facts. This rule is not to be applied to subordinate officers, who possess no authority except such as is conferred upon them by statutes, and their right to act is made to depend upon the existence of some fact. If they erroneously determine that such fact exists, and they act accordingly, their acts are void, and they may become personally liable for the consequences. The acts of a public officer when unlawful may either cause an injury to an individual or to society at large. In the former case the law gives a remedy to the individual by action; in the latter case the State may proceed against the wrong-doer by indictment or by impeachment. It is no defence to an officer, when called upon to answer in a court of justice for an illegal act, that he acted under the orders of the head of an executive department, nor is it important that he acted upon the high seas under color of naval discipline. This rule was applied in a case where a naval officer illegally assaulted and imprisoned one of his subordinates. In the great mass of cases coming before the courts the act complained of is one of negligence. (See NEGLIGENCE.) For personal neglect involving a breach of duty the officer is in general responsible, as where a superintendent of a canal negligently permits a sunken boat to remain in the canal, whereby damage is caused to the complainant. Still, public officers are not in general liable for the neglect or wilful acts of their subordinates, causing damage to individuals, where they have used reasonable care in their selection of servants. Thus, the postmaster of a city is not liable for the misconduct of a clerk in purloining money from letters, unless personal misconduct or neglect can be brought home to the postmaster himself. Some suggestions should be made as to the power of public officers to bind the government by contracts. It is well settled that they cannot bind the government by any acts beyond or contrary to the authority given them by law. The government is to be regarded as the principal and the officer as an agent; and if the government has limited its liabilities by statute, the restrictions are binding upon all who deal with the officer, as they are bound to take notice of the statute. Thus, the head of an executive department can bind the government by contract only when expressly authorized by law, or where an appropriation is made to be expended by him for a specific purpose. In this last case the officer acts without authority if he exceeds the appropriation. It is a further rule that the officer is not personally liable if he acts in the line of his duty and in the course of his authority. His engagements are binding upon the government, and not upon himself. This is true though he affix his own private seal to the contract. A public officer may, if he see fit, by the use of appropriate language, make himself exclusively liable or jointly with the government. Whenever he acts without authority he fails to bind the government, and will in general make himself personally liable.

There are some acts of the official heads of executive departments acting as instruments of the President of the U. S., which are not the subject of judicial cognizance. Whether this be the case or not must depend upon the nature of the act to be done. If one of the heads of departments is acting as the political or confidential agent of the executive merely to execute his will or to perform some matter in which there is a discretionary authority, his act cannot be examined judicially, though a different rule prevails where a specific duty is assigned by law and individual rights depend upon the performance of the duty. In this last case an individual who deems himself to be injured may have recourse to the law for redress. Questions frequently arise as to the liability of a ministerial officer, such as sheriff or constable, acting at the time under the order of a court. The real inquiry is whether the order will protect the officer. The general rule is that if the magistrate or court has jurisdiction (see JURISDICTION) over the subject, and an execution (see EXECUTION) regular in its form is issued, the officer cannot be held liable as a wrong-doer for rendering obedience to the order. A different rule will prevail if there is a want of jurisdiction. The order of the court to seize a debtor's property and to sell it to satisfy the debt does not point out the debtor's property, but leaves it to the sheriff's judgment to ascertain what can be properly regarded as belonging to the debtor. The officer in that respect acts at his peril, and can be sued by any party injured by a wrongful seizure. On the other hand, if the court itself points out specifically what property is to be taken by an officer, he has no discretion. He must obey, and can shield himself under the judicial mandate. Public officers are also criminally liable in certain cases for neglect of duty or oppression or extortion. These offences are in general misdemeanors. They may also be urged as grounds for a forfeiture of the office in the course of an appropriate legal proceeding. (See INFORMATION and QUO WARRANTO.) The great frauds and embezzlements recently practised by municipal and other officers have led in some of the States to stringent legislation. Thus, in New York the act of wrongfully obtaining and converting to one's use public money with intent to defraud, or wilfully paying or auditing a false claim whereby such money shall be obtained and converted, is made a felony, and punishable by imprisonment in a State prison (chap. 19, laws of 1875). The delinquent officer may also be liable to impeachment (see IMPEACHMENT), and also, in some instances, to removal from office by the action of the executive on due notice and hearing. (For these points, the constitutions and statutes of the respective States must be consulted.)

V. There are some important points to be noted concerning the compensation of officers. In some instances they are paid by fees; in other cases there is a compensation fixed by law and paid out of the public treasury. On an appointment to office compensation does not in general commence until the officer is liable to duty. Thus, if an officer in the navy should receive an antedated commission, he is not entitled to pay from the time of the date, but only from the time of his acceptance of the office. So, if an officer be suspended under the authority of the U. S. from service, and be subsequently restored, he is not entitled to compensation during the period of the suspension unless the order is revoked as made without cause and by mistake. If an officer be removed by the appointment of another, he practically continues in office until he receives notice of the appointment of his successor, and is entitled to compensation up to that time. There is quite a number of provisions in the statutes of Congress affecting the compensation of officers. (*Revised Statutes*, §§ 1760-1766,

§ 1782, § 1784, § 1790.) The principal of these are that no person who holds an office under the U. S. government, the annual compensation attached to which amounts to the sum of $2500, shall receive compensation for discharging the duties of any other office unless expressly authorized by law, and that no allowance or compensation shall be made to any officer or clerk by reason of the discharge of duties which belong to any other officer or clerk in the same or any other department, and that no allowance or compensation shall be made for any extra services whatever which any officer or clerk may be required to perform, unless expressly authorized by law, and finally that no officer in any branch of the public service or any other person whose salary or pay is fixed shall receive any additional pay or compensation in any form for the disbursement of public money or other service unless the same is authorized by law, and the appropriation therefor explicitly states that it is for such additional pay or compensation (§§ 1763–1765). Under provisions of law similar to these, it has been decided by the supreme court of the U. S. that the government is not liable upon an agreement by the head of a department to pay a clerk who continues to hold his place and draw pay as a clerk in the department for services rendered outside of the scope of his employment; *e. g.* making inquiries and collecting information in a foreign country. As a general rule of law, and without reference to prohibitory legislation, a salaried officer cannot claim compensation for additional duties imposed upon him by the legislature (*Smith* v. *New York*, 37 New York Reports, 518), nor can he claim extra compensation on the ground that he has performed the duties of his office with extraordinary diligence.

(Further information as to the subject of this article may be sought in the statutes of the respective States, and in Cole *On the Law and Practice of Quo Warranto* and in Tancred on the same.) T. W. Dwight.

Off'set, in surveying is a short course measured at right angles to a longer one. The method of surveying by offsets is used when the lines to be determined are irregular. It is also used in locating the positions of prominent objects lying near the principal lines of a survey. The method of determining the position of an irregular line by means of offsets is to run a straight course in the general direction of the line, and at suitable points of this course to measure offsets to the line in question; then, knowing the distance of each offset from the origin of the auxiliary course, the length of each offset, and its direction, whether to the right or left, the corresponding points of the line in question may be plotted. The irregular line found by joining these points will be an approximate representation of the line to be determined; the more numerous the offsets, the closer will be the approximation. The method of offsets is particularly valuable in filling in the outlines of a topographical survey, and especially in tracing the courses of roads, streams, and coast-lines.

O'Flanagan (James Roderick), b. in Farmoy barracks, in the county of Cork, Ireland, Sept. 1, 1814, studied law, was admitted to the bar of Ireland in 1838 and went the Munster circuit, and was in 1846 appointed a crown prosecutor for the city of Cork. He has published *Impressions at Home and Abroad* (London, 1837, 2 vols.), *Historical and Picturesque Guide to the Blackwater in Munster* (London, 1844), *The Life and Writings of John D'Alton* (1861), *Bar Life of O'Connell* (1866), *The Lives of the Chancellors of Ireland* (1870, 2 vols.), *The Irish Bar* (1879), besides a couple of sporting novels—*Bryan O'Regan* and *Captain O'Shaughnessy's Sporting Career* (2 vols.)—and numerous contributions to the press.

Ogalalla, cap. of Keith co., Neb. (see map of Nebraska, ref. 10–C, for location of county), on Union Pacific R. R. Pop. in 1880, 114; in 1885, 349.

Og'den, R. R. junction, Boone co., Ia. (see map of Iowa, ref. 4–G, for location of county), has several grain-elevators, a steam flouring-mill, and is situated in a rich farming section. Pop. in 1880, 568.

Ogden, important R. R. centre (Ogden City P. O.), cap. of Weber co., Ut. (see map of Utah, ref. 2–G, for location of county), at the confluence of the Weber and Ogden rivers, at the mouth of Ogden Cañon, and at the junction of the Central Pacific, the Union Pacific, and the Denver and Rio Grande R. Rs., has large agricultural and mining interests. Pop. in 1870, 3127; in 1880, 6069.

Ogden (Aaron), LL.D., b. at Elizabethtown, N. J., Dec. 3, 1756; graduated at Princeton 1773; served gallantly through the Revolution, in which he was successively aide-de-camp to Lord Stirling and to Gen. Maxwell, and was distinguished at Yorktown; became a lawyer after the peace; was boundary commissioner for New Jersey; was U. S. Senator 1801–03, governor 1812–13; commanded the New Jersey militia during the war of 1812, and became president-general of the Society of Cincinnati. D. at Jersey City Apr. 19, 1839.

Ogden (David), b. at Newark, N. J., in 1707; graduated at Yale College 1728; studied law in New York; became the head of his profession in New Jersey; became judge of the Supreme Court 1772; was regarded as a Tory, though anxious for an equitable settlement of the questions between Great Britain and the colonies; took refuge in New York 1776; retired to England 1783, his property having been confiscated: returned to the U. S. in 1790, and d. in Queens co., L. I., in 1800.

Ogden (John), A. M., b. at Mount Vernon, O., in 1824; removed in childhood to what is now Crestline, O; was educated by his own efforts; studied at Wesleyan University, Delaware, O., and for three years was principal of its normal department, and then for three years principal of the McNeely (O.) State Normal School; was principal of the State Normal School, Winona, Minn., 1859–62; served in the U. S. volunteers 1862–65; was the founder of Fisk University, Nashville, Tenn., and for a time its principal; afterward became connected with the normal school at Worthington, O.; author of *The Science of Education.*

Ogden (William B.), b. in Delaware co., N. Y., 1805; studied law for some time, but entered in 1826 into business; was elected to the legislature of New York in 1834; moved in 1836 to Chicago, of which city he was the first mayor, and for whose prosperity he did very much by his immense transactions in real estate, railroads, canals, and the lumber business. D. at Fordham Heights, N. Y., Aug. 4, 1877.

Og'densburg, city and R. R. centre of St. Lawrence co., N. Y. (see map of New York, ref. 1–H, for location of county), on the St. Lawrence River, at the mouth of the Oswegatchie River, 72 miles below Lake Ontario. It was incorporated in 1868. It is the head-quarters of the Northern Transportation Company's line of screw-steamers plying between Chicago and intermediate lake ports, and has good water-power, finely-shaded streets laid out at right angles, a post-office and U. S. court-rooms costing $275,000, a good supply of water, 3 fine parks, and a marine railway. It has considerable commerce, and is a port of entry. Pop. in 1870, 10,076; in 1880, 10,341.

Ogee'chee Lime, the *Nyssa capitata*, a small tree of the order Cornaceæ, growing in wet places in the Southern States. It has a soft wood and a remarkably sour edible red fruit about an inch long.

Ogeechee River rises in Green co., Ga., flows in a course generally parallel to that of the Savannah River, and falls into Ossabaw Sound. Its lower waters are navigable for steamers, and a large part of its course for keel-boats.

Ogham is the name of a secret alphabet once in use by the Irish and other Celtic nations, but neither the origin nor the meaning of the name is known. The alphabet is often used on tombstones, but the inscriptions seldom contain more than a name. Such stones are frequent in Ireland, and a few are found in Scotland and Wales.

O'gilby (Frederick), b. in Ireland Dec. 27, 1814; came early to America; was educated in Rutgers College and the General Theological Seminary; became deacon in Grace church, New York, then rector of the Church of the Ascension, Philadelphia, and in 1855 assistant minister of Trinity church, New York. D. in New York Mar. 25, 1878.

Ogilby (John), b. in Edinburgh, Scotland, Nov., 1600; translated Homer, Virgil, and several other classic authors; published a number of atlases of various regions of the world, and was author of *America, being the most accurate Description of the New World* (London, folio, 1671); conducted the poetical part of the coronation pageantry 1661; erected a printing-house in London 1667, and was appointed royal cosmographer. D. at London Sept. 4, 1676.

Ogilby (John D.), D. D., b. about 1808; graduated at Columbia College, N. Y., 1829; was rector of the grammar school of that institution 1829–30; professor of languages at Rutgers College 1832–40; became a clergyman of the Protestant Episcopal Church, and was professor of ecclesiastical history in the general theological seminary, New York, from 1841 until his death at Paris in 1851. Author of *An Argument against the Validity of Lay Baptism* (1842), and of *The Catholic Church of England and America* (1844).

O'gilvie (James), b. in Scotland about 1760; came to America about 1785; established a classical academy at Richmond, where Winfield Scott, the future general, and other celebrated men were his pupils; retired to the backwoods of Kentucky, where in a log cabin he composed a series of lectures afterwards delivered with success in the Atlantic States; went to Scotland to lay claim to a peerage about 1819, and d., probably by his own hand, at Aberdeen Sept. 18, 1820. He published *Philosophical Essays* (1816).

Ogi Takato. See APPENDIX.

O'gle (BENJAMIN), b. in Maryland in 1749; was in the provincial council before the Revolution; was governor of Maryland 1798–1801; d. at Annapolis July 6, 1809.—SAMUEL OGLE, proprietary governor of Maryland 1735–42, and 1747–52, had previously held office in Ireland. D. 1751.

Oglesby (RICHARD JAMES), b. in Oldham co., Ky., July 25, 1824; left an orphan at the age of eight years, he removed to Decatur, Ill., in 1836; learned the carpenter's trade, which, with farming, occupied his time until 1844, meanwhile studying law, and in 1845 was licensed and commenced practice at Sullivan. In 1846 he returned to Decatur, and was commissioned first lieutenant in the 4th Illinois regiment (Col. E. D. Baker's), and with which he participated at Vera Cruz and Cerro Gordo. Resuming his practice at Decatur in 1847, he pursued a course of study at the Louisville Law School, graduating in 1848; in 1849 he journeyed overland to California and engaged in mining until 1851, when he again resumed his residence and practice at Decatur. In 1858 he was defeated for Congress, but was elected to the State senate in 1860, which seat he resigned, and accepted the colonelcy of the 8th Illinois Volunteers; commanded a brigade at capture of Forts Henry and Donelson, and made brigadier-general Mar. 21, 1862, remaining in command of brigade until the battle of Corinth, where he was severely wounded, and disabled until April, 1863, when he returned to duty, having meanwhile (Nov., 1862) been promoted to be major-general, and was assigned to the 16th corps. Resigned May, 1864, and in November of that year was elected governor of Illinois (1865–69); re-elected in 1872, but chosen U. S. Senator Jan., 1873, and served through the term ending 1879.

Oglethorpe, cap. of Macon co., Ga. (see map of Georgia, ref. 5–G, for location of county), on the Flint River and on the Georgia Central R. R. Pop. in 1870, 400; in 1880, 442.

Oglethorpe (JAMES EDWARD), b. in London Dec. 22, 1696; entered the army 1710; went to Oxford 1714; served under Prince Eugene and Marlborough 1715–17; entered Parliament in 1722 for Haslemere; obtained a charter in 1732 and a grant for the founding of Georgia and the colonization of poor debtors in that province; founded Savannah 1733; received the Protestant emigrants of Salzburg 1734, and soon after revisited England, but returned to Savannah with John and Charles Wesley in 1735; in 1736 he took a regiment of troops thither; became in 1737 a colonel and commander-in-chief in Carolina and Georgia; made an unsuccessful attack on St. Augustine 1739–40, and in 1742 repelled by stratagem the attack of the Spaniards upon Georgia; returned finally to England 1743; served as major-general against the Pretender 1745; was court-martialled for misconduct 1746, but acquitted; became lieutenant-general 1747, and general 1765, when he retired upon half pay. D. at Cranham Hall, Essex, July 1, 1785. (See his *Life*, by Robert Wright, 1867.)

O'glio [anc. *Ollius*], a river of Northern Italy, rises in the Rhætian Alps, flows through Lombardy, and joins the Po, after a course of 150 miles, near Borgoforte, 10 miles S. W. of Mantua.

O'Gor'man (JAMES), D. D., b. in Ireland in 1814; came to the U. S., and 1859 was consecrated Roman Catholic bishop of Rhaphanea *in partibus infidelium*, and appointed vicar-apostolic of Nebraska. D. July 4, 1874.

Ogowai, a river of Western Africa, is formed in lat. 40′ S., 100 miles from the coast, by the junction of the Okanda and the N'gooyai, and has been explored up to this point. In the dry season it is navigable for light-draught steamers up to Goombi, 95 miles from the coast, but in the wet season it rises 15 feet and carries an immense quantity of water to the Atlantic through its several mouths.

Og'yges, in Greek mythology, the first king of Thebes, whose oldest gate was called after him the Ogygian. During his time the waters of Lake Copais rose above its banks and inundated the whole valley of Bœotia. An Ogygian deluge is also spoken of in Attica, and Ogyges himself is sometimes represented as a Bœotian autochthon, sometimes as an Egyptian king, and was brought into manifold connections with the earliest legendary history of Greece.

Ohi'o, one of the Central States of the U. S., between 38° 23′ and 41° 58′ N. lat. and 80° 31′ and 84° 48′ W. lon.: bounded on the N. by Michigan and Lake Erie, on the E. by Pennsylvania and West Virginia, on the S. by West Virginia and Kentucky, and W. by Indiana; greatest length from N. to S., about 210 miles; breadth, 195 miles; area, 41,060 square miles, or 26,278,400 acres.

Ohio, by census of 1880, ranks 3 among the States in population, 3 in value of agricultural products, and 5 in value of manufactures.

Face of the Country, etc.—The greater part of the surface is a table-land about 1000 feet above the sea-level, rising to a height of 1300 or 1400 feet on the watershed which separates the waters flowing into Lake Erie from the tributaries of Ohio River, and attaining nearly the same height in the line of hills which crosses the State just below the parallel of 40°. From this table-land there is a gentle descent to Lake Erie on the N., and a somewhat more rapid descent to Ohio River on the S. In the N. and N. W. parts of the State there are prairies of considerable extent. The lake-shore of the State is 230 miles in length, and Ohio River has a course of 436 miles of navigable waters along the S. and S. E. The *rivers* of the State are the Ohio and its tributaries on the N. bank—viz. the Mahoning, the Muskingum (formed by the junction of Walhonding and Tuscarawas rivers), the Scioto and its principal affluent, the Olentangy or Whetstone River, the Little Miami, and the Great Miami. The principal rivers flowing into Lake Erie are the Maumee, Sandusky, Huron, Vermilion, Black, Rocky, Cuyahoga, Chagrin, Grand, Ashtabula, and Conneaut. The lake-shore has not many bays or indentations, but there are good harbors at Cleveland, Sandusky, and Maumee Bay.

Seal of Ohio.

Mineralogy.—The Carboniferous system as developed in Ohio is a portion of the great Appalachian coal-field. It occupies in Ohio about 12,000 square miles. But, though all the groups found in this area belong to the Carboniferous system, they are by no means all of them coal-bearing. Beginning with the W. border of the coal-field, a short distance E. of Portsmouth, and following a nearly N. N. E. line almost to Lake Erie, the strata are developed in the following order: the Waverley group, succeeding immediately to the Erie shale, and consisting of the Cuyahoga shale, the Berea grit, the Bedford, Cleveland, and other shales; next above this comes the Lower Carboniferous limestone, succeeded by a thick conglomerate; and next in order the lower coal-measures, in which, interstratified with fire-clays, sandstones, limestones, and shales, there are seven distinct veins of coal of different qualities, but all, or nearly all, valuable either for combustion, smelting, or gas-producing purposes. The lower coal-measures have an average thicknses of about 400 feet. Next to these succeed the lower barren measures, also about 400 feet thick, in which there are local seams of coal occurring among the beds of limestones, sandstones, and shale. The upper coal-measures come next, about 350 feet in thickness, and, like the lower coal-measures, containing, interstratified with sandstones, limestones, clays, and shale, six more coal-veins, some of them of great value. Still above this are found irregular deposits, in some places attaining a thickness of 300 feet, of what are known as the upper barren measures, containing thin local seams of coal. The amount of coal in this district is roughly calculated at 3,000,000,000 tons. The Devonian system comes to the surface in immediate connection with the Waverley group, which forms the rim of the coal-basin on its W. side. Here we have, in descending order, the Erie shales; the shales, flagstones, limestones, and water-lime of the Portage and Chemung groups; the slates, shales, and limestones of the Hamilton group; a narrow belt of the Utica shales; and the Silurian system comes to the surface with its limestone and sandstone strata of the Niagara group, underlaid immediately by the Helderberg limestones. Iron-ore of excellent quality extends over an area of nearly 12,000 miles in the S. part of the State, where the coal is readily accessible. The amount of iron-ore mined annually exceeds 600,000 tons. Salt is also largely produced from salt springs. Petroleum is produced to the extent of about 1,500,000 gallons in the State; lime is burned to the amount of 500,000 barrels, and water-cement to a moderate extent. There are numerous quarries of excellent sandstone and limestone for building, and grindstones and buhr- or mill-stones. There are numerous mineral springs in the State, and large deposits of marl in the Maumee Valley and elsewhere.

Soil and Vegetation.—In 1820 nearly four-fifths of the surface of the State was covered with forests; now there is but little more than one-fifth. The principal forest-trees are, among the evergreens, a few pines, hemlocks, tamaracks, cypresses, and spruce, mainly found in the N. portions of the State, and some of them only in the swamps; and of deciduous trees, white, red, Spanish, black, burr, swamp, jack, and swamp white oak, blue, white and black ash, beech, black, sugar, and red or swamp maple, butternut, shagbark, thick shellbark, mockernut, and pignut hickory, white, red or slippery, and water elm, sycamore, hackberry, dogwood, ironwood, hop hornbeam, black walnut, butternut, yellow poplar or tulip tree, buckeye, papaw, five species of poplar, including the white poplar, quaking ash, cottonwood, balsam poplar or tacamahac, and balm of Gilead; red and wild or black cherry, linden, five species of thorn, honey locust, box elder, redbud, Kentucky coffee tree, several species of mulberry, gum tree, sassafras, etc. The flora of the State includes most of the flowering plants common to the Eastern States and a large proportion of those peculiar to the Mississippi Valley. Among the medicinal plants, ginseng, valerian, colombo, gentian, cohosh, mandrake, blood and snake roots are indigenous.

Climate.—There is a very marked difference between the climate of the N. and S. portions of the State. The former is characterized by rigorous winters and generally a heavy fall of snow, which lies long on the ground; the summers and autumns are temperate and agreeable. In the S. part the summers are long, and characterized often by intense heat; the winters are usually mild, with but little snow. The State is very healthful. Mean temperature of the year: Cleveland (lat. 41° 30′, lon. 81° 47′, elevation 685 feet), 45.87°; Portsmouth (lat. 38° 45′, lon. 82° 54′, elevation 523 feet), 55.83°. Mean annual rainfall: Cleveland, 38.43 inches; Portsmouth, 38.32 inches.

Zoology.—Very few of the larger wild animals are left in the State. The bear is nearly extinct; the large or gray wolf and the coyote or prairie wolf are rare; deer are occasionally seen, and the raccoon, opossum, skunk, weasel, ground-hog, as well as rabbits, hares, squirrels, and the smaller rodents, are abundant in some parts of the State. Game-birds are plentiful in their season, and most of the birds of prey and song-birds found in New York and Pennsylvania are found in Ohio. Of the reptiles, the number and species are those common to Pennsylvania and the States of the Mississippi Valley. Most of the streams are stocked with trout, black bass, perch, roach, and other fresh-water fish, considerable attention having been paid to fish-culture. Lake Erie has a bountiful supply of the lake white-fish, the salmon or lake trout, etc.

Agricultural Productions.—By the census of 1880, Ohio produced of the great cereals Indian corn, 111,877,124 bushels (ranking fifth in order of production); wheat, 46,014,869 bushels (ranking third in production); oats, 28,664,505 bushels; barley, 1,707,129 bushels; rye, 389,221 bushels; buckwheat, 280,229 bushels. The wool-clip of 1880 yielded 25,003,756 pounds. Of tobacco there were raised, in the census year 1879, 34,735,235 pounds, it being the fourth largest production among the States, the crop being valued at $2,653,234.

*Farm Animals.**—By census of 1880, Ohio had 736,478 horses, 19,481 mules, 1,860,186 cattle, 4,902,486 sheep, 3,141,333 swine. The number of sheep is larger than in any other State.

Fisheries.—These are quite valuable, principally on Lake Erie, though the Ohio and other rivers have furnished important contributions to the food-supply. Total value of fish taken in 1880, $518,120.

Manufactures.—Ohio is a great manufacturing State, producing furniture, textile fabrics, iron and steel manufactures, glassware, pottery, wooden-ware, agricultural implements, machinery, etc. In 1880 there were in all 20,699 manufactories, employing 183,609 hands, paying in wages $62,103,800, with capital invested of $188,939,614; aggregate products, $348,298,390. The value of iron and steel fabrics produced was $34,918,360, and of glassware $1,549,320. The amount of coal mined in 1881 was 8,250,000 tons, ranking Ohio as second in the production of this staple. The salt industry in 1880 employed twenty-five establishments, with $832,600 capital, producing 2,650,301 bushels, valued at $363,791. The cotton-factories in 1880 ran 42 looms, 14,328 spindles, employing 563 persons, and using 10,597 bales of cotton.

COUNTIES.	*Ref.	Pop. 1870.	Pop. 1880.	COUNTY TOWNS.	Pop. 1880.
Adams	8–D	20,750	24,005	West Union	626
Allen	3–D	23,623	31,314	Lima	7,567
Ashland	3–G	21,933	23,883	Ashland	3,004
Ashtabula	1–J	32,517	37,139	Jefferson	1,008
Athens	7–G	23,768	28,411	Athens	2,457
Auglaize	4–D	20,041	25,444	Wapakoneta	2,765
Belmont	5–I	39,714	49,638	St. Clairsville	1,128
Brown	8–D	30,802	32,911	Georgetown	1,293
Butler	6–C	39,912	42,579	Hamilton	12,122
Carroll	4–I	14,491	16,416	Carrollton	1,136
Champaign	5–D	24,188	27,817	Urbana	6,252
Clark	5–D	32,070	41,948	Springfield	20,730
Clermont	7–C	34,268	36,713	Batavia	1,015
Clinton	7–D	21,914	24,756	Wilmington	2,745
Columbiana	3–J	38,299	48,602	New Lisbon	2,028
Coshocton	4–G	23,600	26,642	Coshocton	3,044
Crawford	3–F	25,556	30,583	Bucyrus	3,835
Cuyahoga	2–H	132,010	196,943	Cleveland	160,146
Darke	5–C	32,278	40,496	Greenville	3,535
Defiance	2–C	15,719	22,515	Defiance	5,907
Delaware	4–E	25,175	27,381	Delaware	6,894
Erie	2–F	28,188	32,640	Sandusky	15,838
Fairfield	6–F	31,138	34,284	Lancaster	6,803
Fayette	6–E	17,170	20,364	Washington C.-H.	3,798
Franklin	5–E	63,019	86,797	Columbus	51,647
Fulton	1–D	17,789	21,053	Wauseon	1,905
Gallia	8–G	25,545	28,124	Gallipolis	4,400
Geauga	2–I	14,190	14,251	Chardon	1,081
Greene	6–D	28,038	31,349	Xenia	7,026
Guernsey	5–H	23,838	27,197	Cambridge	2,883
Hamilton	7–C	260,370	313,374	Cincinnati	255,139
Hancock	2–D	23,847	27,784	Findlay	4,633
Hardin	3–D	18,714	27,023	Kenton	3,940
Harrison	4–I	18,682	20,456	Cadiz	1,817
Henry	2–D	14,028	20,585	Napoleon	3,032
Highland	7–D	29,133	30,281	Hillsborough	3,234
Hocking	6–F	17,925	21,126	Logan	2,666
Holmes	4–G	18,177	20,776	Millersburg	1,814
Huron	2–F	28,532	31,609	Norwalk	5,704
Jackson	7–F	21,759	23,686	Jackson	3,021
Jefferson	4–J	29,188	33,018	Steubenville	12,093
Knox	4–F	26,333	27,431	Mt. Vernon	5,249
Lake	1–I	15,935	16,326	Painesville	3,841
Lawrence	8–F	31,380	39,068	Ironton	8,857
Licking	5–F	35,756	40,450	Newark	9,600
Logan	4–D	23,028	26,267	Bellefontaine	3,998
Lorain	2–G	30,308	35,526	Elyria	4,777
Lucas	1–E	46,722	67,377	Toledo	50,137
Madison	5–E	15,633	20,129	London	5,067
Mahoning	3–J	31,001	42,871	Youngstown	15,435
Marion	4–E	16,184	20,565	Marion	3,899
Medina	2–G	20,092	21,453	Medina	1,484
Meigs	7–G	31,465	32,325	Pomeroy	5,560
Mercer	4–C	17,254	21,808	Celina	1,346
Miami	5–C	32,740	36,158	Troy	3,803
Monroe	6–I	25,779	26,496	Woodsfield	861
Montgomery	6–C	64,006	78,550	Dayton	38,678
Morgan	6–H	20,363	20,074	McConnellsville	1,473
Morrow	4–F	18,583	19,072	Mt. Gilead	1,216
Muskingum	5–G	44,886	49,774	Zanesville	18,113
Noble	6–H	19,949	21,138	Caldwell	602
Ottawa	1–E	13,364	19,762	Port Clinton	1,600
Paulding	2–C	8,544	13,485	Paulding	454
Perry	6–G	18,453	28,218	New Lexington	1,357
Pickaway	6–E	24,875	27,415	Circleville	6,046
Pike	7–E	15,447	17,927	Waverly	1,539
Portage	3–I	24,584	27,500	Ravenna	3,255
Preble	6–C	21,809	24,533	Eaton	2,143
Putnam	2–D	17,081	23,713	Ottawa	1,293
Richland	3–F	32,516	36,306	Mansfield	9,859
Ross	7–E	37,097	40,307	Chillicothe	10,938
Sandusky	2–E	25,503	32,057	Fremont	8,446
Scioto	8–E	29,302	33,511	Portsmouth	11,321
Seneca	2–E	30,827	36,947	Tiffin	7,879
Shelby	4–C	20,748	24,137	Sidney	3,823
Stark	3–H	52,508	64,031	Canton	12,258
Summit	2–H	34,674	43,788	Akron	16,512
Trumbull	2–J	38,659	44,880	Warren	4,428
Tuscarawas	4–H	33,840	40,198	New Philadelphia	3,070
Union	4–E	18,730	22,375	Marysville	2,061
Van Wert	3–C	15,823	23,028	Van Wert	4,079
Vinton	7–F	15,027	17,223	McArthur	900
Warren	6–C	26,689	28,392	Lebanon	2,703
Washington	7–H	40,609	43,244	Marietta	5,444
Wayne	3–G	35,116	40,076	Wooster	5,840
Williams	1–C	20,991	23,821	Bryan	2,952
Wood	2–D	24,596	34,022	Bowling Green	1,539
Wyandot	3–E	18,553	22,395	Upper Sandusky	3,540
Total		2,665,260	3,198,062		

Railroads, etc.—In Jan., 1882, there were in operation in Ohio 6664 miles of railway (this State ranking second in railroad mileage). Cost of railways and equipments, $610,728,103; net earnings, $24,414,142; interest and dividends, $17,875,597. Several great trunk-lines permeate the State, notably the Ohio Central, Lake Shore, New York Chicago and St. Louis, Marietta and Cincinnati, Cleveland and Pittsburg, Cleveland Columbus Cincinnati and Indianapolis, and Pittsburg Fort Wayne and Chicago. There are 736 miles of canals in Ohio.

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* On farms only.

* Reference for location of counties. See map of Ohio.

Finances.—The assessed valuation of property in 1881 was: real estate, $1,097,509,830; personal, $427,936,111; total, $1,525,445,941. Rate of State tax, 29 cents on $100, producing $4,479,089; aggregate raised by taxation, 1880, State, county, and municipal, $25,756,658, exceeding the taxation of any State except New York and Pennsylvania. State debt, Nov., 1881, $5,200,000; total indebtedness, State and local, $48,753,954.

Commerce.—Direct foreign commerce is small, the imports of the three customs districts in 1881 being $234,958; domestic exports, $5,042,007. The indirect exportation, however, is heavy, and the internal commerce is prodigious, by R. R., rivers, and lakes. Ohio's shipping in 1881 aggregated 222 steam vessels and 196 sailing vessels, having a total capacity of 139,509 tons.

Banking Institutions.—There were in operation, Oct., 1881, in Ohio, 171 national banks, with capital of $25,689,000; circulation, $19,413,343; U. S. bonds to secure circulation, $22,187,300; aggregate deposits, $53,991,092. There were also 35 State banks and trust companies, with $2,792,180 capital and $9,824,966 deposits; 225 private bankers, with $4,996,387 capital and $23,759,529 deposits; and 6 savings-banks, with $11,195,102 deposits. Of insurance companies there were 38 reported in 1881, paying losses that year of $2,353,400: risks written, 1880, $382,178,150; premiums received, $3,981,958.

Education, etc.—The number of children of school-age (six to twenty-one years) in 1879 was 1,043,320; number enrolled in public schools, 1880, 752,442, with average daily attendance of 495,924. Aggregate expenditure for public schools, 1880, $7,707,630, of which teachers' salaries required $4,972,541. There were 35 universities and colleges in 1880, with 348 instructors and 5694 students, paying in tuition-fees $120,948. Normal schools, academies, and female seminaries abound, and commercial colleges are found in all the larger cities. The law and medical schools of Cincinnati and Cleveland are largely attended. The Ohio University, at Athens, Marietta College, Miami University, at Oxford, Kenyon College, at Gambier, Antioch College, at Yellow Springs, and the Cincinnati University are among the principal. There were published in Ohio, in 1882, 692 newspapers and periodicals, 49 daily.

Churches.—The Methodist Episcopal takes the lead, having 2121 churches, 1782 ministers, and 183,573 members; Lutherans, 572 churches, 320 ministers, 70,500 members; Presbyterians, 588 churches, 504 ministers, 68,893 members; Baptists, 622 churches, 439 ministers, 49,040 members; Roman Catholics, 472 churches, 390 priests, and about 370,000 Catholic pop.; Christians (Disciples of Christ), 425 churches, 217 ministers, 45,500 members; and 30 other denominations, with 40,000 to 100 members.

Population.—In 1860, 2,339,511; 1870, 2,665,260; 1880, 3,198,062 (white 3,117,920, colored 80,142, including 109 Chinese, 3 Japanese, and 130 Indians).

Principal Cities and Towns, Pop. 1880.—Cincinnati, 255,139; Cleveland, 160,146; Columbus (cap.), 51,647; Toledo, 50,137; Dayton, 38,678; Springfield, 20,730; Zanesville, 18,113; Akron, 16,512; Sandusky, 15,838; Youngstown, 15,435; Canton, 12,258; Hamilton, 12,122; Steubenville, 12,093; Portsmouth, 11,321; Chillicothe, 10,938; Mansfield, 9859; Newark, 9600; Ironton, 8857; Fremont, 8446; Bellaire, 8025; Tiffin, 7879; Lima, 7567; Xenia, 7026; Delaware, 6894; Massillon, 6836; Urbana, 6252; Circleville, 6046; Wooster, 5840; Norwalk, 5704; Galion, 5635; Marietta, 5444.

History.—The first explorations of the present territory of Ohio were made by the French under La Salle about 1680. Prior to La Salle's discovery the greater part of Ohio was inhabited by tribes of Indians superior in intelligence and civilization to the aborigines found here by the French. Their mounds and fortifications were constructed with an artistic skill to which the Indians of the last two or three centuries can lay no claim. But when the French soldiers passed through the country, or the American trappers and hunters visited it, they found there tribes of Indians differing in no respect from those of New York or Pennsylvania. There do not seem to have been any white settlers within the limits of the State previous to Apr., 1788, when a colony from New England founded Marietta. In December of the same year a settlement was made on the present site of Cincinnati. Virginia, Massachusetts, Connecticut, and New York all laid claim to portions of the territory, but all eventually ceded the right of eminent domain to the U. S., Virginia and Connecticut reserving, however, the ownership of about 3,700,000 acres each, the Connecticut lands forming what was called the Western Reserve, and the Virginia the region about the Falls of the Ohio, which eventually became a part of Indiana. The Western Reserve began to be settled about 1800. Settlers suffered from Indian incursions from 1792 till about 1799. Ohio was admitted into the Union as a State Nov. 29, 1802, with nearly its present boundaries. During the war of 1812 it suffered from repeated raids of British and Indian bands. The most noteworthy action of that war, so far as Ohio was concerned, was the battle of Lake Erie, fought Sept. 10, 1813, at Put-in-Bay, in which Com. O. H. Perry defeated a superior British squadron. From no other State was there so long or so grand a list of the foremost actors in the late civil war. The State was twice subjected to raids from Confederate bands, the second time by the guerilla chief Gen. John H. Morgan.

Governors.

TERRITORIAL.	
Arthur St. Clair	July, 1788–1802
C. W. Byrd (acting)	1802–03
STATE.	
Edward Tiffin	1803–07
Thomas Kirker (acting)	1807–08
Samuel Huntington	1808–10
Return Jona. Meigs	1810–14
Othniel Looker (acting).	1814
Thomas Worthington	1814–18
Ethan Allen Brown	1818–22
Allen Trimble (acting)	1822
Jeremiah Morrow	1822–26
Allen Trimble	1826–30
Duncan McArthur	1830–32
Robert Lucas	1832–36
Joseph Vance	1836–38
Wilson Shannon	1838–40
Thomas Corwin	1840–42
Wilson Shannon	1842–44
T. W. Bartley (acting)	1844
Mordecai Bartley	1844–46
William Bebb	1846–49
Seabury Ford	Jan., 1849–50
Reuben Wood	1850–July, '53
William Medill (acting),	July, 1853–Jan., '54
William Medill	1854–56
Salmon P. Chase	1856–60
William Dennison	1860–62
David Tod	1862–64
John Brough*	1864–65
C. Anderson (acting)	1865–66
Jacob Dolson Cox	1866–68
Rutherford B. Hayes	1868–72
Edward F. Noyes	1872–74
William Allen	1874–76
Rutherford B. Hayes	1876–77
Thomas L. Young	1877–78
Richard M. Bishop	1878–80
Charles Foster	1880–84
George Hoadly	1884–86
Joseph B. Foraker	1886–88

Revised by A. R. Spofford.

Ohio River, the largest of the affluents of the Mississippi in respect to its discharge of water, which averages 158,000 cubic feet per second, that of the Missouri being but 120,000 feet. The Ohio originates at Pittsburg, Pa., in the confluence of the Allegheny and Monongahela rivers. Its length below Pittsburg is 975 miles; total length to its ultimate source, 1265 miles. A straight line from Pittsburg to Cairo, Ill., at its mouth, measures 615 miles. Its drainage area is 202,400 square miles, according to Ellet, or 214,000, according to Humphreys. Its elevation at Cairo is 322 feet; at Pittsburg, 1021 feet. Its mean fall is .72 of a foot to the mile. Its mean rate of flow is about 3 miles an hour. Its mean rise in flood is some 30 feet above extreme low water; its maximum rise exceeded 60 feet. Above Cincinnati it is in many places fordable at low water, and is then for six or eight weeks scarcely navigable. It has two classes of islands; one kind is fertile, and the other mere sandbanks, called "tow-heads" by boatmen. With its numerous tributaries (some of them navigable the year through), it has fully 5000 miles of high-water navigation. It has no important rapids except at Louisville, Ky., where it falls 22½ feet in 2 miles. It was discovered in 1618 by the French under La Salle, and called by them *La Belle Rivière* ("the beautiful river").

Ohio Wesleyan University, an institution of learning at Delaware, O., chartered in 1843, and organized in 1844 under the auspices of the Ohio and North Ohio Conferences of the Methodist Episcopal Church; since then the Cincinnati, Central Ohio, and West Virginia Conferences have become officially related to it. It has fine grounds and above 800 varieties of trees and shrubs, the site having formerly been a noted watering-place called the Sulphur Springs, has an endowment of $350,000, and is well provided with buildings, museum, and all appliances of a first-class college. The entire property and endowment are estimated at $650,000. The number of students in 1883–84 was 791—310 in regular college classes—being the largest number in any college under the auspices of the Methodist Episcopal Church. The presidents have been Rev. Edward Thompson, D. D., LL.D. (subsequently bishop), 1846–60; Rev. Frederick Merrick, D. D., 1860–73; Rev. Lorenzo D. McCabe, D. D., LL.D., acting president, 1873–76; and Rev. Charles H. Payne, D. D., LL.D., inaugurated June, 1876. C. H. Payne.

Ohm. See Electricity, by Prof. Henry Morton, Ph. D., M. N. A. S.

Ohm (Georg Simon), b. at Erlangen, Bavaria, Mar. 16, 1787; studied in his native city, and was appointed professor in physics in 1817 at the Jesuit college of Cologne, director of the Polytechnic School in Nuremberg in 1833, and professor in 1849 at Munich, where he d. July 7, 1874. He discovered the so-called Ohm's Law (which see), set forth in his *Galvanische Kette, mathematisch bearbeitet* (Berlin, 1827), which was translated into English in Taylor's *Scientific Memoirs* (vol. xi., London, 1841), and was rewarded with the Copley medal by the Royal Society of

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* Died in office.

London. Besides his principal work, *Beiträge zur Molecularphysik* (Nuremberg, 1849), he has written, among others, *Bestimmung des Gesetzes, nach welchem die Metalle die Contact-Elektricität leiten* (1826). He has also made important contributions to the subject of acoustics.—His brother, Martin Ohm, b. at Erlangen May 6, 1792, studied at Berlin, and was appointed professor in mathematics in 1817 at Thorn, and in 1822 at Berlin, where he d. Apr. 1, 1872. He published *Versuch eines vollkommenen consequenten Systems der Mathematik* (9 vols., Nuremberg, 1822–52), and *Geist der mathematischen Analysis* (2 parts, 1842–45), of which the first part was translated into English by A. J. Ellis (London, 1843).

Ohm's Law. See Electricity.

Oiconomos (Constantine), one of the greatest scholars Greece has produced in modern times, b. at Zaritzani, in Thessaly, 1780, was in 1806 made coadjutor to the bishop of Salonica, and in 1809 professor at the academy of Smyrna. Called to Constantinople in 1819, he escaped when the patriarch was murdered, in 1821, and lived for several years in St. Petersburg. In 1834 he returned to Greece and settled in Athens, where he d. in 1857. He was a staunch defender of Greek orthodoxy.

Oil-Cake, the residue which is left after the expression of fixed oils from crushed or ground seed of any kind. It is used both as food and as a direct fertilizer. The cake is frequently pulverized before using, and is then called *oil-meal.* Linseed-oil cake is valuable for fattening cattle. It is largely exported from the U. S. to Great Britain. *Cotton-seed meal* is used for feeding cattle, and is a valuable manure. Rape-cake and colza-cake are fed to sheep or applied directly to the land.

Oil City, R. R. centre, Venango co., Pa. (see map of Pennsylvania, ref. 3–B, for location of county), on the Allegheny River, is located in the centre of the oil-district of Pennsylvania. It has several oil-refineries, an oil exchange, etc. Pop. in 1870, 2276; in 1880, 7315.

Oil, Cod-liver, a fixed oil obtained from the liver of the common cod (*Gadus morrhua*) and other species of *Gadus.* Cod-liver oil is prepared on the coasts of Newfoundland, Nova Scotia, and New England in our own country, and of Britain and Norway abroad. Since its large consumption in medicine, much better means of obtaining the oil pure and sweet have been adopted than were formerly employed. For this purpose the fish caught in boats near the shore are promptly landed, and the oil is obtained from the perfectly-fresh livers by various processes involving the application of heat and expression. Oil thus prepared is called "shore oil" and "pale oil." It is a clear, light-yellow, thick oil, of a perfectly bland taste, but of a disagreeable fishy flavor and smell. Other varieties of oil are called "straits" and "banks," or "light-brown" and "dark-brown" oil from their respective colors. They are prepared from livers which are not perfectly fresh or have actually begun to putrefy; they have a rancid, offensive flavor, and are unfit for use in medicine. Cod-liver oil is a very complex substance, containing, besides the usual ingredients of fats, certain biliary principles and small quantities of iodine, bromine, chlorine, and phosphorus. It is used largely in the arts, especially in the preparation of leather. For over 100 years the oil has been employed more or less for rheumatism, gout, scrofula, etc., but its present prominence in medical practice is principally due to a treatise on the oil by Dr. J. Hughes Bennett of Edinburgh in 1841. It is now a staple remedy in consumption and the above-named diseases, and for all conditions where there seems to be a dyspepsia for ordinary forms of fat, with emaciation and anæmia. When the oil acts favorably, the patient grows fatter and ruddier and the morbid symptoms tend to recede. Apparently, the virtues consist simply in the fact that cod-liver oil is an animal fat which, for some unknown reason connected with its peculiar composition, can be digested and assimilated under circumstances where the ordinary fats of food cannot. Cod-liver oil may be taken in quantities of a tablespoonful two or three times a day, and its fishy taste is best disguised by enveloping the dose in the froth of porter.

Edward Curtis.

Oil from Coal. See Petroleum, by C. F. Chandler.

Oil from Shale. See Petroleum, by C. F. Chandler.

Oil Gas. See Gas-Lighting, by C. F. Chandler.

Oil, Genesee, a local name for petroleum.

Oil, Mineral. See Petroleum, by C. F. Chandler.

Oil of Lin'seed has been mentioned before. (See Linseed Oil.) We add that in the U. S. this industry is divided between the seaboard, where India seed is almost exclusively employed, and the interior, where the domestic seed is consumed. The total product of seed grown in the U. S. in 1875 is estimated at 2,500,000 bushels of 56 pounds. The India seed imported in 1875 was about 1,000,000 bags of 3 bushels each, or 3,000,000 bushels, making the total quantity of linseed prepared in the U. S. in 1875 = 5,500,000 bushels. The American seed yields from 28–29 per cent. of oil; the India seed, 33½ per cent. The oil of American seed is darker and heavier-bodied than that from Indian seed, which is preferred for some purposes. It has been observed that the oil from India seed exposed to a cold of − 6° to − 9° F. is congealed, and if in this state it is subject to agitation in transportation by railroad it is permanently injured, never returning to a completely homogeneous state again. The oil from American seed is not so affected. The importation of linseed into the U. S. is of comparatively recent origin. The first cargo came in 1838–39 from Odessa by the ship Hercules. The India trade followed in ships used for carrying out ice to Calcutta. The foreign seed costs in New York about $2, gold, per bushel. The total product of oil from both foreign and domestic seed is about 47,600 tons. The oil-value of a bushel of seed is about $1.50, currency, and the value of the cake from the same 89 cents, and the cost of its manufacture is 40–45 cents. The cake is very largely exported to London, and is worth about $45, gold, per ton. The process employed in the manufacture of linseed oil in the U. S. is almost exactly that described in Muspratt's *Chemistry,* and more fully in Ure's *Dictionary.* (The above facts are in a private communication to the writer from a well-known manufacturer in New York.)

The composition of linseed is given by Way in the *Journal of the Roy. Agr. Soc.,* x. pt. 2, from four sources, as follows:

	Nitrogen, per cent.	Fat, per cent.	Ash, per cent.	Water, per cent.
From Riga	3.60	34.70	5.25	9.45
" Memel	3.33	36.00	3.56	8.74
" the Black Sea	3.31	38.42	5.64	10.22
" England, 1847	4.60	36.66	2.68	12.33
" " 1848	4.29	38.11	4.03	8.37

Anderson (*Highland Agr. Soc. J.,* 2d series, No. 69, p. 376) found in linseed oil 24.44 per cent of albuminous substance, 34.00 oil, 30.73 gum, sugar, and cellulose, 3.33 ash, and 7.50 water = 100. Meurin (*J. Pharm.* [3], xx. 96) has analyzed the several parts of linseed, as follows:

Episperm	Gum and soluble salts	14	
	Soft resin and fixed oil	1	
	Water	2	
	Matter insoluble in water and ether	4	= 21
Edosperm	Soft resin and fixed oil	6	
	Water	2	
	Soluble in water	3	
	Insoluble in water	12	= 23
	Fixed oil		30
	Water		5
	Matter soluble in water		3
	" insoluble in water and in ether		18 = 100

Linseed also contains a large quantity of mucilage, which is in the outer layers of cells of the epidermis, and swells up when macerated in water, bursting the cell-walls; 1 pint of linseed boiled in 16 of water gives a mucilage so thick as to draw out in threads and form a dark-colored mass when dry. This contains, besides mucilage, legumine, albumen, an organic acid, perhaps malic acid, and ash of lime, potash, iron, partly as phosphates, partly carbonates. (*Schmidt,* as quoted by Watts.)

The so-called "caoutchouc of oils" may be prepared in several ways, as by exposing linseed oil in thin layers it dries up to a transparent, resinous, moderately elastic mass resembling caoutchouc, which does not melt by heat, but carbonizes and burns. Linseed oil, nut oil, or poppy oil, heated to about 600°–700° F., takes fire and burns quietly until only tar or coal remains. If the burning be arrested by closing the vessel, a brown turpentine-like body, adhesive as bird-lime, remains. This substance, boiled continuously with water containing nitric acid (more water being added from time to time to check the too rigorous action of the nitric acid), acroleine is evolved, and the body becomes solid, of the consistence of plaster, resembles caoutchouc, and does not adhere to the fingers. It is then fusible only in part; forms an emulsion in carbon disulphide; shrinks when boiled with concentrated caustic alkali; dissolves only on addition of water; and is reprecipitated by acids; it is soluble in alcoholic potash, swells in ether free from alcohol, and partly dissolves in a larger quantity of ether; alcohol precipitates it from this solution. It swells without dissolving in petroleum, but dissolves completely in an excess of turpentine, which in small quantity only softens it. Its solution in turpentine remains unaltered on evaporation.

Chloride of sulphur in the proportion of 12–15 parts to

100 of linseed oil produces caoutchouc-like products which more of the sulphur compound hardens; dilute acids and alkalies do not attack them, but they are saponified by concentrated alkaline solutions. B. Silliman.

Oil of Tar. See Tar, by C. F. Chandler.

Oil of Turpentine. See Turpentine, by J. P. Battershall.

Oil of Tur'pentine, Medicinal Uses of. This oil is a powerful irritant, speedily producing redness and burning pain if kept too long in contact with the skin. Given internally, its most striking effect is a tendency in anything like overdose to cause great irritation, and even congestion, of the kidneys and urinary passages, with scanty and bloody urine, and severe pain in passing the same. Large doses act as an irritant poison, although death is rare. Oil of turpentine is used externally as a rubefacient to relieve pain or spasm of internal parts. For this purpose flannels wrung out in hot water are dipped in the oil previously slightly warmed, and after being again wrung dry are laid upon the skin. They should not be applied longer than from ten to twenty minutes, for fear of blistering or inflammation of the skin. Internally, the oil is given to control hæmorrhages, for which purpose it is often very efficacious. It is specially useful in bleedings from the stomach and bowels and in the ulceration of the latter organs in typhoid fever. Oil of turpentine is also used as a vermifuge and as an ingredient in cathartic enemata. The dose by the stomach ranges from a few drops to a fluidrachm, to be given in emulsion. The fumes of the oil, volatilized by the heat of boiling water, are inhaled to check bleeding from the lungs. Edward Curtis.

Oil, Olive, is obtained from the fruit of the European olive (*Olea Europæa*), a tree grown for this purpose from the most ancient times, both in Europe and Asia Minor. Over thirty varieties of the olive are grown in France, a catalogue of which is given in the new *Duhamel.* The wild olive has no value except as a stock on which approved sorts are engrafted. In the several departments of Southern France, where the famed virgin oil of Aix is made, the olives are gathered in November and December, when about two-thirds ripe. The favorite olive of this district is called *caiion;* another sort is called *brun* (the brown sort). When ripe this fruit is of mixed red, green, and purple color. The fruit is crushed entire in an edge-wheel mill of stone, driven by animal power usually, care being taken not to crush the stones or kernels, which contain a bitter principle and a poor oil. The virgin oil is dipped out of the mill after the fruit is reduced to a pulp, and is seldom sold in commerce separately, bearing the highest price, and used either by the proprietors of estates or for enriching poorer sorts. After removing the virgin oil, the pumace or *marc* is placed in coarse linen bags or preferably in circular mats of palm-leaf, called *coussins* (cushions), which have a central opening and are about eighteen inches in diameter. These bags are then piled on each other, the bottom of each one closing the opening of that beneath, to the number of ten to twenty or thirty, as may be. The screw-press is then applied, and the oil trickling down is collected by a circular gutter and runs into a tank. This gives the best market oil, and is called *première qualité.* The marc is then taken from the coussins, broken to powder by flat wooden shovels, and repacked in a second set of bags. This process is twice repeated on the dry marc, and a little additional oil obtained each time. After the third pressing about two quarts of boiling water are poured in each coussin, and the fourth pressing then yields a considerable volume of a lower-grade oil, which is used either to mix with other oils or for lubricating and burning oils and in soap manufacture. This treatment by boiling water gives the oil known as *au chaud,* and the process may be repeated, but always with an inferior quality of oil. The total quantity of oil obtained by the four pressings in the department of Var is from 40 to 50 litres for each 5 bushels of fruit, or about 3 imperial gallons to the Winchester bushel. This includes the first *chaud,* but not the subsequent pressings. "The mean produce of a tree in France is about 10 pounds of oil, and in Italy 15 pounds, but single trees have been known in fruitful seasons to produce 300 pounds of oil." (*Hillhouse.*) Even the purest virgin oil is turbid when first pressed. It clears itself by simply standing in the tanks, which on large estates are masonry cisterns underground, where the oil is kept at an even temperature for a long time, air being excluded, the feculence settling. The color of the best oil of Aix and of Tuscany is greenish.

The adulteration of olive oil is made chiefly at Marseilles by adding colza, rape, sesame, cotton-seed, and above all groundnut oil. The groundnut (American peanut, *Arachis hypogæa*) is grown extensively on the African coast expressly for its oil, which is often sold in commerce under the name of olive oil, and, while bland and inoffensive, has nothing of the fruity flavor of the genuine olive oil. The "sweet oil" of olives has a peculiar flavor, due to the fruit, not to be mistaken, and, like other acquired tastes, much in favor. In all Southern Europe it replaces butter and other animal fats for table and culinary use, and its production is a very important industry. The trees attain a great age and large dimensions, and do not come to full bearing under thirty years; they are all grafted varieties. Some groves have an historic celebrity, and are preserved with scrupulous care by stringent laws. Severe pruning is needed to develop the best fruit.

The pickled olive is an important article of commerce. The commoner sorts are simply treated with brine made aromatic with fennel, coriander-seed, cumin, and rosewood. But the *picholines* of Provence (so named from the *Picciolini,* who invented the process), the best pickled olives, are gathered green in October, and after selecting the finest are thrown into a weak alkaline liquor prepared from soda made caustic by lime. In this solution they remain eight or ten hours, till the pulp ceases to adhere to the stone. They are then steeped during a week in cold water renewed daily, and after this treatment (which removes the bitterness of the unripe fruit) they are transferred to an aromatic brine. For luxury the stones are sometimes removed, and the fruit stuffed with capers, truffles, or minced sardines, and closed air-tight in bottles of the finest oil. The picholine is the fruit of Duhamel's eleventh variety (*Olea oblonga*), the *Olea minor lucensis.* N. D., ninth variety, is also esteemed for pickling. (For an extended account of the olive consult Augustus L. Hillhouse in Michaux's *North American Sylva,* i. 50–88.)

In the U. S. the olive is successfully grown in Southern California, where the Franciscan monks planted olive-yards near the close of the last century. Humboldt (*On the Geographical Distribution of Plants*) says the olive requires a climate of a mean temperature of 57.17°, and that its coldest month must not fall below 41.5°. Such a climate is found in California, but nowhere on the eastern coast of North America. New Smyrna in Florida was founded for the cultivation of the olive by an adventurer who led thither a colony of Greeks about the middle of the last century, but in 1783 hardly a trace of this settlement remained, although Bartram, who visited it in 1775, describes it as a flourishing town. There is, however, every reason in respect of fitness of soil and climate for the successful culture of the olive in California. The olive tree is usually, almost uniformly, a biennial, fruiting only in alternate years; but at Aix, where the olive-harvest is in November, it is annual and uniform. In California, where nearly all fruit trees bear twice yearly, the olive is a perpetual bearer. (For many of the facts in reference to the department of Var in this article the writer is indebted to an intelligent American long resident in Southern France.) B. Silliman.

Oil, Palm. See Elæis and Palm Oil.

Oils [Lat. *oleum;* Gr. ἔλαιον]. The oils are liquid fats (see Fats) existing ready formed in nature. They are mostly fluid at ordinary temperatures, unctuous to the touch, stain paper with a permanent greasy spot, are insoluble in water, little soluble in alcohol (castor oil excepted), completely dissolved by ether, often, but not always, tasteless and odorless, and form soaps with alkaline bases, setting free glycerine. In short, the oils are glycerides, and fall under the general designation of fat-oils, including certain pasty sorts, like palm oil, cocoa oil, and other butter-like vegetal fats. The fat vegetal oils are all fixed, while the essential oils are all volatile. The volatility of some of the fatty acids forms no exception to this statement. The essential or volatile oils mostly exist ready formed in plants, from which they are obtained by distillation. They are distinguished from the fat-oils not more by their volatility and odor than by their action with alkaline bases, not being capable of saponification. The volatile oils are therefore separately considered (III.), while the fixed fat-oils are conveniently grouped with reference to their origin, as I. Vegetable Oils, and II. Animal Oils.

I. *Vegetable Oils.*—In plants the fat-oils exist ready formed, secreted chiefly in the seeds, sometimes in the flesh or pulp about the seeds, as in the olive, dogberry, etc., and much more rarely in the roots, as in the earth-almond (*Cyperus esculentus*), which contains 26 per cent. of oil disseminated in minute globules in the cellular tissue. In the oil-producing seeds the oil is often associated with albuminous matters, gum and mucilage; as in linseed, for example. When such seeds are bruised or ground and diffused in water, these albuminous bodies suspend the oil, entangled in a milky *emulsion* of a glairy and mucilaginous consistency. Linseed is a prominent example of this sort of seeds. The vegetal oils are usually divided into two groups: (1) *The drying oils*, like linseed oil, which on exposure to air absorb oxygen and dry to a resinoid surface or varnish; and (2) *the fatty or non-drying oils*, of which olive oil is an example. The latter class become rancid on exposure to air, but as a rule such oils do not dry up, although many of them thicken. This grouping of the vegetal oils is that usually adopted, and in its support is adduced the chemical evidence that there is a corresponding difference in the primary organic nucleus or molecular grouping of the atoms of carbon and hydrogen. Thus, the primary nucleus of the drying oils is $C_{32}H_{38}$, and its acid *linoleic acid*, $C_{32}H_{28}.O_4$, or, in the present notation, $C_{16}H_{28}.O_2$; while in the fatty or non-drying oils the primary nucleus is $C_{36}H_{34}$, giving *oleic acid* $C_{36}H_{34}.O_4 = C_{18}H_{34}.O_2$. (See Linoleic and Oleic Acids, beyond.) Cloëz, who has elaborately investigated the fat-oils of plants (*Ann. de Ch. et Phys.* and *Bull. Soc. Ch.*, 1865), concludes that this distinction is one of degree rather than of kind, since he finds in the case of fifty oils of his own preparation, exposed during eighteen months to air, that all were changed, not only by absorbing oxygen (the usual statement), but also by losing carbon and hydrogen. In the so-called drying oils this change is much greater than in fatty oils, like olive oil. Cloëz has by proximate analyses determined the amount of oil present in over 200 sorts of grains or seeds, and has tabulated the results with reference to the weight of the hectolitre, the amount of water lost at 100° C., the ash, the quantity of oil in the normal and dry seed, and the density of the oil. Cloëz in his researches on the oils used an improved form of displacement apparatus, employing carbon disulphide in the state of vapor as the solvent. Ether, benzene, and chloroform also may be used to exhaust or displace oil from seeds, but are less efficient and otherwise less desirable than carbon disulphide, which also dissolves far less of the foreign bodies present than any other known agent. This agent may be completely freed of the disgusting odor of the commercial product (due to a sulphuretted hydrocarbon) by distilling it from caustic lime in powder (Silliman) or by digesting it for a time on powdered mercuric chloride (Cloëz). The use of carbon disulphide for removing the oil of corn (*Zea maïs*) before its treatment in the mash-tub, for producing whisky, with a view to improving the quality of the liquor, has been perfected by the Messrs. Tracy of New York, and is the subject of a patent. The following table, condensed from the memoir of Cloëz, presents his results upon fifty oils, showing the gain in weight of ten grammes of each oil exposed for eighteen months in tarred capsules of glass, and weighed every three months. These were covered with disks of filter-paper to exclude dust, and each oil was subjected to ultimate analysis both before and after the exposure. Some of the analytical results are cited in the large table on next page.

We select four examples of the analyses of oils by Cloëz, which show the gain in oxygen and the loss of carbon and hydrogen in each oil after eighteen months' exposure to air. Ten grammes of each oil were taken, and the gain in weight of this quantity is shown in the fourth column, and the differences in the fifth:

1. *Oil of Sesame.*

	Fresh oil.	Aërated oil.		
	Composition in 100 parts.	Pr. 100 p'ts.	Pr. 104.83 gr.	Diff.
Carbon	78.670	70.705	74.12	− 4.55
Hydrogen	11.678	10.636	11.15	− 0.528
Oxygen	9.652 = 100	18.695 = 100	19.56 = 104.83	+ 9.918

2. *Castor Oil.*

Carbon	74.361	72.125	74.058	− 0.303
Hydrogen	11.402	11.108	11.405	− 0.003
Oxygen	14.237 = 100	16.767 = 100	17.217 = 102.680	+ 2.980

3. *Linseed Oil.*

Carbon	77.57	67.55	72.299	− 5.271
Hydrogen	11.33	9.88	10.574	− 0.756
Oxygen	11.10 = 100	22.57 = 100	24.157 = 107.030	+ 13.057

4. *Poppy Oil.*

Carbon	77.497	66.68	71.381	− 6.116
Hydrogen	11.398	9.94	10.641	− 0.757
Oxygen	11.105 = 100	23.38 = 100	25.028 = 107.05	+ 13.923

It is plain from these analyses that the oils all absorb oxygen and eliminate carbon and hydrogen. A part of the loss is doubtless in the form of carbonic acid and water, but Cloëz remarks also the production of a volatile hydrocarbon analogous to acroleine, irritating, and staining the paper covers of the glass vessels of a brown color, resembling the like coloration seen on the pages of old books, in which, by a like process of oxidation of the oil in the printer's ink, a suffocating odor is evolved familiar to those who consult these volumes. Old engravings are stained by the same volatile hydrocarbon, doubtless.

Cloëz has also determined the ratio existing between the amount of oil present in the seed, as fixed by analysis, and that obtained by pressure and left entangled in the oil-cake ("*Tourteau*"). In well-regulated manufactories in France the oil left in the cake is about 10 per cent. of the total quantity in the seed. The following table condenses the results obtained in the treatment of five sorts of the more important oil-producing seeds, and shows the application of a formula deduced from experiment, capable of use in any case of a seed in which analysis has determined the total quantity of oil it contains:

Name of oil-producing seeds.	H.	R.	Oil produced by pressure.		Oil retained in cake.	
			Calculated.	Experiment.	Calculated.	Experiment.
Colza of Vendée	44.20	55.80	38.00	37.69	6.20	6.19
Gold-of-pleasure seed (Camelina)	31.64	68.36	24.05	27.27	7.59	5.26
Poppy	44.00	56.00	37.77	37.29	6.23	6.83
Linseed	37.95	62.05	31.06	30.15	6.89	7.81
Peanut (groundnut)	44.10	55.90	37.89	37.10	6.21	6.49

Note.—H = oil contained in 100 parts of seed; $R = 100 - H$; T (the weight of the cake) $= R + \frac{R}{9}$; hence $T = \frac{R}{9} + R = \frac{10R}{9}$, and the quantity of oil (h) to be obtained in pressing 100 parts of seed will be $h = H - \frac{R}{9}$.

Purification of Oils.—The crude oils come from the press more or less changed by the heat employed, and contaminated by albumen, resinous and coloring matter, which must be removed to fit the oils for nice purposes. The treatment originally proposed by Thénard in 1801 is still in general use—mixing the oil with 2 or 3 per cent. of concentrated sulphuric acid in a lead-lined vat, stirring it until it assumes a greenish tint, and finally as the mucilage is carbonized the whole mass blackens. After twenty-four hours' repose about 2 per cent. of its volume of water, of about 170° F., is added, and the whole agitated vigorously until the liquid appears milky, when the mixture is transferred for rest to large reservoirs at a constant temperature of about 80° F. After some days' rest the clear oil is decanted and filtered either through cotton, carded wool, or flannel, sometimes through river-sand and branches of trees free of leaves. The saturation of the acid is accomplished after Dubrunfaut by chalk without the use of so much water. The oil-cake itself is sometimes employed in a state of dry powder, to avoid filtration, 50 kilogrammes of the powdered cake being capable of clarifying 200 hectolitres of oil in successive portions of about 6 hectolitres each. Oils like cotton-seed and palm oil are treated in England by a mixture of nitric acid and potassic chlorate, which rapidly oxidizes the coloring-matters. About 1 to 2 per cent. of this mixture suffices, and an excess of chlorate is to be avoided as well as of nitric acid, which with alkalies gives a strong red color to the oil, very objectionable when used to make soaps. Many other methods of purification have been proposed for oils, of which we mention only that of *air-treatment* with acid by M. C. Michaud, who proposed in 1869 to blow air through the oil, while the acid is permitted to fall in, in numerous small streams. The oil charged with air forms with the feculence a mixture of less density, which gathers as a bulky scum on the surface, which is skimmed off, while the operation is repeated until this scum ceases to appear. The oil is then treated by a current of steam until it is warmed to 212°, and with a diminishing quantity of steam it is in half or three-quarters of an hour ready to separate from the water and filter.

Physical Properties.—All the oils are lighter than water (see the column of sp. gr. in the following table), but their densities vary greatly with temperature; *e. g.* olive oil at 12° C. has sp. gr. .919; at 26°, .911; and at 94°, .862. The congealing points of the oils vary also greatly, being for olive oil 2° (C.); colza, − 6.25°; groundnut, − 7°; almonds, − 10°; grape, − 16°; poppy and castor, − 18°; linseed, − 27.6°; pine, − 30°. The oils vary equally in electric conductivity, that of olive oil being 677 times less than the others. This peculiarity was made the basis of Rousseau's *diagometer*, an instrument designed to detect adulteration in olive oil by the varying intensity of an electrical current moving a magnetic needle.

Chemical Properties.—The effects of air upon the vegetable oils have already been given. In general, the non-drying, both vegetable and animal, become rancid by exposure to air, while the drying oils become gummy or resinous. This effect is quickened or intensified by boiling them with oxide of lead, peroxide of manganese, and borate or acetate of manganese—an operation attended with the production of a high color. For colorless varnishes drying oils are treated in the cold by oleate of lead prepared after the method of Bouis by acting on oleic acid by litharge. The same result is obtained by the use of protoxide of manganese, precipitated by an alkali from a protosalt of manganese, rapidly washed, and incorporated with the oil. On driving into the mixture a finely-divided current of air the manganese is peroxidized in the midst of the oil, giving after washing with oil a colorless and very drying oil. The action of acids and alkalies upon oils is considered under OLEIC ACID, OLEINE, and also under SAPONIFICATION and SOAP. (For a fuller list of oils than above given see Watts's *Chemical Dictionary*, art. "Oils." For CASTOR OIL, LINSEED OIL, OIL, OLIVE, etc., see those articles.)

Table of Analyses of Fifty Species of Oleaginous Seeds, with the Results of their Exposure to Air for Eighteen Months. By M. S. Cloëz (Bull. de la Soc. Chem., iii. 46, 1865).

Names of plants.	Weight of 1 hectolitre of grain.	Fatty matter—		Loss in water at 100° C.	Ash in 100 parts.	Density of oil at 15° C.	Weight of 10 gr. of oil after 18 months' exposure to air.	Condition of the oil after exposure to air.
		in 100 parts by weight.	in volume per hectolitre.					
	kil.	gr.	gr.	gr.	gr.		gr.	
Cocoanut oil (*Cocos nucifera*)	57.84	69.300	42.900	5.04	1.36	0.934	10.280	No change in appearance.
Cardon oil (*Cynara cardunculus*)	64.80	20.010	14.005	9.02	3.46	0.926	10.758	Nearly solid, surface wrinkled.
Bardane oil (*Arctium lappa*)	51.64	19.032	10.559	11.12	3.08	0.930	10.776	" " " undulated.
Oil of madi (*Madia sativa*)	45.69	32.700	16.079	8.34	4.16	0.929	10.699	" " " wrinkled.
Sunflower (*Helianthus annus*)	44.00	21.810	10.374	9.30	3.20	0.925	10.689	" " " "
Ram-till (*Guizotia oleifera*)	66.80	35.100	25.414	7.94	3.84	0.923	10.733	" " " even.
Dulcamara (*Solanum dulcamara*)	48.75	23.86	12.524	7.44	2.82	0.929	10.802	" " " much wrinkled.
Stramonium (*Datura stramonium*)	58.48	25.00	15.940	8.56	2.92	0.922	10.698	Solid surface uniform.
Paulownia (*P. imperialis*)	6.70	21.98	1.592	10.18	3.15	0.925	10.812	Very thick, irregular surface.
Sesame of India (*S. Indicum*)	62.20	53.95	36.311	5.24	5.68	0.924	10.483	Thick uniform surface.
Oil of *Dracocephalum moldavicum*	64.00	21.32	14.634	10.04	5.60	0.932	10.835	Nearly solid, surface much wrinkled.
Olives (*Olea Europea*)	67.10	39.45	28.883	29.20	1.79	0.916	10.372	Liquid, scarcely thickened.
Holly (*Ilex aquifolium*)	59.80	25.905	16.796	7.62	1.96	0.922	10.802	Very thick, surface uniform.
Cotton (*Gossypium herbaceum*)	63.00	23.675	15.931	9.30	3.76	0.936	10.397	Liquid, hardly thickened.
Euphorbia (*E. lathyris*)	56.82	43.75	26.842	7.34	2.76	0.926	10.438	" " "
Bancoul-nuts (*Aleurites moluccana*)	46.87	62.12	31.166	5.14	3.18	0.934	10.742	Solid, wrinkled.
Castor oil (*Ricinis communis*)	56.10	68.81	40.073	3.76	2.56	0.963	10.268	Liquid, hardly thickened.
Croton (*C. tiglium*)	48.73	37.03	19.142	6.48	2.72	0.942	10.476	Very thick, uniform surface.
Linseed (*Linum usitatissimum*)	69.62	37.95	28.253	7.84	3.90	0.935	10.703	Solid, very wrinkled.
Pistachio-nuts (*P. vera*)	62.60	5.40	35.034	8.10	2.60	0.918	10.505	Liquid, little thickened.
Horse-chestnut (*Æsculus hippocastanum*)	57.40	5.215	3.243	12.65	1.75	0.923	10.542	" thickened.
Spindle tree (*Euonymus europæus*)	57.60	44.80	26.961	7.74	3.06	0.957	10.391	" slightly thickened.
Thlaspi oleifera	73.14	18.45	14.619	12.76	5.50	0.923	10.812	Solid, uniform.
Gold-of-pleasure seed (*Camelina sativa*)	67.04	31.64	22.784	8.84	4.16	0.930	10.810	Nearly solid, surface undulated.
Cress-seed (*Lepidium sativum*)	75.39	23.97	19.507	10.40	4.66	0.926	10.856	" " " uniform.
Colza (spring), (*Brassica c. oleif. præcox.*)	62.25	39.50	26.997	8.84	3.30	0.910	10.566	Liquid, thickened.
Colza (in season), (*B. campestris oleifera*)	68.80	43.42	32.770	7.64	3.56	0.912	10.572	" "
Cabbage (*B. sempervirens*)	69.87	39.25	29.721	9.08	3.60	0.922	10.536	" "
Rutabaga (*B. napobrassica*)	66.60	39.10	28.428	8.44	2.68	0.916	10.542	" "
Winter cabbage (*B. napus oleifera*)	66.79	40.97	29.891	8.70	3.36	0.915	10.537	" "
Summer cabbage (*B. asperifolia oleifera*)	69.93	40.62	30.98	8.72	3.32	0.916	10.539	" "
Turnip (*B. rapa*)	70.70	37.60	29.09	9.10	3.80	9.917	10.542	" "
Mustard (*Sinapis arvensis*)	72.55	25.70	20.24	7.74	4.36	0.921	10.524	" "
Mustard, black (*S. nigra*)	72.60	31.92	24.82	8.24	9.90	0.933	10.572	" "
Mustard, white (*S. alba*)	75.42	31.27	25.59	8.42	3.30	0.921	10.527	" "
Radish (*R. oleifera*)	68.60	36.13	26.57	8.40	4.16	0.932	10.537	" "
Glaucium flavum	65.00	37.75	26.84	6.84	8.40	0.924	10.773	Solid, very much wrinkled.
Red glaucium (*G. corniculatum*)	65.84	27.08	19.26	7.24	11.16	0.925	10.696	" " "
Poppy (*Papaver* ————)	60.80	42.30	27.74	7.40	6.48	0.927	10.705	" " "
Flax (Chènvre)	56.00	31.50	18.95	8.80	4.70	0.930	10.778	"
Cucumber (*Cucurbita perennis*)	38.70	39.22	16.23	6.44	3.96	0 934	10.740	Nearly solid, smooth, uniform.
Evening primrose (*Œnothera biennis*)	40.05	21.83	9.47	10.68	4.52	0.929	10.682	" " wrinkled.
Sweet almonds	58.92	55.69	35.88	5.64	2.85	0.918	10.459	Liquid, little thickened.
Apricot almonds	57.56	43.63	20.66	7.28	2.46	0.915	10.547	" " "
Groundnuts (*Arachis hypogæa*)	62.15	50.50	34.18	5.26	1.62	0.918	10.426	" " "
Groundnuts, without shells	44.16	64.32	30.58	4.68	2.00	0.928	10.747	Solid, very wrinkled.
Beechnuts (*Fagus sylvatica*)	63.45	43.52	30.05	9.14	3.30	0.918	10.621	Very thick, even surface.
Filbert, shelled (*Corylus avellana*)	54.45	60.35	28.37	6.64	2.16	0.919	10.434	Liquid, hardly thickened.
Spruce fir (*Abies excelsa*)	55.00	32.40	19.05	9.12	3.90	0.935	10.785	Solid, much wrinkled.
Pignon fir (*Pinus parviflora ?*)	54.80	44.73	26.30	7.88	4.10	0.919	10.825	Very thick, even surface.

II. *Animal Oils.*—The animal oils and fats have a constitution closely identical with the non-drying vegetal oils. They are in general propenylic ethers of the fatty acids (see FATS and GLYCERINE), so rich in oleic acid as to remain fluid at ordinary temperatures, while the corresponding glycerides of palmitic and stearic acids are more or less solid fats, as tallow, mutton suet, lard, etc. The animal oils have, as a class, a characteristic and very persistent odor, referable to their origin, which in some of the fish oils is peculiarly offensive. This animal odor adheres to the soaps made from even the sweetest animal oils with great obstinacy. The liquid animal oils are largely derived from marine animals. *Sperm oil* occurs in the cavity of the head of the sperm whale (*Physeter macrocephalus*), mixed with spermaceti, from which it is separated by crystallization and pressing in the cold. It is saponified with difficulty by potash, yielding the same fatty acids as spermaceti fat, with which it appears to be isomeric. It is esteemed the most valuable of animal oils, and bears the highest price. *Whale* or *train oil* is obtained from the blubber of the right whale (*Balæna misticetus*), from the black-fish, and from other species of whales. Its sp. gr. varies from .919 to .929. Dolphin oil and porpoise oil contain a peculiar fat called delphinine, phocenine, or dolphin fat. It is a neutral, very mobile oil, of sp. gr. 0.948–0.954, of a faint, peculiar, somewhat ethereal odor, like that of valeric acid. Phocenine is regarded as a mixture of valeveriens, and has been separated by Berthelot into valeric acid and glycerine. Seal oil, shark oil, sea-calf oil are fat oils obtained from the blubber of these animals, and having characteristics in common with whale oil. The menhaden of the Atlantic coast are extensively taken for the oil they furnish and the *fish-guano* produced from the compressed fish after boiling to separate the oil.

Cod-liver Oil. (See OIL, COD-LIVER.)

III. *Essential or Volatile Oils.*—The group or natural family of hydrocarbons which is known as the *aromatic group* embraces benzole and its homologues (see BENZOLE); hydrocarbons of the naphthalene series, C_nH_{2n-8}, and the terpenes, $C_{10}H_{16}$, of which turpentine oil and its isomeres are members, including also caoutchouc and gutta-percha. The volatile oils form a sort of appendix to the aromatic group, and to this appendix are referred also, properly, the resins and balsams, the bitumens, and allied substances. We restrict our remarks here to the volatile oils and essences found already formed in plants. The essential oils of plants consist chiefly of mixtures of hydrocarbons with acid or oxygenized bodies of the same class. They are mostly isomeric or polymeric with oil of turpentine, represented by $C_{10}H_{16}$. Turpentine oil is the product of various species of Coniferæ, and is obtained from wounds or incisions in the bark, from which it exudes in combination with the resin and other vegetable juices, and is separated from them by distillation. While all the volatile oils thus obtained from coniferous plants are alike in general properties, as of odor, solvent power, etc., they really differ much in density, and more especially in optical properties, some revolving the polarized beam to the right (dextro-rotatory), while others revolve it to the left (lævo-rotatory), and in unlike degrees. Most kinds of turpentine oils are mixtures of two or more isomeric or polymeric hydrocarbons, differing in physical and sometimes in chemical properties. The oxidized constituents of the essential oils are sometimes the direct products of the oxidation of the hydrocarbon itself, in which case they are usually viscid resins; while in other cases the two classes appear distinct—*i. e.* not derivative of the same primary nucleus. Gladstone has lately carefully studied the volatile oils in view of their specific gravity, boiling-points, and optical properties (*Journ. Chem. Soc.*, 1864, xvii. 1, and again *Ibid.* [ii.], x. 1, 1872). The hydrocarbons from essential oils may be arranged in three polymeric groups, having the formulæ, respectively, $C_{10}H_{16}$, $C_{15}H_{24}$, $C_{20}H_{32}$. The first group comprises the greater number of these bodies—turpentine, orange, caraway, nutmeg, anise, thyme, etc.; the second, those from cloves, rosewood, cubebs, calamus, etc.; while the last group has only one representative, colophene. These groups are distinguished by the vapor-densities of the bodies belonging to them—viz. the first group requires a theoretical vapor-density of 4.71, while actual experiment on oil of turpentine, pepper, juniper, lemon, orange, etc. gives closely approximate results. For calamus and patchouli oils Gladstone got densities of 6.80 and 7.2, respectively, while theory requires for the formula $C_{15}H_{24} = 7.06$ sp. gr. Gmelin (*Handbook*) gives an experimental density for colophene greater than is required by the formula $C_{20}H_{32}$.

The volatile oils generally absorb oxygen rapidly, rarefying and gaining color in the process, and sometimes forming crystals of camphor-like bodies. Oil of turpentine in four months absorbs twenty times its volume of oxygen, and in forty-three months 128 volumes; it thus acquires the properties of ozone, and its bleaching power is seen on the cork used to stop the bottle containing it. Chlorine, bromine, iodine, and hydrochloric acid gas are all absorbed by turpentine and other oils of that group, which are thus changed generally into resins, balsams, or camphors. The oils of lemon, orange, etc. by exposure seem spontaneously to lose their delicate perfume and change to the odor of turpentine.

The volatile oils are generally obtained by distilling the parts of plants in which they exist, as the leaves, bark, roots, and even wood, either alone or more usually with water, the vapor of which carries over mechanically the oils of a higher boiling-point, which usually emit at 212° a vapor of considerable tension, which gives the characteristic odor of the plant, and is condensed with the steam, separating in the receiver into a milky or turbid layer, usually, but not always, lighter than the water. Many oils of delicate perfume, like oil of lemons, orange, etc., exist in cells in the skin of the fruit and leaves in a state sufficiently abundant to permit their separation by mechanical pressure, while heat would impair their delicacy. The *essences* are only the watery solutions of essential oils, and are often prepared in domestic economy, as rose-water, essence of pennyroyal, mint, etc., by distillation or by addition of the oils to a sufficient quantity of water to hold them in emulsion or hydration, forming the so-called *distilled waters* of the apothecary.

Some of the volatile oils contain acids, aldehydes, etc., the study of which has shed important light on organic chemistry—*e. g.* oil of winter-green (*Gaultheria procumbens*) and meadow-sweet (*Spiræa ulmaria*) furnishing salicylate of methyl and salycylic aldehyde. Bitter almonds furnish benzoic aldehyde, and aldehydes of analogous constitution are obtained from the essential oils of cumin (*Cicuta virosa*), oil of cinnamon and cassia, etc. Sulphur exists in certain oils, as of garlic and mustard. The number of the volatile oils of vegetable origin is very large. Gmelin describes over 170 in his *Handbook*. There are large areas of the earth where plants with a terebinthine or balsamic odor abound almost exclusively, as in portions of Nevada and California. The properties of the plants referred to remain, for the most part, to be investigated. A peculiar turpentine of the Sierra Nevada, called "theoline," and derived chiefly from *Pinus ponderosa* and *P. Sabiniana*, has a density of only about 690, ordinary turpentine being 870 or over.

The odors of volatile oils are by no means all agreeable. Many are pungent, irritating, and even repulsive; their taste is usually aromatic, often burning. Alcohol and ether are their proper solvents. Many volatile oils are the result of decomposition of other compounds by heat, fermentation, and the action of acids; such are eupione, creosote, naphthaline, fusel oil, oil of wine, etc.; while others which exist ready formed in plants, like those of *Spiræa ulmaria* and *Gaultheria procumbens*, may be formed artificially. There are some volatile oils of animal origin, as in ants, castoreum, skunk, etc.

The adulteration of volatile oils is often practised with fixed oils, when it may be detected by a permanent greasy stain left on paper after evaporation and warming; by distilling off the volatile oil, leaving the fixed oil behind; or by dissolving the volatile oil in three or four volumes of 80 per cent. alcohol, when the greater part of the fixed oil remains behind. Alcohol is also a frequent adulterant, and may, when the quantity is large, be detected by dilution of the adulterated oil with water, when it becomes very turbid. Oil of turpentine is often used to adulterate the costly oils of the same series, as of orange, lemon, neroli, etc. It may often be detected by the smell, or after setting fire to it and then blowing it out.

The odor of volatile oils is closely connected with their oxidation. Oil of turpentine, lemon, clove, and the like, when distilled in carbonic acid or nitrogen, and over lime, are nearly odorless. Air restores the odor. Moisture seems essential also to the development of the odor of volatile oils. All odorous flowers are more fragrant when moistened with dew, and in dry climates roses and other fragrant blooms are scentless after the dry-season sets in and dew no longer falls. Violets dried over calcium chloride under a bell lose all odor, but regain it completely when moistened again with water; and paper moistened with a volatile odor and then perfectly dried ceases to emit odor until it is again moistened with a little water. Rose-leaves and other fragrant petals yield a much stronger water if distilled from a bath acidulated with sulphuric acid—a fact noticed by Albertus Magnus. It is a curious fact that many distilled waters when kept in well-closed bottles become slimy, lose their proper odor, and acquire an offensive smell; whereas if kept in loosely-covered vessels they remain unchanged, or even recover their proper odor when exposed, after change, to air again. Gmelin suggests that this is due to albuminous and mucous matters carried over in the distillation, which, when they putrefy, rob the volatile oil of a portion of its oxygen, depriving it of its proper odor. B. SILLIMAN.

Oil, Seneca, a local name for petroleum.

Oils, Essential. See OILS.

Oils, Volatile. See OILS.

Oint'ment [Lat. *unguentum*], a pharmaceutical preparation designed to be applied externally, and usually mixed with oily matter, but less fluid than a liniment. Ointments are often very useful local anodyne applications, are employed also as discutients, astringents, stimulants, and are especially useful in the treatment of skin diseases.

Oise, a river of France, rises in Belgium, in the Ardennes, and joins the Seine after a course of 158 miles, half of which is navigable.

Oise, department of France, along the Seine and the Oise. Area, 2218 square miles. Pop. 404,555. The surface is flat, and the soil rich and very well cultivated. The wine is of inferior quality, but large crops of wheat are raised, and enormous quantities of fruit and vegetables are brought to the market of Paris. Various branches of manufacturing industry are carried on, but on only a small scale. Cap. Beauvais.

Oje'da, de (ALONSO), b. at Cuenca, Spain, about 1465; accompanied Columbus in his second voyage to America 1493; led a party of exploration to Cibao and through the interior of Hispaniola, or Santo Domingo, then supposed to be Cipango; explored the Vega Real in a second expedition (Apr., 1494); obtained command of an independent exploring expedition; set sail May 20, 1499, accompanied by Americus Vespucius; discovered in June the country which he named Venezuela, and returned to Spain; in 1501, again accompanied by Vespucius, made another voyage and discovered the Gulf of Uraba; returning to Spain in 1508, he obtained a royal grant of Nueva Andalucia (now Colombia); set out with 300 men, among whom was Francisco Pizarro; founded the town of San Sebastian on the Gulf of Darien; embarked for Hispaniola in quest of reinforcements; was put in irons by the treacherous owner of the vessel and carried to Cuba; was for some time engaged in toilsome wars with the Indians of that island; ultimately reached Hispaniola in broken health and spirits, and d. there in 1510 or 1511.

Ojibways. See CHIPPEWA INDIANS.

O'ka, a river of Central Russia and the chief affluent of the Volga, rises in the government of Orel, becomes navigable at the city of Orel, and joins the Volga at Nizhnee-Novgorod, after a course of 837 miles. As it runs through some of the most fertile and densely-peopled regions of Russia, it is of great importance as a road of traffic.

Okanagans, or **Cutsanim,** a tribe of American Indians residing upon a river of the same name in Washington Territory, E. of the Cascade Mountains. They belong to the Shushwap branch of the Selish family; have always been friendly to the white settlers; have become semi-civilized by missions established among them in 1846; have made some progress in agriculture, and number little over 300.

O'Kane (JAMES), U. S. N., b. Nov. 11, 1839, in Indiana; graduated at the Naval Academy in 1860; rose to commander in 1874; served in the Brooklyn at the passage of Forts

Jackson and St. Philip in 1862, and commanded the sailor infantry at the battle of Tulifinty Cross-roads, Dec. 6, 1864.

FOXHALL A. PARKER.

O'Kanogan, W. T. See APPENDIX.

Okecho'bee, Lake, the largest lake in the Southern U. S., lies in Southern Florida, and mostly in Brevard co. It is 40 miles long, 25 miles wide, and only 12 feet in maximum depth. It contains but few fishes. It receives several streams, of which Kissimee River is the most important. A large part of the lake is grown up with grass and weeds. Its waters are discharged through the Everglades without any discoverable stream which can be called an outlet. Nearly all the shores of the lake are impenetrable, swampy jungle, and the lake itself is nearly inaccessible. It contains a few low islands. The reports of ruined buildings upon these islands are false. It has lately been partially drained. Area, 1200 square miles.

O'Keefe (JOHN), b. at Dublin, Ireland, June 24, 1747; became an actor and a prolific dramatic author. Several of his comedies were very popular at the close of the eighteenth century, especially *Wild Oats, The Castle of Andalusia, The Poor Soldier, The Young Quaker,* and *Peeping Tom.* In 1808 he became blind, received a pension from the Crown, published *Autobiographical Memoirs* in 1826, and d. at Southampton Feb. 4, 1833.

Okefino'kee Swamp, one of the largest swamps of the U. S., covers an area of about 500,000 acres, in Charlton, Ware, and Clinch cos., Ga., and Baker co., Fla. It is about 40 miles N. and S. by 30 E. and W. The eastern part is mostly an open lake dotted with small floating islands. The lake portion is 12 miles in width. This swamp has forests of heavy timber, and is the abode of countless rattlesnakes, moccasins, and alligators, besides many species of game-birds.

O'ken [originally OCKENFUSS], (LORENZ), b. at Bohlsbach, Würtemberg, Aug. 1, 1779; studied medicine and natural science at Würzburg and Göttingen, and was appointed professor of medicine at Jena in 1807 and of natural science in 1812. In 1816 he commenced the publication of *Isis*, a periodical of a miscellaneous character, though chiefly devoted to natural history and philosophy. Some political criticisms which it contained gave the government an opportunity of interfering, and in 1819 Oken resigned his office and lived as a private teacher till 1828, when he received a professorship at Munich. In 1832 he removed to a similar position in Zürich, where he d. Aug. 11, 1851. His principal works are—*Lehrbuch der Naturphilosophie* (1808–11), translated into English by Dr. Tulk (London, 1847), *Lehrbuch der Naturgeschichte* (1813–27), *Die Zeugung* (1805), *Ueber die Bedeutung der Schädelknochen* (1806), etc. As a pupil of Schelling, the general character of Oken's works has not been acceptable to naturalists, speculation having been cultivated too much at the expense of observation, and his hypotheses now exist chiefly as a warning against "transcendental" excesses. Even the hypothesis of the vertebral composition of the skull, which he developed, after but independently of Goethe, has little now generally accepted.

Okhotsk', Sea of, a large inlet of the Pacific Ocean on the eastern shore of Asia, between the island of Saghailin, Siberia, Kamtchatka, and the Kurile Islands. Its northern part is frozen from November to April.

Okolona, Miss. See APPENDIX.

Okra. See GUMBO.

Okubo (JUSAMMI TOSHIMICHI), b. in the province of Satsuma, Japan, about 1829; belonged to the class of Retainers; received a good native education; early took an interest in the welfare of the empire, and was a counsellor of the prince of Satsuma; when the tycoon abdicated in 1868 became a national counsellor; was a member of the embassy which visited America and Europe in 1872; in 1874 was instrumental in putting down an insurrection at Saga; when the difficulty with China about Formosa was attracting universal attention took upon himself the task of carrying out the policy of the cabinet; went to China as a special ambassador, and was successful in securing an honorable peace and an indemnity, for which service he was greatly honored throughout the Japanese empire. He does not speak English, but is a profound Oriental scholar; is an advocate of education and agriculture, a leader in the national council, and became minister of the interior.

F. A. P. BARNARD.

Okuma Shigenobu. See APPENDIX.

O'laf, SAINT, the patron saint of Norway, b. about 995, a son of Harald Gränske, a grandson of Harald the Fairhaired, commanded a viking fleet when twelve years old, and was one of the most famous and most dreaded sea-kings of the North before he was nineteen. In 1014 he returned from a pillaging jaunt along the coasts of France and Spain, and installed himself in his patrimony, the throne of Norway. He now set about introducing Christianity among his countrymen, but his measures were so severe and violent that the Norwegians rose in rebellion against him, and when in 1028, Knud (Canute) the Great, king of Denmark and England, who laid claim to Norway, landed with an army near Drontheim, Olaf was compelled to flee to Russia. Two years afterwards he returned with aid from Russia and Sweden, and gave battle at Stiklestad, near Drontheim, July 29, 1030, but his army was routed, and he himself slain and buried on the spot. Subsequently, when Norway became thoroughly Christianized, his body was brought to the cathedral of Drontheim and enshrined behind the high altar. Great miracles were reported; crowds of pilgrims journeyed to his shrine; legends and folk-lore gathered around his name; and in the following century he was solemnly canonized and declared the patron saint of the country. Aug. 21, 1847, King Oscar I. instituted the order of St. Olaf.

O'land, an island of Sweden, in the Baltic, opposite the city of Kalmar. Area, 608 square miles. Pop. 40,000. It is well wooded and affords good pasturage, and has rich alum-mines and still richer fisheries.

Ola'the, city and R. R. junction, cap. of Johnson co., Kan. (see map of Kansas, ref. 5–K, for location of county), 21 miles S. W. of Kansas City, has a commercial college, good public schools, and a deaf and dumb asylum. Pop. in 1870, 1817; in 1880, 2285.

Ol'bers (HEINRICH WILHELM MATHIAS), b. at Arbergens, near Bremen, Oct. 11, 1758; studied medicine at Göttingen, and practised as a physician at Bremen, where he d. Mar. 2, 1840. His leisure hours he gave to the study of astronomy, especially comets. He invented a new method of calculating the orbits of comets from three observations, which proved easier and more accurate than the old one; and his calculations and observations of the comets of 1798, 1802, 1804, 1815, and 1821, collected and published in Bode's *Annuaire* (1782–1829) and in Encke's (1833), enjoy a great reputation. Of the planets between Mars and Jupiter, which were eagerly sought after by the astronomers in the beginning of the present century, he discovered two—Pallas, Mar. 28, 1802, and Vesta, Mar. 29, 1807. His excellent library on comets was bought by the Russian government, and is now at Pulkova.

Old'bury, town of England, county of Worcester, on the Tame. The vicinity is rich in coal and iron mines, and the town has extensive manufactures of iron and steel goods, locomotive engines, and machinery. Pop. 18,821.

Old'castle (SIR JOHN), BARON COBHAM, popularly known as "the good Lord Cobham," b. in England about the middle of the fourteenth century; fought with credit in the French wars; obtained the title of baron by marriage; was an early convert to the doctrines of Wycliffe; took part with John of Gaunt, duke of Lancaster, in his efforts to promote ecclesiastical reform, presenting a remonstrance on the subject in Parliament, entitled *Twelve Conclusions addressed to the Parliament of England;* wrote a number of discourses and satirical verses; declared the pope to be Antichrist; was consequently accused of heresy, and thrown into the Tower in the first year of Henry V. (1413); escaped to Scotland, and thence into Wales; was falsely accused of raising an army of 20,000 "Lollards" to overthrow the king; was thereupon outlawed by Parliament and a price set on his head. Being captured in Wales, he was hung in chains alive upon a gallows and burned to death by a slow fire at St. Giles's Fields, London, Dec. 25, 1417. (See his *Life*, by Gilpin, 1808.)

Old Cath'olics, a body of seceders from the Roman Catholic Church under the lead of Dr. Döllinger and other distinguished scholars of that Church. The Old Catholic movement dates from a protest against the papal infallibility decree of the Vatican Council in 1870 as being contrary to history and conscience. Dr. Döllinger, in an open letter to the archbishop of Munich (formerly his pupil), declared (Mar. 28, 1871) that, "as a Christian, as a theologian, as an historian, and as a citizen, he could not accept the Vatican decrees;" whereupon he was excommunicated Apr. 17, 1871, as being guilty of "the crime of open and formal heresy." His colleague, Prof. Friedrich, incurred the same fate. The movement spread with considerable rapidity in Germany and Switzerland. It professed to retain the whole Catholic system, with the exception only of the Vatican decrees, which were regarded as dangerous innovations. It never identified itself with Protestantism in any form, and continues to hold a medium position between Romanism and the churches of the Reformation. It was formally organized in 1873 by the election of Prof. Joseph Hubert Reinkens as bishop. He was consecrated by the Jansenist bishop Heykamp at Rotterdam, Aug. 11, 1873, and recognized in this new dignity by the Prussian government. He resides at Bonn on the Rhine. The Old Catholics, or "Christian Catholics," of Switzerland elected Edward Herzog, formerly a priest at Olten, their bishop. He was consecrated by Bishop Reinkens at Rheinfelden, Sept. 18, 1876, and resides at Berne. In 1880 he visited the U. S. as a guest of the General Convention of the Protestant Episcopal Church then in session at New York. The Old Catholics are most in sympathy with the Episcopal Church of England and America, but still retain the mass and most of the doctrines and ceremonies of the Roman Church. They have a theological faculty at Bonn, and one at Berne. The movement never extended beyond Germany and Switzerland, but Père Hyacinthe, the eloquent ex-preacher of Notre Dame, occupies a similar position in France, and has a small congregation of admiring followers in Paris. PHILIP SCHAFF.

Ol'denburg, grand duchy of Germany, consists of Oldenburg proper, bordering N. on the German Ocean and surrounded on the other sides by Hanover, and comprising an area of 2417 square miles, with 319,314 inhabitants; the principality of Lubeck, wholly enclosed by Holstein and comprising an area of 180 square miles, with 34,353 inhabitants; and the principality of Birkenfeld, situated in Rhenish Prussia, and comprising an area of 143 square miles, with 36,128 inhabitants. Oldenburg proper is low and flat; large dykes have been erected along the shores of the ocean and the rivers Weser and Jahde. The soil is partly marshy, partly sandy, in some places covered with extensive forests, in other with heath. Agriculture and cattle-breeding are the chief occupations; of manufactures there are none. Oldenburg was established as an independent state, ruled by a count, at the end of the twelfth century; in 1773 it was made a duchy, and in 1815 a grand duchy. A constitution was given to the grand duchy Feb. 18, 1849, which, revised by a decree of Nov. 22, 1852, granted liberty of the press, trial by jury, and equality of all citizens in political and social matters. The legislative power is exercised by a *landtag* or diet; the executive, by a responsible ministry under the grand duke.

Oldenburg, city of Germany, capital of the grand duchy of Oldenburg, has several good educational institutions, museums, and scientific collections; a fine ducal palace with beautiful gardens; two large and much-frequented cattle and horse fairs; and an active trade on the river Hunte, here navigable for small vessels. Pop. 18,416.

Old'ham, town of England, county of Lancaster, on the Medlock, 6 miles from Manchester. In 1760 it consisted of only 60 houses, but the discovery of rich coal-mines in its immediate vicinity occasioned the establishment of large factories, and soon it became one of the leading manufacturing towns of England. Besides the cotton manufacture, several large machine-shops and brass and iron foundries are in operation. Pop. 111,343.

Oldham (Capt. JOHN), b. in England about 1590; came to Plymouth, Mass., 1623; intrigued with Lyford to set up a separate worship 1624; lived afterwards at Hull and Cape Ann; represented Watertown in general court 1634; visited the Connecticut River country 1633; returned there with a vessel to trade with the Indians 1636, and was killed by them, the event leading to the first Pequot war.

Oldha'mia, a peculiar organism having a branching, plant-like form, thought by some to be a polyzoon, by others a vegetable; found in the Cambrian rocks of Ireland, and interesting as one of the first-known forms of life. It was named after Dr. Oldham, late director of the geological survey of India. J. S. NEWBERRY.

Old Lutherans. See SEPARATE LUTHERANS.

Oldmix'on (JOHN), b. at Bridgewater, England, in 1673; became collector of the customs at his native place; is thought to have visited America; wrote some dull plays and several historical works, among them *The British Empire in America* (2 vols., 1708), *A Critical History of England, Ecclesiastical and Civil* (2 vols., 1726), and a *History of England* (3 vols., 1730–39) comprising the period from Henry VIII. to George I., inclusive. Having attacked the literary merits of Swift, Gray, and Pope, the latter poet retorted by making him one of the heroes of the *Dunciad*. D. in London July 9, 1742.

Old Perlican, port of entry on Trinity Bay, Newfoundland, 28 miles from Heart's Content. Pop. 868.

Old Point Comfort, Elizabeth City co., Va. (see map of Virginia, ref. 7-I, for location of county), on R. R. and Hampton Roads, the estuary of James River, and in which is situated Fort Monroe. The place belongs to the U. S. government. Pop. in 1870, 313; in 1880, 308.

Old Red Sandstone, a name formerly used to designate the members of the Devonian system in Scotland and Wales. Here the most characteristic element in the formation is Red Sandstone, and the term Old Red was applied to this to distinguish it from the Triassic red sandstones, which overlie the carboniferous system, and which received the name of the New Red Sandstone. Later geological investigations have shown that the group of rocks which in other countries are the equivalents in age of the Old Red Sandstones of Scotland sometimes contain no red sandstone, and consist of limestones, shale, etc. The term which has been made so familiar through the writings of Hugh Miller has therefore been generally superseded by that which Sir R. Murchison first suggested, and "the Old Red Sandstone group" is now generally known as the Devonian system. The Old Red Sandstone series of Scotland has been estimated to have a thickness of from 6000 to 10,000 feet. According to Hugh Miller, it consists of the following members:

3. Upper.	3. Yellow sandstone, containing *Holoptychius*, etc.
	2. Concretionary limestone.
	1. Red sandstone and conglomerate.
2. Middle.	Gray sandstones and shales, containing *Onchus, Ctenodus, Osteolepis, Pterichthys*, etc.
1. Lower.	3. Red and variegated sandstone.
	2. Bituminous schists, containing *Dipterus, Pterichthys, Coccosteus, Cephalaspis;* also the crustaceans *Eurypterus, Pterygotus*, etc.
	1. Conglomerate and red sandstone.

As is shown in the above table, the Old Red Sandstone series of Scotland consists mainly of mechanical sediments deposited in shallow water, and were formed by the wash from near and older land; Prof. Ramsey has suggested that they were formed in bodies of circumscribed and perhaps fresh water. The characteristic fossils of the formation are fishes and large crustaceans. The fishes include many genera and species, of which graphic descriptions have been given by Hugh Miller in his charming books *The Old Red Sandstone* and *Footprints of the Creator*. There are also found here many traces of land-plants, but the flora of the age is much better represented in the Devonian rocks of other countries. In the S. of England, in Central Europe, and in N. America the Devonian system includes heavy beds of limestone, which are open-sea deposits and contain great numbers of mollusks, corals, etc., forming a very different fauna from that of the Old Red Sandstone of Scotland. Fishes are, however, the most characteristic fossils of the group wherever it has been examined. These were the highest forms of life which existed during the Devonian age, and they were so numerous and varied and attained so large size that this well deserves the name applied to it in geological history, *the age of fishes*. The first knowledge obtained of this remarkable fish-fauna was supplied by the admirable studies made by Hugh Miller of the Old Red Sandstone of Scotland. The latest and most complete description of the structure and history of this group of rocks is given in Giekie's admirable monograph *The Old Red Sandstone in Western Europe* (Royal Society of Edinburgh, vol. xxviii.). (See GEOLOGY and FOSSIL FISHES.) J. S. NEWBERRY.

Olds (GAMALIEL S.), b. at Granville, Mass., in 1777; graduated at Williams College 1801; was a tutor there, and then (1806–08) professor of mathematics; was a Congregational minister of Greenfield, Mass., 1813–16; mathematical professor in the University of Vermont 1819–21, in Amherst College 1821–25, and later in the University of Georgia; removed in 1841 to Ohio, where he was a preacher. D. at Circleville, O., June 13, 1848.

Ol'dys (WILLIAM), b. in London, England, July 14, 1696; assisted in editing the *Harleian Miscellany;* appointed Norroy king-at-arms 1755; distinguished for his bibliographical knowledge, accuracy, and integrity; author of *The British Librarian* (1737) and *A Life of Sir Walter Raleigh* (1740), etc., and left a valuable collection of MSS. D. at London Apr. 15, 1761.

Olea'ceæ [from *Olea*, one of the genera], a natural order of exogenous trees and shrubs, now extended so as to include the jessamine family, mostly natives of warm temperate and tropical climates, the ash alone having a higher northern range. The leading character of the order is that of having regular monopetalous or sometimes polypetalous flowers, with the parts of the calyx and corolla four and hypogynous, while the stamens are only two, and the ovary 2-celled; but some are apetalous. The olive tree is far the most important representative of the order, and next to it the ash trees with their excellent tough timber, one species also yielding manna. Among the small trees or shrubs cultivated for ornament are lilacs, privet, fringe tree, Forsythia, and jessamine.

A. GRAY.

Oleacin′idæ [from *Oleacina*, the name of one of the genera], a family of terrestrial gasteropod mollusks of the order Pulmonata and sub-order Geophla. The animal has a long hernia-like protrusion of the viscera into a spiral sack enveloped in the shell; the mantle is thin; the respiratory orifice on the right side, beneath the margin of the foot; the head has a projectile and retractile buccal sack, and is furnished with peculiar labial processes developed as outwardly curved, fleshy, and elongated triangular feelers; there are four retractile tentacles, the two longer ones posterior and bearing eyes at their extremities, the shorter anterior; the lingual ribbon is long and narrow, armed with numerous nearly uniform sigmoidally curved and pointed teeth, with their apices directed backwards, and arranged *en chevron;* the jaw is wanting; the foot elongated and narrow, without any independent locomotive disk, and simple posteriorly; the vent is near the respiratory orifice, the orifice of the reproductive organs on the right side, some distance behind the occuliferous tentacles. The shell is spiral, and in most oblong and with a narrow aperture in some, but is depressed and heliciform, with a wide aperture. The family includes numerous species, and is distinguished by characteristics of the animal, especially the labial palpi, the absence of the jaw, and the peculiar dentition. The animals thus organized are disguised in quite different shells, some being like those of ordinary snail-shells and others most like actinias. The American species all have an oblong shell, and belong to the restricted genus Glaudina. By Messrs. Binney and Bland eight species are recognized as inhabitants of the southern or south-western sides of the Union. THEODORE GILL.

Olean′, R. R. centre, Cattaraugus co., N. Y. (see map of New York, ref. 6–C, for location of county), on Alleghany River and Genesee Valley Canal, has a large lumber and produce trade. Pop. in 1870, 1327; in 1880, 3036.

Olean′der [Fr. *oléandre*], the *Nerium oleander,* an evergreen shrub of the order Apocynaceæ, a native of warm parts of the Old World, and now extensively cultivated. In colder regions it thrives as an ornamental shrub, but requires protection from frost. Its flowers are usually of a rich pale red, but are sometimes white. *N. odorum,* the fragrant oleander, a native of India, is a more tender species, with sweet-scented flowers. The wood and all parts have a poisonous action resembling that of digitalis, best treated by a judicious use of stimulants. Other varieties are cultivated in the middle of Europe, though mostly of a plainer and less delicate description.

Oleas′ter [Lat.], *Elæagnus angustifolia,* a small tree of the order Elæagnaceæ, a native of warm regions in the Old World, is planted as an ornamental tree for its silvery foliage. Its flowers are exceedingly fragrant.

Ole Bull. See BULL, OLE BORNEMANN.

Olefiant Gas. See ETHYLENE.

Olefines, hydrocarbons of the general formula C_nH_{2n}, homologous with ethylene, C_2H_4, so called from their property of forming oily compounds with chlorine, like Dutch liquid, $C_2H_4Cl_2$. They are found among the products of destructive distillation, and may be formed by the exposure of paraffines to high temperatures under pressure; thus:

$$\overset{\text{Butane.}}{C_4H_{10}} = \overset{\text{Ethane.}}{C_2H_6} + \overset{\text{Ethene.}}{C_2H_4}.$$

(See ETHYLENE, HYDROCARBONS, PARAFFINES, and TAR.)
C. F. CHANDLER.

Oleg′gio, town of Northern Italy, province of Novara. It is a place of lively trade and much industry, and the silk and cotton factories are extensive. The churches are much praised for their architecture, and many fine old conventual buildings are now used for secular purposes. This town, first mentioned in the eleventh century, was fortified by the Visconti, and these defences have only recently been demolished. Pop. 8058.

O′leic Ac′id ($C_{18}H_{34}O_2$). This monatomic acid, discovered in 1811 by Chevreul, is the most important of the group of fatty acids of the general formula $C_nH_{2n-2}O_2$, set free by the saponification of oleine, the fluid component of most oils and natural fats. It is obtained by treating olive oil, almond oil, or animal oils by a caustic alkali, preferably by potash, decomposing the resulting soap by tartaric acid and heating the fatty acid, after first washing it with water in the water-bath with half its weight of oxide of lead in fine powder for some hours. The oleate of lead, separated by ether and filtration from the stearate, is decomposed by dilute hydrochloric acid in deficiency, and the ethereal solution of oleic acid is then separated from the acid-water, washed, and the ether distilled from it. Oleic acid is soluble in alcohol, and crystallizes from it on cooling in brilliant crystals which melt at 57° F. to a clear colorless oil. At 39° F. this fluid acid solidifies to a hard white crystalline mass, which expands as it cools. Oleic acid distils over unchanged in a vacuum, and is even soluble in strong sulphuric acid at ordinary temperatures without decomposition. It is without smell or taste when pure, and is insoluble in water. Alcohol and ether dissolve it in all proportions, and in solutions it reacts neutral. By air it is slowly oxidized at ordinary temperatures, but it rapidly absorbs oxygen when melted, becoming rancid both to smell and taste, and then develops a strong acid reaction. It dissolves the solid fats, and is itself dissolved by oleate of soda (as in bile), forming a soap with an acid reaction.

Very large quantities of crude and high-colored oleic acid are produced in the lime saponification of lard and tallow by Chevreul's method in the manufacture of stearine candles. The insoluble lime-soap formed in this process is decomposed by dilute sulphuric acid, and the cake of fatty acids which forms on the surface of the cooled mother-liquor holds the oleic acid entangled in the stearic and margaric acids, from which it is in great part freed by filtration at 32° in the hydraulic press. This impure oleic acid, which is found in commerce under the name of *red oil,* yields pure oleic acid after separation from its lead-salt, after a second saponification with an alkali, and is salted out with sodium chloride mixed with sodium carbonate, by which means only can it be freed from the associated coloring-matters. At 66° F. the sp. gr. of oleic acid is 0.898. Oleic acid burns when heated in air, combines with sulphur when distilled dry with that element, yielding a red-brown, bad-smelling oil, with evolution of much H_2S. With bromine and chlorine in presence of water, oleic acid forms dibromoleic and dichloroleic acids. Iodine does not act upon it. Tribromoleic acid ($C_{18}H_{31}Br_3O_2$) is formed when bromine falls drop by drop into oleic acid. Nitrous acid converts oleic acid into elaidic acid, an isomeric form of oleic acid, without forming a second decomposition product. Nitric acid acts on oleic acid with violence, evolving volatile acids of the general formula $C_nH_{2n}O_2$—namely, acetic, butyric, propionic, caproic, etc.—and mixed acids of the general formula $C_nH_{2n-4}O_2$, such as suberic, pimelic, adipic, etc.; the number and proportion of these depending on the activity and duration of the reaction. With the metals oleic acid forms neutral oleates $M'(C_{18}H_{33}O_2)$ or $M''(C_{18}H_{33}O_2)_2$, according to the equivalence of the metal. The neutral oleates of the alkali metals are soluble in water, and are not completely thrown down from solution, as are the stearates and palmitates, by the addition of another soluble salt. The acid oleates are liquid and insoluble in water. Absolute alcohol and ether dissolve the oleates in the cold, by which reaction they are distinguished and separable from the stearates and palmitates. By heating oleic acid in sealed tubes with glycerine in varying proportions three glycerides are produced—viz. *monoleine* $(C_3H_5)'''(OH)_2C_{18}H_{33}O_2$; *dioleine* $(C_3H_5)'''(OH)(C_{18}H_{33}O_2)_2$; and *trioleine* $(C_3H_5)'''(C_{18}H_{33}O_2)_3$. The two first are solids at 60° F. The oleine of various non-drying oils which become rancid or are converted into viscid masses with an acid reaction, as olive oil and some other vegetal and animal oils, appears identical with trioleine. Olive oil at and below 40° F. deposits a large quantity of curdled fat, mainly palmitine, and the liquid oil filtered from it is mainly oleine. Submitted to destructive distillation, oleine yields acroleine, sebacic acid, and gaseous and liquid hydrocarbons. The drying oils, as linseed, castor, nut, poppy, etc., as already observed, contain a different primary nucleus, and contain the glycerides of other series. We may here consider, out of its alphabetical order—

Linoleic Acid (*Papeveroleic Acid, Trockenölsäure*), $C_{16}H_{28}O_2$.—This monatomic acid of the fatty group exists in linseed and poppy oil, from which it is obtained by saponification with potash, and purified by repeated treatment with salt, and thrown down by chloride of calcium. The precipitated lime-salt is washed, pressed, and digested in ether, which dissolves out the linoleate of lime and leaves the salts of the solid fatty acids undissolved. The ethereal solution is decomposed by cold hydrochloric acid, whereby the linoleic acid is separated and remains dissolved in the ether; the solution is drawn off, and the ether distilled at as low a temperature as possible in a stream of hydrogen gas. Linoleic acid then remains as a dark-yellow liquid, soluble in alcohol, but precipitated by ammonia and baric chloride. The barium salt, washed and pressed, is dissolved in ether, and the granules gradually formed in the solution are repeatedly crystallized from ether. The acid is separated from its barium salt by agitating with ether and hydrochloric acid, withdrawing the ethereal solution and distilling off the ether; it is dried over oil of vitriol in a vacuum and a mixture of ferrous sulphate and lime. Linoleic acid is a limpid oil, more so than poppy oil, of sp. gr. 0.92 at 14° C., of a faint yellow color, a slight acid reaction, and a high refractive power. It remains liquid even at —18° C. Taste, at first mild, becomes soon harsh. Its formula calls for carbon 76.19, hydrogen 11.11, oxygen 12.70 = 100. It absorbs 2 per cent. of oxygen by long standing, and thickens so that it will hardly flow, but remains colorless, and forms a varnish on wood, but on glass merely becomes tough. Linoleic acid is insoluble in water. The linoleates of sodium, barium, lime, zinc, magnesium, lead, and silver have all been studied; they are soluble in alcohol and ether, are white, for the most part uncrystallizable, and separate from their hot solutions in flakes; by spontaneous evaporation they are obtained in the form of a jelly.

Palmitic Acid ($C_{16}H_{32}O_2$), (otherwise known as *Cetylic Acid, Ethalic Acid, Olidic Acid*).—As already mentioned under FATS, Chevreul distinguished in 1820 the solid fatty acids resulting from the saponification of fats as *margaric acid* and *margarous* (afterward *stearic*) *acid*, the former melting at 60° C., the latter at 75°, and solidifying at 70°. Chevreul did not consider the difference between the two acids as fully established, but suggested that margaric acid might be a mixture of stearic acid with another more fusible acid and richer in oxygen. Accordingly, Heintz in 1852 showed the margaric acid of Chevreul to be a mixture of about 90 per cent. of *palmitic acid* and 10 per cent. of stearic acid. Meantime, palmitic acid and various mixtures of that with stearic acid and other acids received peculiar names. Heintz proved that (1) all the acids obtained in the saponification of fats contain an even number of carbon atoms divisible by 4 without remainder; (2) the margaric acid of most chemists is separable into palmitic and stearic acids; (3) fatty acids may be mixtures, and not definite compounds, even though neither their composition nor their melting-points can be altered by recrystallization; (4) such mixtures may, however, be separated by partial precipitation; (5) they differ from pure acids as regards their melting-points and mode of solidifying. (*Gmelin*, xvi. 351.) Palmitic acid is universally distributed in the fats of the animal and vegetable kingdoms. Combined with glycerine, it occurs abundantly in palm oil, the fat of certain palms, in Chinese tallow, in Japanese wax, and the wax of *Myrica cerifera*. (*G. E. Moore*.) In the animal kingdom it is combined with ethal in spermaceti (*J. L. Smith*); in the melissine of beeswax, etc. It is easily prepared from palm oil by saponification with caustic potash, decomposing the soap with sulphuric acid, and recrystallizing the fatty acid several times from hot alcohol till it gives a steady melting-point. From oleic acid it may be evolved, along with acetic acid, by fusion with potassium hydrate, $C_{18}H_{34}O_2 + 2KOH = KC_{16}H_{31}O_2 + KC_2H_3O_2 + H_2$. Palmitic acid is a colorless solid, lighter than water, crystallizes in small shining scales, and is without odor; insoluble in water, but freely so in hot alcohol and ether. The solutions are acid, and if concentrated solidify on cooling, or if dilute yield tufts of slender needles with an acid reaction. This acid may be distilled unchanged, and, gently heated, evaporates without residue from an open dish. It burns like other fats with a light smoky flame, and is attacked by warm chlorine with evolution of HCl and the formation of substitution products. It forms with the alkali metals acid-salts analogous to the acid-acetates, and it forms normal or neutral salts with other metals according to their equivalence. The potassium and sodium palmitates are soluble in water and alcohol; the rest are insoluble.

Palmitines or *glyceric palmitates* are ethers known as *mono-*, *di-*, and *tri-palmitine*, all crystalline fats which are artificially formed, of which the last is natural palmitine from palm oil and other fats.

Palm Oil comes chiefly from the African coast, and is an important article of commerce for the production of candles. When fresh it has an agreeable odor and a deep orange-red tint, which it loses by exposure to light and air, becoming at the same time rancid and developing both glycerine and oleic acid, with palmitic acid—a change analogous to saponification. B. SILLIMAN.

Oleine. See OLEIC ACID.

Oleo-Margarine, so called from the old idea, now disproved, that a fat margarine existed in butter and suet. (See BUTTER.)

Oleo-Phosphoric Acid, a phosphuretted fatty acid found in the brain. It is a yellow, gummy body, containing 1.9 to 2.0 per cent. of phosphorus. By long boiling with water or alcohol, more quickly with acidulated water, it gradually forms a pure oleine, while the liquid becomes decidedly acid from the phosphoric acid set free. Alkalies form oleates and phosphates with free glycerine. All parts of vertebrate animals contain this body, and a similar substance is found in the yolk of the eggs of cartilaginous fishes and other animals. (See article LECITHINE; also Frémy, *Ann. Ch. Phys.* [3] ii. 474, l. 172, Diaknow, *Zeit. f. Chem.* [2] iv. 154, and Strecker, *Zeit. f. Chem.* [2] iv. 437.) C. F. CHANDLER.

Oleo-Resins, natural mixtures of fixed or volatile oil with resins. The most important are those of capsicum, cubebs, the male fern, lupuline, black pepper, and ginger. They are prepared by exhausting the portion of the plant containing them with ether, and subsequently evaporating off the solvent. C. F. CHANDLER.

Oléron′, an island of France, lies opposite to the mouth of the Charente, and belongs to the department of Charente-Inférieure. It is 20 miles long, 5 miles broad, and has a population of 16,800. It is fertile, produces wheat, maize, wine, and fruits, and has important salt-works and fisheries. It contains three lively and thriving towns, with from 3000 to 5000 inhabitants each, and considerable trade in corn, wine, salt, and fish—Château d'Oléron, St. Georges d'Oléron, and St. Pierre d'Oléron. Its wines, however, are of an inferior description.

Olhao′, town of Portugal, in the district of Faro, on the Atlantic, has a good harbor and valuable fisheries, in which almost all its inhabitants are engaged. Pop. 6916.

Olib′anum (*incense, frankincense*), a gum resin which exudes from a tree growing in Arabia and India. It occurs in oblong or rounded laminæ, opaque, of yellow or reddish color, dull and waxy on the fracture. It melts with difficulty and imperfectly when heated, and burns with a bright flame. It has a balsamic, resinous smell and an acrid bitter taste. Triturated with water, it forms a milky, imperfect solution. Alcohol dissolves nearly three-fourths of it. Braconnot (*Ann. Chim. Phys.* [2] lviii. 60) found 100 parts of it to yield 8 of volatile oil, 56 of resin, 30.8 of gum, and 5.2 of a glutinous body insoluble in water and alcohol, with some mineral matter. It is used for fumigation and in the preparation of plasters. It has been burned from antiquity in religious ceremonies. (See *U. S. Disp.*; *Jahresb.*, 1858, 482; *Ann. Chem. u. Pharm.*, xxxv. 306; *Zeit f. Chem.* [2] vii. 201.) C. F. CHANDLER.

Ol′ifant's River, or **Elephant's River,** a river of South Africa, flowing through the territory of Cape Colony, and entering the Atlantic in lat. 31° 38′ S. It is impeded by rocks, and not navigable, but its waters are available for irrigation.

Ol′igarchy [Gr. ὀλιγαρχία, "government by a few"] differs from aristocracy solely in the extent of the governing class. In an aristocracy a body of nobles or one of the estates or leading interests of the realm have a controlling voice in the management of affairs. In an oligarchy the ruling class is small. In point of fact, oligarchies have usually been among the most unjust and oppressive of governments. They have been usually gotten up by "rings" or cabals, by means of *coups d'état*, and have almost always been short-lived and unpopular.

Oligochæ′tæ [Gr. ὀλίγος, "few," and χαίτη, "lock of hair" or "bristles"], an order of the class of worms or annelids, including the common earth-worm and fresh-water worms, and distinguished by the union of the two sexes in the same individuals. The form exemplified in the familiar species is repeated in all; *i. e.* the body is elongated, cylindrical, and distinctly articulated, or ringed; each ring is furnished with setæ generally combined in a dorsal and an abdominal pair of setæ or bristles of variable length; the mouth is terminal or sub-terminal; the anus is at the posterior extremity; the alimentary canal straight and differentiated into a pharynx, œsophagus, and intestine; the nervous system has pre-oral cerebral ganglia, and is continued backwards along the inferior portion of the body into a double chain of ganglia closely united together; the sexes are combined in the same individual and situated towards the fore part of the body, the male organs anterior, the female a little farther behind. The order includes quite a large number of species, which have been grouped into two families, distinguished by the distribution of the setæ: (1) Lumbricidæ, with simple setæ, including the earth-worms, and (2) Naidæ, with bifid or hair-like setæ, embracing the fresh-water species. In the earth-worms (Lumbricidæ, Lumbricinæ) the setæ are isolated or grouped two by two; in the Lumbricidæ, Enchytræinæ, they are three or four in number, in bundles; in the Naidæ, Naiinæ, they are in four rows (exceptionally bi-serial), and then all hair-like; and in the Naiidæ, Chætogastrinæ, they are bi-serial, but never hair-like. Such is the division proposed by Vaillant (1868), who has recognized in the several groups twenty-five genera from various parts of the world, which are represented in nearly all regions of the globe. THEODORE GILL.

Olig′oclase [Gr. ὀλίγος, "brittle," and κλάσις, "fracture"], one of the feldspars, crystallizing in the triclinic system, and essentially a silicate of alumina and soda.

Olin (Abraham B.), LL.D., b. at Shaftesbury, Vt., 1812, son of the late Judge Gideon Olin, one of the founders of Vermont; graduated at Williams College 1835; became in 1838 a lawyer of Troy, N. Y., where he was three years city recorder; was in Congress 1857–63; judge of the supreme court of the District of Columbia 1863–78, and exercised a widespread and beneficial influence in the community. D. July 7, 1879.

Olin (Henry), b. in Vermont in 1757; was a member of the general assembly continuously from 1799 to 1825, except four years; of the constitutional conventions of 1814, 1822, and 1828; associate judge of Addison co. 1801–06; chief-judge 1807 and 1810–24; member of Congress 1824–25; lieutenant-governor 1827–29, and councillor 1820–22. D. at Salisbury in 1837.

Olin (Stephen), D. D., LL.D., son of Judge Henry Olin, b. at Leicester, Vt., Mar. 3, 1797; graduated at Middlebury College 1820; entered the Methodist Episcopal ministry 1824; labored two years in Charleston, S. C.; was president of the Abbeville Seminary; held the chair of English literature in Franklin College, Ga., 1826–33; president of Randolph-Macon College 1832–37; was in Europe 1837–41; a delegate to the Evangelical Alliance 1846; president of the Middletown Wesleyan University from 1842 until his death, Aug. 16, 1851. He wrote *Travels in the East;* his works were published in New York in 1852, and *Life and Letters* in 1853.

Olin′da, town of Brazil, province of Pernambuco, on the Atlantic, is one of the oldest, and was in the sixteenth and seventeenth centuries one of the most flourishing, towns of the country. But it suffered much during the wars between the Dutch and the Portuguese, and when Recipe was founded it lost its trade. It is now a decaying, half-deserted place; no vessels visit its harbor, cattle feed in its streets. Pop. about 7000.

Olinda (Pedro de Araujo **Lima**), Marquis of, b. at Pernambuco, Brazil, in 1790; educated at the universities of Pernambuco and Coimbra; was a member of the Constituent Assembly of Portugal 1821; member of the Brazilian Parliament more than a third of a century; president of the Chamber of Deputies 1825–27, 1831–33, and 1835–37; was cabinet minister 1823, 1827, 1832, and 1837; twice regent of the empire during the minority of Dom Pedro II.; made Viscount Olinda 1841, marquis 1854, and member of council of state 1842, which position he held to his death, June 7, 1870.

Oliphant (Carolina). See Nairne.

Ol′iphant (Laurence), b. in England in 1829, son of Sir Anthony Oliphant, who was appointed chief-justice of Ceylon 1838; educated in England; went to Ceylon in youth; accompanied Jung Bahadoor, the Nepaulese ambassador in London, on his return to his own country in 1850; wrote *A Journey to Katmandu, or the Nepaulese Ambassador at Home* (1852); studied law at the University of Edinburgh; made an extended journey in Southern Russia and the Crimea a few months previous to the Crimean war, which circumstance gave occasion to a large sale for his next book, *The Russian Shores of the Black Sea* (1853); became private secretary to Lord Elgin, governor-general of Canada; was subsequently superintendent of Indian affairs in Canada; travelled extensively in the U. S.; published *Minnesota, or the Far West* (1855); wrote an anonymous pamphlet, *The Coming Campaign,* soon afterwards re-issued under the title *The Trans-Caucasian Provinces the Proper Field of Operations for a Christian Army* (1855); accompanied the army of Omar Pasha to the region in question; wrote *The Trans-Caucasian Campaign of Omer Pasha* (1856); accompanied Lord Elgin as private secretary on his mission to China in 1857; wrote *A Narrative of the Earl of Elgin's Mission to China and Japan* (1860); was chargé d'affaires in Japan 1861, at which time an attempt was made upon his life by assassins; entered Parliament 1865; joined the semi-religious community established in 1868 by Thomas L. Harris in the township of Portland, Chautauqua co., N. Y., which he has continued to make his permanent residence; was correspondent of the London *Times* in Paris at the outbreak of the Franco-German war (1870), and was manager of the American interests of the Direct Cable Company, a submarine telegraphic enterprise, 1873–75. He has published two novels, *Patriots and Filibusters* (1861) and *Piccadilly* (1870); also *The Land of Gilead* (1880).

Oliphant (Margaret **Wilson**), b. in Liverpool, England, about 1818; has published a large number of successful novels, consisting chiefly of delineations of Scottish life and character, most of which have been republished in the U. S. Among them are *Adam Graeme of Mossgray* (1852), *The Chronicles of Carlingford* (1863), *Salem Chapel, The Perpetual Curate* (1864), *The Minister's Wife* (1869), and *A Rose in June* (1864). She has also written biographies of Edward Irving (1862), St. Francis of Assisi (1870), and Count Montalembert (1872), and *Hist. Sketches of Reign of George II.* (2 vols., 1869).

Oliphant (Thomas Lawrence Kington), b. at Henleaze, near Bristol, England, Aug. 16, 1831; educated at Eton and at Baliol College, Oxford; studied law; was called to the bar at the Inner Temple, and inherited the estate of Gask, Perthshire, Scotland, in 1867. Author of a *Life of the Emperor Frederick the Second* (1862), *The Sources of Standard English* (1873), and *The Duke and the Scholar, with other Essays* (1875), the latter work chiefly biographies of the French archæologist, the duke de Luynes, and his secretary, M. Huillard-Bréholles.

Oli′va, town of Spain, province of Valencia, beautifully situated near the Mediterranean. Pop. 7410.

Ol′ive [Lat. *oliva*], an evergreen fruit and oil-producing tree, the *Olea Europæa* (but not originally European), of which many varieties have been developed by cultivation and differences of soil and climate. The olive is supposed to be indigenous in Northern India and in other temperate Asiatic regions, and there are large forests of wild olives on the southern flanks of the Himalayas. There are wild olive woods in the Tuscan Maremme and in the island of Sardinia also, but there are historical reasons for believing that all the olives of Europe, as well as of Northern Africa, are descended from plants originally introduced from Asia Minor by human industry. The tree and its oil were known in Palestine in very remote ages, and are familiarly spoken of by the Old Testament writers, the oil (which belongs to the class called *fixed*) being used for food, for anointing the hair and person, for sacrificial libations, and for illumination. They are also mentioned not infrequently by Homer, in whose time, however, oil seems to have been a comparatively rare and costly product among the Greeks, not employed as food, but only for simple anointing and as an ingredient in perfumed unguents. Neither the old Jewish nor the most ancient Greek writers, so far as we have been able to discover, refer to the drupe or berry as an edible fruit, and the art of pickling it for the table belongs apparently to later ages. The wood of the olive tree is often noticed by the ancients as fine-grained, hard, and durable, as well as beautiful. The slow growth of the olive made its wood rare and costly, and this quality, with the evergreen foliage and apparent imperishability of the tree and the importance of its annual products, rendered the olive not merely valuable, but even sacred, in the eyes of the ancient world. The olive-branch was the symbol of peace, and the destruction of the tree by a public enemy was regarded as a barbarous violation of the usages of civilized warfare. The olive tree occupies a conspicuous place in Roman agricultural literature and in the Carthaginian authors, whose works on rural husbandry were so highly prized by the Roman conquerors. For several centuries before the Christian era the olive subserved a vast variety of uses in most of the countries subdued by Rome. Its berries were pickled for the table, and the oil was employed for all the purposes for which it is now used, except for the manufacture of soap—an article not known to the ancient Roman toilet or laundry. In fact, olive oil was relatively much more important in Roman than in modern domestic economy, for butter was scarcely used in the Roman *cuisine,* and according to Pliny no "artificial" oils were known until after Cato's time, the oil of the olive being considered the only *natural* oleaginous fluid. Even in Pliny's days the few other oils manufactured in Italy or introduced by foreign commerce were neither abundant nor much used for economical purposes, though some of them, as well as other fragrant and spicy substances, were employed to give a piquant flavor to olive oil and to the olive berry. The Romans, as well as the Greeks, thought frequent anointing the body with olive oil highly conducive to health, and the consumption of it for this purpose, as well as for illumination, cooking, and other uses, was such as to give it, next to breadstuffs, perhaps the highest rank among agricultural products. At the present day, although lard is preferred for cooking, as more nutritious, and great quantities of it are imported from America and exchanged for oil in the southern provinces of Italy, yet olive oil is very generally used for frying the everlasting *frittata, frittella,* and *frittura,* as well as in dressing macaroni and other dishes of Italian tables; and it is almost the only fluid employed by the poorer and middle classes in that country for illumination, as well as generally for most purposes to which other fixed oils are applied elsewhere.

The olive is now extensively cultivated in Asia Minor and in Syria; in Tunisia, Algeria, and Morocco, where it is extremely productive; in all Southern Europe, including the Mediterranean islands, the Slavonic provinces on the

Adriatic coast, and even the Crimea, where a variety is grown which is alleged to be hardy enough to resist the severest winters of that climate. In Spain and Portugal the berry is large and superior to all others for the table, and the oil wants only more careful preparation to be of equal excellence. Much of the Hispanic peninsula is too elevated and too arid for the olive, but wherever the local conditions are favorable it thrives luxuriantly. In France its growth is confined to the southern departments, and though the olives and oil of Provence are in high repute, it is seriously questioned whether the cultivation of the olive is, on the whole, profitable even there, for the tree will not have repaid the cost of its cultivation before its thirtieth year, and it is cut down by frost as often, upon the average, as once in forty years. The severe winter of 1709 is often said to have killed all the olives in France and in the adjacent Italian provinces, but many trees must have escaped, for there are on the Ligurian coast, near Nice, olives of five, six, and even above seven feet in diameter, which must be the growth of several centuries. France produces but a small proportion of the olive oil it consumes, importing it largely from Algeria, from Sicily and the Neapolitan provinces, and from the Greek islands. In Italy the olive is cultivated extensively in all the provinces not too distant from the Mediterranean—for this tree loves the sea-air—except in those watered by the lower Po and those so elevated as to be much exposed to frost, which, even at inferior levels, kills the foliage and the young shoots as often as once in two or three generations, and occasions the loss of one, and sometimes, though rarely, of several successive crops.

Of all fruit trees, the olive is doubtless the hardiest, for scarcely any amount of mutilation, any severity of frost, or even sharp scorching by fire, suffices to destroy the life of the tree. The smallest strip of green wood or living bark, or, in the absence of that, the roots, throw out new shoots, and the stock becomes again productive. Nor does the olive seem liable to perish from natural decay. Such is its tenacity of life that it still survives for centuries after the heart and all but the outer layer of young wood are rotten and gone, and one may often see a large trunk not only hollow in the middle, but split vertically into several distinct stems, all alike flourishing and productive. The olives now standing in what is called the garden of Gethsemane at Jerusalem are alleged to be identified by tax-rolls as existing 1000 years ago, and the tradition which makes them contemporaneous with the Founder of the Christian religion is not altogether improbable.

The ancient methods of cultivating the tree and preparing the berry and the oil for use were much the same as those now followed, but if Hesiod was right in saying that no man ever lived long enough to gather fruit from an olive he had himself planted, the habits of the tree have been modified since his time, for it now produces berries at the age of seven years, and shoots grafted on old stocks bear much sooner. Columella describes ten varieties of the olive, and Pliny speaks of a kind grown in Africa and in Portugal, the dried berries of which were sweeter and more palatable than raisins. More than twenty varieties are now recognized in Italy, but only five or six are thought specially worthy of propagation. In Europe the olive does not often exceed fifteen, or at most twenty, feet in height, and for the convenience of gathering the fruit a low, spreading growth of the crown is preferred and promoted by pruning, but in Palestine and in some of the Mediterranean islands there are olives as lofty as the tallest oak, and apparently quite sound in trunk and ramification. Both ancient and modern writers speak of this tree as producing fruit only biennially, but in the opinion of good authorities the failure of the crop in the alternate year is the effect of bad husbandry in tillage and in pruning, and especially of the practice of beating the branches to shake off the fruit, by which the young shoots and buds designed by nature to bear the following year are bruised and made unproductive. The olive is propagated by sowing the stone or kernel of the berry; by grafting or budding, generally on a wild stock; by slips, and by planting the knots or eyes found in the trunk near the surface of the ground. The trees are planted at from fifteen to twenty or twenty-five feet apart, and the ancient writers recommend even a much greater distance. When the surface is not too rough it is usually cultivated for some annual field-crop, but, though the stirring of the soil may be advantageous to the trees, the abstraction of nutritive matter from the earth by the roots of small plants grown between them is believed to be injurious to their product. It is generally thought, however, that the damage to the olive-crop is compensated by the harvests yielded by grain or other vegetables cultivated in the olive orchards. Under exceptionally favorable conditions of soil, exposure, and treatment a well-manured tree may yield twenty-five pounds avoirdupois of oil, but according to Cosimo Ridolfi the average product in Tuscany is not above two pounds and a half. The best table oil is that of Lucca in Central, and that of Bari in Southeastern, Italy. The land occupied by olive orchards in Italy is estimated at 1,235,000 acres, and the quantity of olive oil annually produced at from 30,000,000 to 40,000,000 gallons. England imports from the Mediterranean countries about 20,000 tons of olive oil per year.

The olive prefers light, rich, warm ground—does not thrive on alluvial soils, but grows well on hilly and rocky surfaces. Hence, much land too rugged for other crops is turned to profitable account by olive plantations, and the steep mountain-slopes rising by narrow terraces, supported by dry walls, to the height of many hundred feet and clothed with the olive, form one of the most picturesque features in Italian scenery. The height to which these orchards can be carried is limited by the liability to frost. A temperature of 19° F., or 13° below the freezing-point, especially if accompanied with *vetrone* or glazed frost, or followed by alternate thawing and freezing, is injurious to the tree, and if the thermometer falls to 14° F., or 18° below freezing, and remains any length of time at that degree, the young shoots, and even well-grown branches, are generally killed.

For the table the berries are gathered when fully grown, but still quite green; steeped for twenty or twenty-four hours in weak ley of wood-ashes or lime-water; then in fresh water changed every twelve or twenty-four hours for four or five days, or until they have lost their bitter flavor and the water runs off clear and tasteless. They are now salted or pickled in strong brine, in which they are kept for use in close vessels, though sometimes preserved in oil. The harvest of the berries for oil begins as soon as the skin has turned to a dark wine color, and good husbandry requires that it be finished in two or three months; but in ordinary practice it is continued, according to convenience, through the whole winter, and even into spring. The berries are spread for a short time to dry off moisture from the surface, and immediately pressed, the best table oil being obtained from unground fruit. They are then ground, but as the oil is found only in the pericarp or pulp, the millstones should not be heavy enough to crush the hard kernel. They are now subjected to repeated pressure, sometimes aided at last by pouring warm water on the mass, an inferior quality of oil being produced by every repetition of these processes. Oil is also extracted from the *sansa*, or pomace, by mechanical and chemical means. The total yield of oil is estimated at from one-eighth to one-ninth of the weight of the berries. Oil for the table, for illumination, and some other purposes is refined by settling, filtering, washing, and by various chemical processes. French chemical skill imitates table oil by manipulating American lard, which is then re-exported from Marseilles to the U. S. as oil of Lucca or Provence. George P. Marsh.

Oliven'za, town of Spain, province of Badajoz, near the Portuguese frontier, is fortified. Pop. 5717.

Olive Oil. See Oil, Olive.

Oliver (Andrew), b. at Boston, Mass., Mar. 28, 1706; graduated at Harvard College 1724; was a representative of Boston in the general court 1743–46; member of the council 1746–65; secretary of the province 1756–70; distributor of stamps 1765, but compelled to resign that post at the "Liberty Tree;" succeeded his brother-in-law, Hutchinson, as lieutenant-governor 1771, sharing his opinions and political conduct. D. at Boston Mar. 3, 1774.

Oliver (Andrew), son of Lieut.-Gov. Andrew, b. at Boston, Mass., Nov. 13, 1731; graduated at Harvard College 1749; possessed considerable literary and scientific talent; was an original member of the American Academy of Arts and Sciences, to whose *Transactions* he was a frequent contributor; author of an essay *On Comets* (1772); was a judge of common pleas for Essex county, member of the general court for Salem 1766, and was a loyalist during the Revolution. D. at Salem Dec., 1799.

Oliver (Benjamin Lynde), son of Rev. Thos. F. Oliver and grandson of Judge Andrew, b. at Marblehead, Mass., in 1788; graduated at Harvard College 1808; became a lawyer; was author of several excellent legal treatises, and noted for his skill as a chessplayer. D. in 1843.

Oliver (Daniel), M. D., LL.D., grandson of Lieut.-Gov. Andrew and brother of B. L. Oliver, b. at Marblehead, Mass., Sept. 9, 1787; graduated at Harvard College 1806; practised medicine some years at Salem; was lecturer on chemistry 1815–20; professor of the theory and practice of physic in Dartmouth Medical School and of intellectual philosophy in Dartmouth College 1820–37; professor in the Medical College at Cincinnati, O., from 1840 until Mar., 1842; author of *First Lines in Physiology* (Boston, 1835). D. at Cambridge, Mass., June 1, 1842.

Oliver (George), D. D., b. at Papplewick, England, Nov. 5, 1782; graduated at Trinity College, Cambridge, 1803; took orders in the Church of England: became head-master of King Edward's grammar school at Great Grimsby 1809; became vicar of Scopwick 1831: incumbent of Wolverhampton 1834, and rector of South Hykeham, Lincolnshire, 1847; filled high posts in the Masonic order, and wrote several works upon Masonry which met with wide acceptance. Among them are *Historic Landmarks of Freemasonry*, *The History of Initiation*, *Antiquities of Freemasonry*, and *Institutions of Masonic Jurisprudence*. D. at Lincoln Mar. 3, 1867.

Oliver (Peter), LL.D., brother of Lieut.-Gov. Andrew, b. at Boston, Mass., Mar. 26, 1713; graduated at Harvard College 1730; held several offices in Plymouth county, and was appointed a justice of the supreme court Sept., 1756; became chief-justice 1771; was impeached by the house of representatives 1774 for refusing to subscribe an engagement to receive no pay or emolument except from the assembly; accompanied the British troops on their retirement from Boston 1776; subsisted some years in England on a grant from the Crown, and d. at Birmingham Oct. 13, 1791. Author of various political writings and of some poems.

Oliver (Peter), son of Prof. Daniel, b. at Hanover, N. H., in 1821; educated for the bar; edited his uncle, B. L. Oliver's, *Practical Conveyancing;* wrote a number of articles for the New York *Church Review* under the name of "William Pynchon Oliver," and d. in 1855, while on a voyage for his health. A posthumous work, *The Puritan Commonwealth* (1856), edited by his brother, Fitch Edward Oliver, exhibited historical research and literary skill in a criticism of the Puritan founders of New England. An answer was published by J. W. Thornton in 1857.

Oliver (Thomas), b. at Dorchester, Mass., Jan. 5, 1734; graduated at Harvard College 1753: was a distant relative of Andrew Oliver, on whose death he succeeded to the office of lieutenant-governor of Massachusetts and president of the council. Compelled by the people to resign his seat at the council board Sept., 1774, he took refuge with the British troops at Boston, and accompanied them finally to England. D. at Bristol, Eng., Nov. 29, 1815. Author of *Poem XXIX.* in the *Pietas et Gratulatis* (Boston, 1764).

Olives, Mount of, or **Mount Olivet,** now **Jebel et-Tûr,** is on the E. of Jerusalem, from which it is separated by the narrow valley of Jehoshaphat, and rises 2693 feet above the level of the sea, and 100 feet above the most elevated part of Jerusalem. It forms the middle summit of a ridge of hills which to the N. expands into a large elevated table-land, but which here contracts and terminates in a row of three hills. The southernmost of these hills is now called the "Mountain of Offence," because Solomon here instituted the pagan worship for his concubines. The northern hill was the place where Titus encamped when he came before Jerusalem. The middle summit is the proper Mount of Olives. At its foot, near the bridge over the brook of Kedron, lies the garden of Gethsemane. Its swelling sides are streaked with patches of bare rock between the olive groves, which are planted in terraces. The church of the Ascension, built upon its top by Helena, which was seen by Sir John Mandeville in 1327, has disappeared, and in its place is a small octagonal chapel within a paved court connected with a mosque. In the Old Testament, Mount Olivet is first mentioned in connection with the flight of David from Absalom (2 Sam. xv. 30); next as the scene of the worship of Chemosh and Moloch, set up by Solomon (1 Kings xi. 7), but destroyed by Josiah (2 Kings xxiii. 13); and finally as the place from which, by the order of Ezra, the people got the branches for the feast of tabernacles (Neh. viii. 15). In the New Testament the allusions are much more numerous. "It is very prominent," Dr. Schaff says in his *Through Bible Lands*, "in the closing scenes of our Saviour's ministry. In Bethany, on the eastern slope of Olivet, he had his most intimate friends—Lazarus, Martha, and Mary—and performed his last and greatest miracle (Luke x. 38–42; John xi.). From Mount Olivet he made his triumphal entry into Jerusalem (Luke xix. 29–38). Here he spent the nights intervening between the entry and his passion, and returned every morning to teach in the temple (Luke xxi. 37.) Descending from this mountain, he wept over the ungrateful city and foretold her fearful doom (Luke xix. 41–44). To it he repaired on the night of his betrayal (John xviii. 1); from it he ascended to heaven to take possession of his throne (Luke xxiv. 50; Acts i. 12)." (See also Tobler, *Siloahquelle und d. Oelberg*, St. Gallen, 1852.)

Olivet, Dak. See Appendix.

Olivet (Joseph Thoulier), Abbé d', b. at Salins in 1682; entered the Society of the Jesuits; about 1714 abandoned them, and devoted himself to letters; was admitted a member of the French Academy in 1723, and took an earnest part in the discussions. His devotion to Latin literature enrolled him on the side of the defenders of the study of the classics. Among his numerous works may be mentioned an edition of Cicero with useful notes (Paris, 1740–42, 9 vols.; reprinted, Geneva, 1758, 9 vols., 4to, the notes separately in 3 vols., 8vo, London, 1819); translations of Cicero's *De Natura Deorum* and *Catilinariæ Orationes*, and of the *Philippics* of Demosthenes; *Poemata Didascalica*, and a history of the French Academy. Voltaire was received into the Academy by Olivet. D. 1768. Henry Drisler.

Oliv'etans, or **Brethren of our Lady of Mount Olivet,** a congregation of Benedictine monks, whose first general was John Tolomei, chosen in 1319 by authority of Pope John XXII. The congregation spread rapidly, but long since declined, and now numbers but very few houses.

Oliv'idæ [from *Oliva*—*i. e.* olive-shaped—the representative genus], a family of gasteropod mollusks of the order Pectinibranchiata, and sub-order Rhachiglossa, having polished shells much sought after by collectors. The animal varies considerably; the mantle is moderate, and has an elongated posterior filament fitting into a notch and groove round the spire; the siphon is recurved; the head small; the tentacles pointed; the eyes present on peduncles, connate with the external margin of the tentacles or wanting; radula with the teeth in three rows, the median or rachidian variously armed, the external versatile and with a single recurved or hook-like apex; foot very large, more or less covering the shell in extension (and producing the polished coat of the shell), and with a cross groove in front on each side. The shell is sub-cylindrical, smooth, and polished, with a short spire, whose sutures are channelled or covered with callus, with the aperture narrow, and with the pillar-lip obliquely plaited in front. The family is quite an extensive one, embracing species that closely agree among themselves in their shells, the chief differences being expressed in the form of the mouth (whether linear or expanded forwards) and the length of the spire. Three quite distinct types, however, are differentiated by the teeth of the lingual ribbon. (1.) In one (Olivinæ), the rachidian tooth is broad and convex, and armed at the middle with three teeth (the internal of which is smallest), and the lateral tooth is broad, with its extremity flexed inwards; this includes the large and most familiar species of the family. (2.) In the second (Ancillinæ) the teeth essentially agree with those of the first, but the median denticle of the rachidian tooth is enlarged, and between it and the lateral smaller ones intervene. (3.) In the last (Olivellinæ) the rachidian tooth has a convex base, is narrowed sideways, and has the margin armed with numerous denticles, and the lateral teeth are claw-shaped and recurved outwards, and at their bases square supplementary pieces. Theodore Gill.

Ol'ivine [Lat. *oliva*], a name given to an olive-green variety of chrysolite, a natural silicate of magnesia and protoxide of iron, glass-like in appearance. It occurs commonly in many basalts and lavas. Olivine has also been met with in meteorites. E. C. H. Day.

O'lla Podri'da ["putrid, ripe, or seasoned pot;" Fr. *pot pourri*], the Spanish name of a *ragout* or stew made of many ingredients. Hence a literary work of extremely miscellaneous character.

Ollivier', (Émile), b. at Marseilles July 2, 1825; studied law, and began to practise as an advocate at Paris in 1846. In 1848 he was sent as commissary-general to Marseilles to pacify the city, and shortly after he was appointed prefect, but in 1849 returned to his business in Paris. In 1857 he was elected a member of the Legislative Assembly, and made himself conspicuous by his courageous and eloquent opposition to the government of Napoleon III. Gradually, however, the emperor succeeded in winning him over to his side, and he was generally considered a political renegade, when on Jan. 2, 1870, he became Napoleon's prime minister. He was president of the cabinet when the war was declared against Prussia, but he retired Aug. 9, after the first reverses of the French arms. He has published *Démocratie et Liberté* (1867), *Le 19 Janvier* (1869), *Principes et Conduite* (1875), *L'Église et l'État au Concile du Vatican* (1879, 2 vols.), *M. Thiers à l'Académie et dans l'Histoire* (1880).

Olmsted (Denison), LL.D., b. at East Hartford, Conn., June 18, 1791; graduated at Yale 1813; was a college tutor 1815–17; became in 1817 professor of chemistry, mineralogy, and geology, and executed what is believed to have been the first State geological survey in this country (report published 1824–25); became in 1825 professor of mathematics in Yale College, and in 1836 professor of astronomy and natural philosophy; published in 1831, 1832, and 1842 textbooks on natural philosophy, several works on astronomy for schools, and a number of biographical memoirs: made important observations on hail, on meteors, the aurora borealis, etc.; his conclusions regarding the latter phenomenon are in vol. viii. of the *Smithsonian Contributions.* D. at New Haven, Conn., May 13, 1859.

Olmsted (Frederick Law), A. M., b. at Hartford, Conn., Apr. 26, 1822; studied agricultural science and engineering at Yale 1845–46; became a practical farmer, first in Central New York, and then on Staten Island; was appointed, with Mr. Calvert Vaux, to superintend the construction of the Central Park, N. Y. (see Central Park), a work upon which he was several years employed. In 1874 he was appointed to superintend the reconstruction of the grounds about the Federal Capitol, Washington, and he has also taken part in the laying out of the parks of Brooklyn, Chicago, San Francisco, etc. He is the author of *Walks and Talks of an American Farmer in England* (1852), which he wrote after making an extensive pedestrian tour through England and portions of the Continent, and *Journey in the Seaboard Slave States* (1856), *Journey through Texas* (1857), *Journey in the Back Country* (1860), the *Cotton Kingdom* (1861), which are the results of several journeys he made as correspondent to the New York *Times* to investigate the influence of slavery on the agricultural States of the Union. He is widely known as a pungent writer and skilful landscape-gardener.

Ol'mütz, city of Austria, province of Moravia, on the Marsch, is strongly fortified, and was the place of imprisonment of La Fayette. It is the see of an archbishop. It has a well-attended university, two military academies, a polytechnic school, extensive manufactures of linens, cloths, and porcelain, and a large trade in corn and cattle. Pop. 22,846.

Olney, city and R. R. centre, cap. of Richland co., Ill. (see map of Illinois, ref. 9–G, for location of county), has good schools, several mills, and a fine court-house. Pop. in 1870, 2680; in 1880, 3512.

Olney (Jesse), A. M., b. at Union, Tolland co., Conn., Oct. 12, 1798; exhibited in childhood a remarkable fondness for geography, as well as aptness in classical studies; was for twelve years a teacher in the Hartford Grammar School, where he was the first American teacher to introduce the method, now generally adopted, of separating geography from astronomy, and beginning the former study by familiarizing the pupil with the description and surroundings of his own town, county, and State, advancing thence to national and foreign geography. His school *Geography and Atlas*, first issued in 1828, almost immediately became a standard throughout the country, has had a sale of several millions of copies, and has been the model of which all subsequent school geographies have more or less been imitations. In 1831 appeared the *National Preceptor*, a reading manual far superior to any predecessor in the U. S., which was followed by a series of readers and outline maps, an arithmetic, and a school *History of the U. S.* Mr. Olney was also author of a small volume of poems, anonymously published at Hartford. To perfect himself in his favorite studies he visited Europe several times, residing at Paris for considerable periods. Residing at Southington 1834–54, and at Stratford for the remainder of his life, he served ten terms in the Connecticut legislature, where he was an active worker in behalf of educational interests, and was elected State comptroller of public accounts in 1867. D. at Stratford July 30, 1872.

Ol'neyville, Providence co., R. I. (see map of Rhode Island, ref. 4–H, for location of county), on the New York and New England and the Providence and Springfield R. Rs., has extensive manufactures. Pop. not in census.

Olonetz', government of European Russia, S. W. of the government of Archangel, around the Lake of Onega. Area, 57,437 square miles. Pop. 317,110. The ground is low, flat, and marshy, containing many large lakes, and covered with immense forests. Rye, hemp, and flax are produced; marble and slate are found; but timber and furs are almost the only articles exported. Cap. Petrozavodsk.

Oloron'-Sainte-Marie, town of France, department of Basses-Pyrénées, on a river of the same name, has tanneries, dyeworks, wool-spinning factories, and manufactures of paper, linens, and horsecloth. Pop. 9117.

Olot', town of Spain, province of Gerona, stands on the Fluvia, at the foot of the Pyrenees, in a volcanic district, and carries on a lively manufacturing industry, comprising silken, woollen, and cotton fabrics. Pop. 6867.

Oloz'aga (Salustiano), b. at Logroño, Spain, in 1803; educated for the bar; elected to the Cortés 1833; reporter of the constitutional commission 1837, when he insisted on the retention of the senate; proposed and carried laws providing for electoral reform, the suppression of monasteries, the abolition of ecclesiastical tithes, and a general amnesty; was ambassador to France three times; formed the cabinet in 1843 after the fall of Lopez, but could not maintain himself against the intrigues of Narvaez, and fled to Portugal, and thence to England; was the chief author of the constitution of 1855; retired from political life on the triumph of O'Donnell in 1856, but continued to reside in France: president of the Cortés Mar., 1869, and Apr., 1871. D. at Enghein, Belgium, Sept. 26, 1873.

Ols'hausen (Hermann), b. at Oldeslohe, Holstein, Aug. 21, 1796; studied theology at Kiel and Berlin, and was appointed professor in 1821 at Königsberg, and in 1834 at Erlangen, where he d. Sept. 4, 1839. His *Biblischer Commentar über sämmtliche Schriften des neuen Testaments*, published posthumously in Germany, has been (in part) translated into English for Clark's *Foreign Theological Library*, and a revised edition of it (by A. C. Kendrick, D. D.) published in New York (6 vols.) in 1858.

Olug Beg. See Ulugh Begh.

Ol'vera, town of Spain, province of Cadiz, has some very picturesque ruins of a Moorish castle. Pop. 8285.

Olym'pia, a plain in Elis, Peloponnesus, on the banks of the Alpheus, where the Olympic games were held, containing the Altis or sacred grove, which was said to have been enclosed by Hercules, and which contained the temple of the Olympian Zeus, with his statue by Phidias, and many other public buildings. Connected with the Altis were the stadium and the hippodrome. (See Grecian Games.) At the time of the elder Pliny (23–79 A. D.) about 3000 statues were standing; now the space is occupied with cornfields, with a few scattered ruins. (See E. Curtius, *Internat. Rev.*, Nov., Dec., 1875.)

Olympia, city, cap. of Washington Territory, and seat of justice of Thurston co. (see map of Washington Territory, ref. 4–B, for location of county), on R. R. and the De Chutes River, at its entrance into Budd's Inlet, the southern projection of Puget Sound, in 47° 3' N. lat. and 122° 55' W. lon., and 15 miles N. of Tenino, a station on the Pacific division of the Northern Pacific R. R. Tumwater, on the opposite side of the river, is connected with the city by a bridge 520 feet long, and another bridge connects the city with the western shore of the inlet, 2030 feet long. It was first settled in 1846, incorporated in 1859, is well laid out, the streets broad and regular, shaded with elms and maples, the residences generally surrounded with gardens; has good waterworks, the capitol, city hall, court-house, jail, an academy, 2 public libraries, with about 12,000 volumes, and fine water privileges utilized by several factories and mills. It is in communication by steamers with Victoria, on Vancouver Island, is the manufacturing and commercial centre for the surrounding country, and is in the midst of grand mountain-scenery. Pop. in 1880, 1232.

Olym'piad ['Ολυμπιάς], the period of four years between any two celebrations of the Olympic games. The Olympiad was early adopted as an æra for the recording of the dates of events. The Olympiads were designated by number, the first being reckoned from the victory of Corœbus in the foot-race, B. C. 776; or, again, they took the name of the principal victor in the next previous Olympic games. Events are recorded as having happened in such and such an Olympiad, or in such a year of a certain Olympiad. A new æra of Olympiads was established in the Roman empire in 131 A. D., which was sometimes used. (See Grecian Games.)

Olympic Games. See Grecian Games.

Olym'pus, the modern *Elymbo*, was the ancient name of a lofty range of mountains which separated Thessaly from Macedonia. Their sides are clad with beautiful forests, but the tops are covered with snow for nine months of the year. The highest peak rises 9754 feet, and on its broad, cloud-veiled summit stood, according to the oldest myths of Greece, the palace of Zeus and the other gods. Later, the abode of the gods was moved by a more refined sentiment to the celestial spheres, but Mount Olympus still retained its charm for the imagination.

Olyn'thus, now *Aio Mamas*, an ancient city of Macedon, on the Toronaic Gulf, was at different periods dependent on Athens or Sparta, acquired great wealth from its excellent commercial position, but was taken in 347 by Philip of Macedon, who sold the inhabitants as slaves and destroyed its buildings.

O'maha, city and R. R. centre, cap. of Douglas co., Neb. (see map of Nebraska, ref. 10–H, for location of county), situated on the W. bank of the Missouri River, 950 feet above sea-level, was laid out in 1854, and is now one of the leading railroad centres of the North-west. The city contains a high school and several public schools, churches representing all denominations, a public library, gasworks, extensive machine- and car-shops, oilworks, silver-smelting works, foundries, pork-packing establishments, furniture-factories, several street railways, a fire department possessing several steam fire-engines, and a system of electric fire-alarm signals. The U. S. custom-house, post-office, Grand Central Hotel, and numerous private residences are examples of fine architectural skill and beauty. Pop. in 1880, 30,518; in 1885, 61,835.

Omaha Indians, a tribe of the Dakota stock, occupying a reservation of 143,225 acres in Blackbird co., Neb., their ancestral abode. They are peaceable, honest, and generally industrious, and numbered 1167 in 1884.

Oman′, a large territory of South-eastern Arabia, extending from the Arabian Sea to the Persian Gulf along the Sea of Oman, and divided into several states, of which the most important is Muscat.

O′mar (Abu Hafsah Ibnul-Khattab), the second caliph of the Moslems, a relative of Mohammed, b. about 581; was at first one of the bitterest adversaries of the Prophet, but became after his conversion one of the most zealous apostles of Islam. In 634 he succeeded Abubekr, assumed the title of *Amîr El-Mumenîn* ("commander of the faithful"), and by his great talents, both as a military commander and as a civil governor, he laid the foundation of the vast Arabian empire. In 637, Syria and Palestine were conquered, and a mosque was built on the spot where once stood Solomon's temple; in 639, Egypt was subdued; in 642, Persia. He kept standing armies on pay, instituted a city police, regulated the relation between master and slave, etc., and under his rule an internal consolidation of the empire went with the conquests. In 644 he was stabbed by a Persian slave and buried at the side of the Prophet.

O′mar Pa′sha, b. at Plaski, Croatia, in 1806, a son of an Austrian officer; was educated at the military school of Thurn, and served for some time as a cadet in one of the Austrian frontier regiments; but fled in 1833 to Bosnia, changed his true name, Mikail Lattas, embraced Mohammedanism, and became tutor to the sons of Hussein Pasha. With them he went to Constantinople, became teacher in a military school, and writing-master to the heir-apparent, Abd-ul Medjid, and when, in 1839, Abd-ul Medjid ascended the throne, Omar rose rapidly. In 1842 he was appointed military governor of Lebanon; in 1843 he was made a pasha, and in the following years he distinguished himself by putting down with great skill and energy the rebellions in Albania, Bosnia, Koordistan, and other places. In the war between Turkey and Russia he commanded the army on the Danube, defeated the Russians several times, compelled them to give up the siege of Silistria, and finally to withdraw from the principalities. In the beginning of 1855 he then transferred his army to Eupatoria, repelled with great success a Russian attack, but failed in relieving Kars, whither he was sent in the same year. After the peace he was appointed governor of Bagdad, but having been accused of maladministration he was discharged, and even banished to Kharpoot in 1859. He was soon recalled, however, and sent to Bosnia in 1861, and to Crete in 1867, to put down rebellions. In 1869 he had charge for a short time of the ministry of war, and continued a member of the council of the sultan to his death, Apr. 18, 1871.

Ombay′, an island of the Malay Archipelago, N. of Timor, in lat. 8° 2′ S. and lon. 124° 17′ E., is 50 miles long, 30 miles broad, high, volcanic, and inhabited by savage tribes of a mixed negro and Malay origin. At Alor the Dutch have a settlement and carry on some trade in wax, edible birds'-nests, and pepper. The pop. of the island is estimated at 194,000.

O'Mea′ra (Barry Edward), M. D., b. in Ireland about 1780; entered the British army as assistant surgeon to the 38th regiment; served in Italy and Egypt; was surgeon to the man-of-war Bellerophon in 1815; became medical attendant to Napoleon at St. Helena; obtained his friendship; quarrelled with Sir Hudson Lowe in consequence of his treatment of his prisoner, which he denounced to the admiralty, and published several books relating to the captivity of Napoleon. D. at London June 3, 1836.

O′men [Lat.], among the ancient Romans, a sign by which the gods were believed to indicate their favor or opposition to any proposed public or private action. The omens were publicly observed by the magistrates, assisted by haruspices and augurs, the former observing signs of the first, the latter of secondary importance. In the time of Cicero, and even before it, the whole matter of taking omens, of divining, soothsaying, and the like, had fallen into disrepute among the intelligent, but with the vulgar these arts grew in importance as the empire sank in corruption.

Omen′tum, a membranous sheet extending between certain abdominal organs and distinguished as the great omentum, a quadruple fold protecting the small intestine; the gastro-hepatic, a double fold extending from the liver to the stomach; and the gastro-splenic, a double fold extending from the great pouch of the stomach to the spleen.

Omer, cap. of Arenac co., Mich. (see map of Michigan, ref. 5–J, for location of county). Pop. not in census.

Omish. See Mennonites.

Ommy′iades [from *Ommeyah*, one of their ancestors], the second dynasty of the Arabian caliphate. They were fourteen in number; reigned at Damascus from A. D. 661 (41 Hejira) till 750.

Omnibus. See Carriages.

Omnis′cience, an attribute of God, in consequence of which he knows of all that has been, all that is, and all that shall be. In its last phase, as Foreknowledge (which see), it has occasioned several very subtle theological distinctions.

Om′ro, Winnebago co., Wis. (see map of Wisconsin, ref. 5–E, for location of county), on the Chicago Milwaukee and St. Paul R. R., 10 miles W. of Oshkosh. It has saw and shingle mills, a planing and a grist mill, an elevator, carriage-factories, a woollen-mill, and a glass manufactory, etc. Pop. in 1870, 1838; in 1880, 1476.

Omsk, town of Asiatic Russia, in the district of Akmollinsk, belonging to the Central Asiatic provinces, is situated at the confluence of the Om and the Irtish, in lat. 54° 57′ N. and lon. 73° 40′ E. It is fortified, and the seat of the governor-general of Western Siberia. It has several military schools, manufactories, and mining-works. Pop. 30,890, including about 5000 soldiers.

Onagra′ceæ [from *Onagra*, a former genus], a natural order of exogenous herbs and shrubs which are found mainly in temperate climates, and especially in America. It is distinguished from related polypetalous with inferior ovary by having the lobes of the calyx valvate and the petals convolute in the bud, a single slender style, stamens only as many, or twice as many, as the calyx-lobes, and seeds without albumen. The leading genus is *Œnothera*, or evening primrose (the English name alluding to the resemblance of the corolla of the earliest known and commonest species to a primrose, and to the time when it opens), a specially American genus, of which many ornamental species are familiar in cultivation. *Fuchsia*, a well-known genus of shrubs, in which the calyx is as showy as the corolla, is still more important and familiar in horticulture. The order is destitute of active properties; one or two herbaceous species have been somewhat used as potherbs. An aquatic form, *Trapa*, of Europe and Asia, produces a large fleshy embryo, which is used for food under the name of water-chestnut. The Halorageæ, a group of mostly water-plants, long regarded as a degraded form of Onagraceæ, are referred to a separate order. A. Gray.

Onarga, Ill. See Appendix.

Onawa, city, cap. of Monona co., Ia. (see map of Iowa, ref. 4–D, for location of county), on the Sioux City and Pacific R. R., 37 miles S. by E. from Sioux City, has some manufactures. Principal employment, farming and stock-raising. Pop. in 1870, 478; in 1880, 882.

Onchid′idæ [ὀγχιδίον, a "little tubercle," from the wart-like tubercles], a family of gasteropod mollusks of the order Pulmonata and sub-order Geophila, including naked slug-like forms. The body resembles that of the ordinary garden-slugs, but has a large, shield-like, coriaceous mantle, which entirely covers the back; the respiratory orifice is posterior, at the right side and under the margin of the mantle; the vent posterior; head continuous with the body; the eyes at the extremity of non-retractile cylindrical peduncles, arising near the antero-lateral margins; tentacles none; lingual ribbon broad, with the teeth nearly uniform, "in numerous straight, transverse rows; the central, single, short, narrow, equilateral; the lateral numerous row nearly equilateral, with a broad, flat, sub-central tip," foot narrow, elongated, simple posteriorly; shell completely wanting. The family includes several genera, the species of which, for the most part, live in damp places near the water, either fresh or salt, and are supposed to be herbivorous. The species are mostly inhabitants of the tropical or warm countries. One species, however (*Peronia celtica*), is British. Theodore Gill.

Onck′en (Johann Gerhard), b. at Varel, Oldenburg, Germany, about 1800; was in early life a domestic servant; lived for a time in England, where he married and became a member of an Independent church; opened a bookstore at Hamburg as agent of the Edinburgh Bible Society and the Lower Saxony Tract Society; organized a Baptist church, of which he became pastor 1834; was appointed a missionary of the American Baptist Convention 1835; visited many parts of Germany, Austria, Switzerland, and Denmark, preaching, baptizing, distributing the Scriptures, founding churches, and promoting the erection of chapels; was several times imprisoned; edited religious journals in English and German; visited the U. S. in 1852 and in 1865, had established 76 churches, with a membership of more than 11,000, and nearly a hundred Sunday schools.

On′derdonk (Benjamin Tredwell), D. D., LL.D., b. in New York City in 1791; graduated at Columbia College in 1809; was ordained to the Protestant Episcopal priesthood 1813; was a professor in the General Theological Seminary 1826–30; bishop of New York 1830–45, when he was suspended by the House of Bishops. D. in New York Apr. 30, 1861.

Onderdonk (Henry, Jr.), b. at Manhasset, N. Y., June 11, 1804; graduated at Columbia College 1827; was principal at Union Hall Academy, Jamaica, L. I., 1832–65; author of a series of works of value, mostly illustrative of the history of Long Island.

Onderdonk (Henry Ustick), M. D., LL.D., b. in New York Mar., 1789; graduated at Columbia College 1805; studied medicine in London and took his medical degree at Edinburgh 1810; was for a time associated with Dr. Valentine Mott in the editorship of the N. Y. *Medical Journal;* was ordained in 1815 as deacon in the Protestant Episcopal Church; was engaged in labors at Canandaigua, N. Y., 1816–20; rector of St. Ann's, Brooklyn, N. Y., 1820–27; consecrated assistant bishop of Pennsylvania 1827; on the death of Bishop White became bishop of Pennsylvania; suspended 1844, restored 1856, but never resumed episcopal functions. D. at Philadelphia Dec. 6, 1858.

O'Neall (John Belton), LL.D., b. at Bush River, S. C., Apr. 10, 1793; graduated at South Carolina College 1812; was a teacher in the academy at Newberry, S. C.; served for a time in the war of 1812–15; came to the bar in 1814; was four times sent to the South Carolina legislature, and twice chosen its Speaker; became a judge 1828, a judge of the court of appeals 1830, presiding judge of the courts of errors and appeals 1850; later was chief-justice of South Carolina. Author of a *Digest of Negro Law* (1848), *Annals of Newberry, S. C., Biographical Sketches of the Bench and Bar* (1859), etc. D. near Newberry Dec. 27, 1863.

One′ga, a large lake in the government of Olonetz in Western Russia. Next to Lake Ladoga, it is the largest lake of Europe, covering an area of 4830 square miles. It is connected with the Volga and the Dwina by canals, and communicates with Lake Ladoga by the Sweer. It is very rich in fish.

One′glia [*Unelia*], a maritime town of Italy, in the province of Porto Maurizio, in lat. 45° 53′ N., lon. 8° 9′ E. The old harbor of this town was destroyed in the wars of the seventeenth century, but the new one has been constructed since 1825, and about 2000 vessels, total tonnage 100,000, now enter this port annually. The commerce and industry of the place are thriving. Some of the churches and other public buildings are very respectable, and the charitable institutions numerous and well endowed. The neighboring country is very fertile, and the hills that partially encircle the town are terraced with rich gardens and olive orchards. Oneglia originally stood at some distance from the sea, but being destroyed by the Saracens in 935, its fugitive inhabitants sought the seashore for food, and here rebuilt their town, which afterwards shared the prosperity and reverses of other Ligurian towns. Pop. 8047.

Onei′da, R. R. junction, Lenox tp., Madison co., N. Y. (see map of New York, ref. 4–G, for location of county), in a fine farming region, noted for hop-raising, has a seminary and a brisk trade. Pop. in 1870, 3262; in 1880, 1649.

Oneida Community, a communistic society established on Oneida Creek, Lenox tp., Madison co., N. Y., and constituting the chief establishment of the religious organization known as Bible Communists or Perfectionists. They are the disciples of John Humphrey Noyes, who made a first unsuccessful attempt to found a community at New Haven, Conn., in 1834, organized the existing association at E. Poultney, Vt., 1838, and removed to the present locality in 1847. The Community numbers about 300 members, owns a fine estate of 650 acres, has a commodious mansion, several mills and manufactories, and is understood to be in prosperous circumstances, the chief industrial occupations being the manufacture of traps and the preservation of fruits. Another smaller community, with about 60 members, is settled at Wallingford, Conn. The distinctive doctrines of the society are stated by the founder to be the same as those of the Gospels and the writings of Paul, and his own agency to be confined to a restoration of the primitive Christian ideal, which ceased to exist about 70 A. D., at which date Mr. Noyes places the second advent of Christ. The cardinal principles are four in number: I. Reconciliation to God, II. Salvation from sin, III. Recognition of the brotherhood and equality of man and woman, and IV. Community of labor and its fruits. The latter item embraces a scheme of "pantagamy," by which all the male and all the female members of the community are held to be in a sense married to each other—a circumstance which has exposed them to the obnoxious name of "free-lovers," but the system as regulated by the "principle of sympathy," and controlled by that free public opinion which constitutes the supreme government of the society, is far from being amenable to the reproach of immorality, in any ordinary sense of the word. A distinguishing feature of the religious belief of the "Bible Communists" is their rejection of all laws and rules of conduct, except those which each believer formulates for himself, subject to the free criticism of his associates. They hold that the Mosaic law and ordinances were abrogated by the second coming of Christ, at which time the reign of sin was concluded, and the true believers have since been free to follow the indications of the Holy Spirit in all things, nothing being good or bad in itself. The great object to be attained is holiness, which consists in the entire extinction of all selfish desires, and this goal is thought to have been reached by a large number of the Community. (See Hepworth Dixon's *New America* (1867), J. H. Noyes's *History of American Socialisms,* and C. Nordhoff's *Communistic Societies of the U. S.* (1875).) Porter C. Bliss.

Oneida Lake, in Oneida, Oswego, Madison, and Onondaga cos., N. Y., is 20 miles long and 6 miles wide. Its surface is 369 feet above the sea and 141½ above Lake Ontario. It abounds in fish. It formerly, with its outlet, Oneida River, was the channel of an important navigation, but it is superseded by railroads. The river is a deep, sluggish, tortuous stream, 18 miles long, with low banks. It falls into Oswego River.

Oneidas, one of the Five Nations of the Iroquois confederacy, resided in Central New York near the lake and in the county to which they have given name; were engaged, like the other allied nations, in protracted hostilities with the Hurons and the Canadian French, but were less warlike and better disposed towards the French than their neighbors, and at different periods allowed the residence of Jesuit missionaries among them. During the French wars of the eighteenth century they were faithful allies of the English, but joined with the Tuscaroras in refusing to fight against the colonists during the war of the Revolution, owing to the influence of the missionary Kirkland, who had resided some years among them. Their lands and homes were consequently ravaged by the British and Tories, for which they received compensation from the U. S. government in 1794. They ceded most of their lands to the State of New York by treaties of 1785 and 1788, retaining a reservation at Oneida Castle. A large number emigrated to the Thames River in Canada, and subsequently, in 1821, to Green Bay, Wis., where they received a large reservation. They have become Christians, maintain schools and churches, and are well advanced in the arts of civilization, as well as the Brotherton and Stockbridge Indians, who reside with them.

O'Neil (Charles), U. S. N., b. in 1842 in England; entered the navy as a master's mate in 1861; became an acting master in 1862, an acting volunteer lieutenant in 1865, a lieutenant in the regular navy in 1867, a lieutenant commander in 1868; served on board the Cumberland when sunk by the Merrimack, Mar. 8, 1862, and in the Rhode Island participated in both attacks on Fort Fisher, "discharging his duty with special credit."

Foxhall A. Parker.

O'Neill, cap. of Holt co., Neb. (see map of Nebraska, ref. 8–E, for location of county), on Sioux City and Pacific R. R. Pop. in 1880, 57; in 1885, 613.

O'Neill (Charles), b. at Philadelphia, Pa., Mar. 21, 1821; graduated at Dickinson College 1840; was admitted to the bar 1843; was a member of the Pennsylvania house of representatives 1850–52, of the State senate 1853; again a member of the lower house 1859–60; was a Republican member of Congress for the 2d Philadelphia district 1863–71; continuously re-elected up to 1884.

Oneon′ta, Otsego co., N. Y. (see map of New York, ref. 5–H, for location of county), on the W. bank of the River and on the Albany and Susquehanna R. R., has an opera-house, a grist- and a saw-mill, a sash and door factory, and a foundry. The round-house, repair and machine shops of the Delaware and Hudson Canal Company are located here. Pop. in 1870, 1061; in 1880, 3002.

Onimus (Ernest Nicolas Joseph), b. at Mühlhausen, Alsace, Dec. 6, 1840, studied medicine in Strasburg and Paris, began to practise in the latter place, and acquired reputation by his successful application of electricity. He wrote, among other works, *Traité d'électricité médicale* (1871), and *Guide pratique d'electrothérapie* (1877).

APPENDIX.

[EMBRACING SUPPLEMENTARY ARTICLES AND ARTICLES RECEIVED TOO LATE FOR INSERTION IN THEIR ORDER.]

Linds'borg, city, McPherson co., Kan. (see map of Kansas, ref. 6–G, for location of county), on Salina and South-western branch of Kansas division Union Pacific R. R. and on Smoky Hill River, 21 miles S. of Salina. P. in 1880, 466.

Lip'pitt (Christopher), Gen., was b. at Cranston, R. I., in 1744; filled in early life with great credit many civil and military offices, and was an earnest advocate of Revolutionary principles. He became colonel in the Revolutionary army Sept., 1776, and was engaged at White Plans, Trenton, and Princeton; was afterward brigadier-general of R. I. militia, and was a member of the State legislature. D. at Cranston, R. I., June 18, 1824.

Livo'nia Station, Livingston co., N. Y. (see map of New York, ref. 5–D, for location of county), is a manufacturing village, on Rochester division of New York Lake Erie and Western R. R., 30 miles S. of Rochester. P. of Livonia tp. in 1870, 2705, including 399 in v.; of tp. in 1880, 3119, including 688 in v.

Lock'wood (Belva Ann Bennett), b. at Royalston, N. Y., Oct. 24, 1830; educated in a district school; taught school at fifteen for $5 per month and "boarded round;" was married at eighteen, but lost her husband next year; wrote for papers and magazines; graduated at Genesee College, Lima, N. Y., at twenty-seven; taught school eleven years; was married to Dr. E. Lockwood in 1868; studied law; graduated at the National University at Washington, D. C., and was admitted to the bar of the District in 1873. Susan B. Anthony.

Long (Crawford W.), M. D., b. Nov. 1, 1815, in Danielsville, Madison co., Ga.; educated at the University of Georgia, graduating with honor in 1835; began to study medicine under Dr. George R. Grant in Jefferson, Ga., in 1836; graduated at the medical department of the University of Pennsylvania in 1839; soon after began to practise medicine in Jefferson, Ga. In 1842 he performed the first operation on a patient fully etherized that the world has any account of. His discovery of anæsthesia in surgery antedates the claims of Horace Wells two years and eight months, and those of Morton four years and six months. Long before the day of Horace Wells we were on the eve of the discovery of anæsthesia. In 1790, Priestley discovered nitrous oxide gas. In 1799, Sir Humphry Davy experimented with it, and in 1800 he published his *Researches, Chemical and Philosophical, chiefly concerning Nitrous Oxide Gas and its Respiration,* in which he distinctly announced his belief that it might be used as an anæsthetic in surgical operations. But no one acted upon his suggestion, and this grand idea was lost to the world till its resuscitation by Wells. But prior to Wells ether was used as an anæsthetic by Dr. Crawford W. Long of Athens, Ga. It is well known that sulphuric ether was used sportively ever since the beginning of this century by the young men in all our New England colleges; and in certain sections of the South its use as an excitant was at one time very common. Dr. Wilhite of South Carolina informed the writer that "ether frolics" were the fashion forty years ago in some portions of Georgia; that boys and girls, meeting at quiltings and other parties, often wound up the evening's entertainment with an ether frolic; and that the effects of the ether, carried only to the stage of intoxication, were identical with those of nitrous oxide gas, such as laughing, dancing, speaking, fighting, etc. In 1842, Dr. Crawford W. Long practised medicine in Jefferson, Jackson co., Ga. He had four students at the time—viz. P. A. Wilhite, D. I. Long, H. R. P. Long, and John S. Groves. They all occasionally indulged in "ether frolics." On several occasions Dr. Long became furiously excited under the influence of the ether, and could not be controlled. After recovering from the intoxication he often noticed that his arms were badly bruised, and he was not conscious of having felt any pain at the time. From this fact he inferred that it might be used as an anæsthetic in surgery. Accordingly, for this purpose he administered the ether to a Mr. Venables, putting him profoundly under its influence, and then exsected a tumor from Mr. V.'s neck. The operation, entirely painless, was witnessed by the four medical students above named and by others. Dr. Long performed other operations under ether. The first one was on Mar. 30, 1842. His operations were known to medical men in the neighborhood. But Dr. Long did not communicate his discovery to any scientific body, nor did he write it out for any medical journal till the year 1849, when he sent it to the *Southern Medical and Surgical Journal,* which was long after the labors of Wells, Morton, Jackson, and Simpson in this direction were fully recognized. In a communication by Dr. Charles T. Jackson to the *Boston Medical Journal,* Apr. 11, 1861, he says he visited Dr. Long at Athens, Ga., on Mar. 8, 1854, to examine into Dr. Long's claims to being the first to use sulphuric ether as an anæsthetic in surgery, and he further says: "From the documents shown me by Dr. Long it appears that he employed sulphuric ether as an anæsthetic agent—First, on Mar. 30, 1842, when he extirpated a small glandular tumor from the neck of James W. Venable, a boy [Mr. Venable was twenty years old when the operation was performed—J. M. S.], in Jefferson, Ga., now dead. Second, on July 3, 1842, in the amputation of the toe of a negro boy belonging to Mrs. Hemphill of Jackson, Ga. Third, on Sept. 9, 1843, in the extirpation of a tumor from the head of Mary Vincent of Jackson, Ga. Fourth, on Jan. 8, 1845, in the amputation of a finger of a negro boy belonging to Ralph Bailey of Jackson, Ga. Copies of the letters and depositions proving these operations with ether were all shown me by Dr. Long. He also referred me to physicians in Jefferson who knew of the operations at the time."

From these facts it is clear that Dr. Crawford W. Long was really the first man who ever performed an operation under an anæsthetic. His operations were witnessed by medical students, known and talked of by medical men in the community, but, unfortunately, he procrastinated their publication till the great discovery of anæsthesia was made by others. J. Marion Sims.

Long'shore (Hannah Myers), b. May 30, 1819, in Ohio; married and moved to Philadelphia, where she began the study of medicine; entered the Woman's Medical College in Philadelphia in 1849; graduated with honor, and began practice. Susan B. Anthony.

Loomis (Lafayette Charles), A. M., M. D., b. July 7, 1824, in Coventry, Conn.: self-educated; graduated Wesleyan University 1844, A. M. 1848, and since then has held positions as teacher of science and president in various colleges; was professor of natural science and belles-lettres Western Female College, Wilmington, Del., 1854–57; president same 1857–58; president Wheeling Female College, West Virginia, 1865–68; professor of physiology and microscopy Howard University, Washington, D. C., 1869; member of the American Association for the Advancement of Science 1858, and several other learned societies: was for many years a public lecturer on art. Author of *Mizpah* (392 pp., 1858; 2d ed. 1862), *Mental Culture* (250 pp., 1867; 2d ed. 1874), *Index Guide to Travel and Art Study in Europe* (632 pp., 1882; 2d ed. 1883; 3d ed. 1884), and other smaller works.

Loomis (Silas Lawrence), M. D., b. May 22, 1822, in Coventry, Conn.; self-educated; at the age of fifteen lost the thumb and use of two fingers of the left hand, and at seventeen was teacher of mathematics and natural sciences in Holliston Academy, Massachusetts; graduated from Wesleyan 1844, A. M. 1847, and since then has held various positions as teacher of science in different colleges; professor of physiology Georgetown University, D. C., 1859–60; professor of chemistry same institution 1861–67; astronomer to lake-coast survey 1857; surgeon in the army 1862–65; professor of practice of medicine Howard University, Washington, D. C., 1867; professor of chemistry and toxicology and dean same institution 1868–72, and in many other positions in later years as president of mining and manufacturing enterprises; elected a member of the American Association for the Advancement of Science 1852, of the American Medical Association 1862, and several other learned societies. As one of the founders, he changed a plan of a theological institution to that of Howard University; established the medical department, which was the first institution in the U. S. to extend the curriculum over three years and to admit women to the degree of doctor of medicine and surgery. His *Report* to the secretary of the treasury (41st Cong., 2d session, H. R. Ex. Doc. No. 272) was the basis for the standard saccharometer and the new gauging-rod now universally used (1870). He invented improvements in areometers, making them instruments of precision (1880); also discovered process by which ores of chromium, formerly condemned, have become valuable (1879); has discovered a process and invented machinery for producing a textile fibre from varieties of palmetto (1878–85), bearing the same relation to palmetto that the gin does to cotton. He is author of *Normal Arithmetic* (300 pp., 1859; 2d ed. 1863), *Analytical Arithmetic* (200 pp., 1860), *Key to the Normal Course* (1860), and many smaller books and papers.

Lophobran′chii [Gr. λόφος, "tuft," and βράγχια, "gills"], an order of fishes distinguished by the fibro-cartilaginous skeleton; the development of the bones of the head, and especially by the presence of but a single large operculum on each side; the production of the snout and lower jaw into a tube, at the end of which is the mouth, which is formed above by the intermaxillaries, behind which are the supramaxillaries; and especially by the gills, which (instead of being laminated, as in other fishes) are developed in the form of a row of tufted lobes on each of the branchial arches. The air-bladder is simple and closed, having no duct communicating with the intestinal canal. In all the species the dermal skeleton is largely developed, and composed of numerous angular plates in longitudinal rows. The muscles are mostly very little developed. This order, distinguished from all others by a peculiar modification of the gills, is represented by two types, which differ so much from each other as to have been elevated into sub-orders—viz. (1) Syngnathi, in which there is only a single dorsal fin and ventrals are entirely absent; and (2) Solenostomi, in which there are two distinct dorsal fins, the spinous one being developed, and ventral fins are present, and inserted near the scapular arch and under the spinous dorsal. Both groups are distinguished by peculiarities in the care which the parent fishes take of the eggs. In the Syngnathi the male receives from the female her eggs, and carries them on different parts of his body—*i. e.* on the breast or under the tail, either in a modification of the integument or a special pouch; while in the Solenostomi the female carries the eggs in a pouch formed by the coalescence of the ventral fins at the inner sides with the integuments of the breast. The family Pegasidæ, formerly included in this order, is now regarded as a teleocephal.
THEODORE GILL.

Lorain′, R. R. junction, Lorain co., O. (see map of Ohio, ref. 2–G, for location of county), 26 miles W. of Cleveland. P. in 1880, 1595.

Los Lu′nas, cap. of Valencia co., N. M. (see map of New Mexico, ref. 6–J, for location of county), on Atchison Topeka and Santa Fé R. R. P. in 1880, 876.

Love′land, Larimer co., Col. (see map of Colorado, ref. 1–D, for location of county), on Colorado division of Union Pacific R. R., 75 miles N. of Denver. P. in 1880, 236; in 1885, 557.

Lo′zier (CLEMENCE HAMED), M. D., b. Dec. 11, 1812, in Plainfield, N. J.; moved to New York 1814; taught a school for young ladies for eleven years; studied medicine, and graduated at the Syracuse College 1853; helped to found the New York Medical College and Hospital for Women and Children in 1863, and became dean and professor at that institution.
SUSAN B. ANTHONY.

Lub′bock (FRANK R.), b. at Beaufort, S. C., Oct. 16, 1815; went to Texas in 1836; was chosen secretary of the house of representatives in the extra session of the first congress 1838; was twice appointed comptroller; held the position of county clerk of Harris county from 1843 to 1856; was elected lieutenant-governor in 1856 and governor in 1861; joined the Confederate army; took part in all the actions on Red River; served on the staff of Pres. Davis in Richmond; was captured, and imprisoned at Fort Delaware from Apr. to Dec., 1865. He became treasurer of the city of Galveston.
C. G. FORSHEY.

Lu′kis (WILLIAM COLLINGS), b. in England in 1817; graduated at Trinity College, Cambridge; held several benefices, and became rector of Wath-juxta-Ripon, Yorkshire, and rural dean of the deanery of Catterick East, which he now fills; is a member of various antiquarian societies, and published, besides other works, *Church Bells and Bell Foundries* (1858), *Danish Cromlechs and Burial Customs compared with those of Brittany, Great Britain, etc.* (1861); contributed articles on cromlechs, tumuli, and barrows to the *Journal of the British Archæological Society*, and written on "The Stone Avenues of Carnac," "Brittany Sepulchral Chambers, and their Chronological Order," and other antiquarian researches.

Luray Cavern, in Page co., Va. (see map of Virginia, ref. 4–G, for location of county), one mile W. of the village of Luray, on the Shenandoah Valley R. R., was discovered on Aug. 13, 1878, by Mr. Andrew J. Campbell, who entered the extensive and beautiful cave from one of the sink-holes of Cave Hill. The whole area occupied by the cave, with its innumerable chambers, often arranged in tiers, is about 100 acres, of which, however, only a comparatively small part has been fully explored; but such parts as have been opened to the public by the Luray Cave Company are now illuminated by electric lamps, and the effect of the stalactitic display exceeds that of any other cave known. The temperature is uniformly 54° F., the same as in the Mammoth Cave, Kentucky, and the air is very pure. Though there are no streams or true springs, there are hundreds of basins, varying from 1 foot to 50 feet in diameter, and from 6 inches to 15 feet in depth. The water is exquisitely pure, but destitute of life. A few bats, rats, mice, spiders, flies, and small centipedes are found in the chambers: and when first entered, the floors of the cavern showed thousands of tracks of raccoons, wolves, and bears, probably made centuries ago. A single human skeleton has been found, embedded in stalagmite; also some pieces of charcoal, flint, etc.

Lycod′idæ [from *Lycodes*—one of the genera—λυκώδης, "wolf-like," and the family termination], a family of fishes of the order Teleocephali and sub-order Jugulares, whose representatives have an elongated, eel-like body, with the soft-rayed dorsal and anal fins confluent with the pointed caudal, and invested, like the body, in a loose skin; the anus submedian or anterior, and with a raised margin; the branchial apertures more or less restricted to the sides; minute jugular ventral fins or entirely wanting; and, generally, two rudimentary pyloric cæca. The family embraces three sub-families—(1) Zoarceinæ, (2) Lycodinæ, and (3) Gymnelinæ, the first of which is represented by a species along the coast of the U. S. (*L. anguillaris*), and the second and third by a number of species in the polar and especially Greenland seas.
THEODORE GILL.

Ly′man (JOSEPH BARDWELL), b. Oct. 6, 1829, in Chester, Mass.; graduated at Yale College in 1850; was admitted to the bar in New Orleans, La., in 1856. Near the close of the civil war he came to New York, adopted journalism as a profession, and had been at the time of his death (Jan. 28, 1872) for several years agricultural editor of the New York *Tribune*. He was the author of several treatises on agricultural subjects, and with his wife wrote *The Philosophy of Housekeeping*.

Lyman (LAURA ELIZABETH BAKER), b. at Kent's Hill, Me., Apr. 2, 1831; graduated at the Wesleyan Academy, Wilbraham, Mass., in 1849; was married to Joseph B. Lyman July 14, 1858; in 1870 became known by a series of articles published in *Hearth and Home* under the *nom-de-plume* of "Kate Hunnibee." For years she has been editress of the "Home Interest" department in the New York *Tribune;* became editress also of the *Dining-Room Magazine*, and is a contributor to several periodicals.

Lyman (THEODORE), b. Aug. 23, 1833, at Waltham, Mass., is son of Theodore, formerly mayor of Boston; graduated from Harvard College 1855; studied zoology and geology under Louis Agassiz at the Lawrence Scientific School, from which he graduated B. S. 1858; afterward continued the pursuit of science in this country and in Europe. His principal attention has been given to the Radiata, on which he has published many papers. His chief work is *Ophiuroidea of the Challenger Expedition* (4to, 400 pp., and 48 plates, 1882). From 1865–82 he was commissioner of inland fisheries of Massachusetts, and made the first scientific experiments in fish-culture undertaken by any State. Sept. 2, 1863, to Apr. 20, 1865, he served as lieutenant-colonel and volunteer aide-de-camp on the staff of Maj.-Gen. Meade, commanding army of the Potomac. He is a member of the American Academy of Arts and Sciences and of the National Academy of Sciences. He has also been interested in the administration of charities, and is president of the Boston farm-school and a trustee of the Peabody education fund. He is also one of the overseers of Harvard University, and was a member of the 48th Congress.
RALPH S. TARR.

M.

McAdoo (William Gibbs), A. B., A. M., b. Apr. 4, 1820, near Knoxville, Tenn.; graduated at East Tennessee University, Knoxville, 1845; was a member of the Tennessee legislature 1845–46; an officer in the Mexican war 1847; entered the law; was attorney-general of the Knoxville judicial district 1851–60; removed to Georgia in 1862; was captain in the Confederate service; appointed judge of the 20th judicial district of Georgia 1871; is author of published addresses, etc., and with Prof. H. C. White of Georgia, of *Elementary Geology of Tennessee.* Resides at Milledgeville, Ga. In 1857 he married Mary Faith Floyd, b. Sept. 8, 1832, who wrote *The Nereid*, a romance, and contributed largely to Southern periodicals.

McCal'lum (Daniel Craig), b. at Johnston, Renfrewshire, Scotland, Jan. 21, 1815; came to America with his parents at an early age; settled at Rochester, N. Y., and became an architect and builder; in 1851 invented the "inflexible arch truss bridge;" was general superintendent of the New York and Erie R. R. 1855–56; on Feb. 11, 1862, was appointed military director and superintendent of railroads in the U. S. Though to no individual belongs the credit altogether of the military railroad operations, McCallum was the acknowledged efficient head, and "for faithful and meritorious services" was brevetted brigadier and major-general. In June, 1865, he was mustered out of service, and in 1866 made a valuable report upon the military railroads under his charge during the war. D. at Brooklyn, N. Y., Dec. 27, 1878.

McCra'ry (George W.), LL.D., b. at Evansville, Ind., Aug. 29, 1835; removed very early to that part of Wisconsin Territory which afterward became the State of Iowa; was educated in a Western academy; studied law at Keokuk, and was admitted to the bar in 1855; was elected to the State legislature in 1857, and served in the State senate from 1861 to 1863, holding the position of chairman of the committee on military affairs; devoted himself chiefly to his profession from 1863 to 1868, when he was elected to Congress, and re-elected four times in succession, serving on the naval committee, the committee on the revision of the laws, and as chairman of committee on elections; he was Secretary of War 1877–79, and then U. S. circuit judge.

McLa'ren (Edward William), A. B., A. M., S. T. D., b. Dec. 13, 1831, at Geneva, Ontario co., N. Y.; graduated at Jefferson College in 1851, and at the Western Theological Seminary, Pittsburg, in 1860; was ordained to the Presbyterian ministry in the same year, and went to South America as a missionary; returned in 1863, and became pastor to the Second Presbyterian church, Peoria, Ill.; moved in 1866 to Detroit, Mich., as pastor to the Westminster church; entered the Episcopal Church in 1872; became rector of Trinity church, Cleveland, O., and was elected bishop of Illinois in 1875.

Maclean' (John), D. D., LL.D., b. in Princeton, N. J., Mar. 3, 1800; was graduated at the College of New Jersey in 1816, and at the Princeton Theological Seminary in 1821; in 1822 was made teacher of mathematics and natural philosophy at the College of New Jersey; in 1823 professor of mathematics, in 1829 professor of ancient languages and vice-president, and in 1853 president, from which position he retired in June, 1868. He has contributed articles to the *Princeton Review*, and published a number of pamphlets on education, temperance, and other subjects. After his retirement he devoted his leisure to the preparation of a *History of the College of New Jersey.*

Henry C. Cameron.

McLeod' (Hugh), b. in Georgia about 1814; graduated at West Point Military Academy in 1836; joined Texas in her struggle with Mexico, and commanded a company in the battle with the Cherokees in 1839. In 1841 he commanded as brigadier-general an expedition to Santa Fé, sent out by Pres. Lamar to open trade with New Mexico, but was betrayed into the hands of the Mexicans, and held a prisoner for nearly a year, until released by intercession from the U. S. In 1842–43 he was a member of the congress of the republic; in 1861 commanded the 5th Texas, and took part in the battle of Manassas; contracted pneumonia at Dumfries, and D. in Feb., 1863.

McMur'do (William), C. B., Maj.-Gen., b. about 1819, was of Scotch descent, and became an ensign in the 78th Highlanders in 1837; went to India with them, and was engaged there on the staff. He distinguished himself at the battle of Meanee, Feb. 17, 1843, in the campaign in Scinde under Sir Charles Napier, who appointed him assistant quartermaster-general. McMurdo became major in 1848, lieutenant-colonel in 1853, and colonel in 1854. Early in the Crimean campaign he had charge of the Land Transport Corps, afterward called the Military Train, in which service he was very efficient, and for it he was made C. B. Soon after the volunteer movement of 1859 he was appointed inspector-general of volunteer forces.

McPher'son (John Roderic), b. in Livingston co., N. Y., May 9, 1833; engaged in farming and stock-raising, and settled in 1858 in Hudson City, N. J., where he dealt in stock and established a new stockyard in 1863. He was the originator, designer, and constructor of the great buildings used by the Central Stockyard and Transit Co. at Harsimus Cove, N. J.; also of the abattoir and stockyard of Philadelphia; and the inventor of a new stock-car, and the great improvements he introduced soon attracted the attention of sanitarians and philanthropists. He was alderman of Hudson City 1863–69, and State senator from Hudson county 1872–74. Elected U. S. Senator for New Jersey Jan. 24, 1877; re-elected. H. L. Stuart.

Macroscel'idæ [from *Macroscelis*—μακρός, "long," and σκελός, "thigh"—and *-idæ*], a family of typical Insectivores of mouse-like appearance, clothed with soft hair, and adapted for leaping, the hind limbs being much elongated. The skull has a transversely convex muzzle; orbits open behind; the lachrymal foramen within the margin of the orbit, and a suboptic foramen; the teeth are I. $\frac{3}{3}$ or $\frac{1}{3}$, C. $\frac{1}{1}$, P. M. $\frac{3}{3}$, M. $\frac{3}{3}$ or $\frac{3}{4} \times 2$; the upper molars are quadricuspid, the anterior and posterior cusps connected by transverse ridges. The intestinal canal has a long cæcum. The family is peculiar to Africa, and its representatives are distributed into two sub-families and three genera—viz. Macroscelidinæ, with the genera *Macroscelides* (Africa generally) and *Petrodomus* (Mozambique), and Rhynchocyoninæ, with genus *Rhynchocyon* of Mozambique.

Theodore Gill.

Macru'ridæ [from *Macrurus*—μακρός, "long," and οὐρά, "tail"—and the family suffix], a family of fishes of the order Teleocephali and sub-order Jugulares, distinguished by a body which gradually terminates in a tapering, long, and compressed tail, and which is covered by keeled or ornamented scales; the first dorsal is near the head, and short, the second very long, and like it is the anal, the two encompassing the tail without the intervention of a differentiated caudal. There are numerous pyloric appendages. The family is related to the Gadidæ or codfishes, and is divided into three genera, with species in the Mediterranean and contiguous regions of the Atlantic, Chino-Japanese seas, Australia, and the North Atlantic (Greenland, etc.), viz.—(1) *Macrurus*, (2) *Coryphænoides*, and (3) *Malacocephalus.* The North Atlantic or Greenland species are *Macrurus rupestris* and *Coryphænoides norvegicus.*

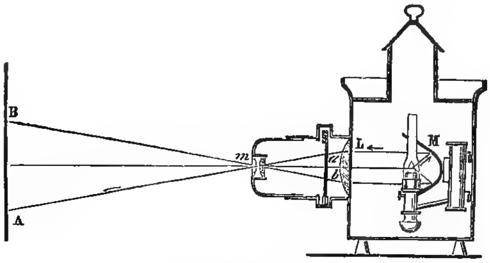
Theodore Gill.

Madstone, said to be a cure for hydrophobia and poisonous bites. Stones bearing this name are said to be formations found in the bladders of deer, and exist only in those animals that live in a high, dry climate where there is not a full supply of water and the water drank is impregnated with limestone. The stones are about the size of a hen's egg and slightly flattened. They are very smooth, and present the appearance of having been sandpapered. The stones are of a buff-color; they are porous and possess strong absorbent qualities. In bites of snakes or dogs or other poisonous wounds the stone is applied to the wound, to which it immediately adheres, and as the virus is drawn from the flesh the stone turns black. It is then washed in tepid water or sweet milk and applied again. As long as the stone sticks to the wound there is poison in the blood and flesh. These stones are credited with remarkable cures by many people.

Maffia, or **Mafia,** a secret society which included all classes and had an organized system of spying, murder, and brigandage, became powerful in Sicily in 1860. It is opposed to the Camorra, a similar society. The government has endeavored to suppress them both.

Mag'ic Lan'tern, an optical contrivance, the device of Father Athanasius Kircher, a German Jesuit, of the seventeenth century, for producing enlarged images of transparent or translucent objects, usually paintings, drawings, or photographs on glass. Optically considered, it consists of two distinct parts, an illuminating apparatus, and a magnifying apparatus. The illuminating apparatus embraces a source of light (in the original construction, a lamp), enclosed in a tightly-shutting box or chamber opening on the side, a condensing lens some inches in diameter adapted to an opening in the front of the box, and a concave mirror behind the light within, and opposite to the lens. This is properly the lantern; the magnifying apparatus is external to it, and consists of one or more converging lenses fixed in a sliding tube. Fig. 1 shows the entire apparatus in section. M is the mirror, here shown as attached to the oil-chamber of the lamp, which is secured to the back of the lantern by means of bracket-hooks; L is the condensing lens; *a b* is a figure upon a glass plate, supported by a frame which slides in the grooves or ways shown in the diagram; *m* is the magnifying system of lenses; and A B is the magnified image as received upon a plane white surface, or screen. In order to give distinctness to this image, the tube carrying the lenses *m* is drawn out or pushed in till the true focus is found. The mirror, M, in this design, is parabolic, and is supposed to be perforated, or notched, at top to accommodate the lamp-chimney; but in the simpler forms it is of spherical curvature, and is entirely behind the lamp.

Fig. 1.

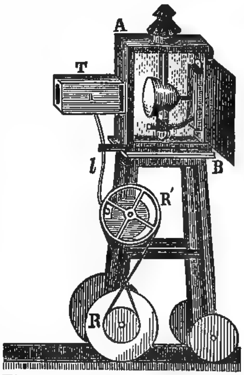


The Magic Lantern.

In order to exhibit the optical effects of this apparatus, the room must be darkened; and inasmuch as there must be provision for the admission of air to the lantern, and for the escape of the gaseous products of combustion, care must be taken that the apertures so provided are screened against the escape of light into the apartment.

For a very long time after its invention, the magic lantern was employed for no more important purpose than to surprise or to amuse. It was in high esteem with professional conjurers and jugglers, who found in it a means of producing very startling effects. A construction much employed by them was the phantasmagoria lantern, represented in Fig. 2. This is a lantern supported by a stand on wheels, and designed to run upon a horizontal table. One of these wheels carries a pulley, R, which is connected by a band with another pulley, R′, higher up. On the axis of the pulley R′ is a cam, against which rests one extremity of a lever, *l*, the other extremity acting on a sliding tube carrying the magnifying lenses within the larger tube, T. The proportions of the cam and lever are such that if, when the magnifiers are at the nearest practicable approach to the object, and the size of the image is therefore maximum, the lantern be placed at the distance from the screen which gives a distinct image, then on rolling the apparatus toward the screen, the magnifiers will be drawn backward at precisely the rate necessary to preserve the distinctness of the image, while this will rapidly diminish in size till it vanishes in a point. In preparing designs for phantasmagorial displays, the ground is made absolutely black, so that no light may pass except that which exhibits the figures. The lantern is also placed behind the screen, so as to be invisible to the spectators of the display, the screen being of dampened or varnished muslin, and translucent. Under these circumstances, the sudden increase of size of the image creates irresistibly the impression that the object represented is rapidly approaching the observer; and the sudden diminution of size of the same image causes the object to seem to recede. It contributes to the force of these impressions, that, by means of another simple contrivance, not here represented, the aperture of the lantern is gradually closed as the image diminishes in size, and gradually reopened as it again increases, so as to preserve a harmony, such as we see in nature, between the brightness of the image and the imagined distance. The exhibitor often avails himself of the opportunity when the image has dwindled to so minute a point as to be unrecognizable, to change the slider in the lantern; so that when the object, after apparently receding into the distance, returns again, it appears with a new and often formidable aspect. Thus, a being of angelic beauty may seem to fade away almost to the point of vanishing, and then come suddenly rushing back in the character of a gorgon or a fiend.

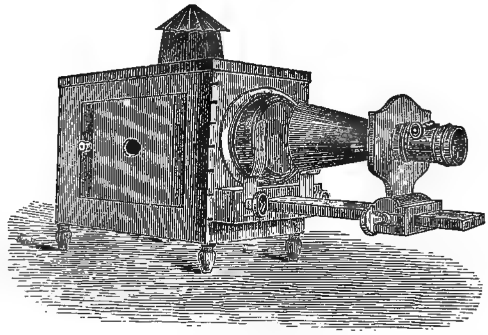
Fig. 2.



The Phantasmagoria Lantern.

Within the last half century the magic lantern has been very greatly improved. Designs on glass of objects of every kind in nature and art are so expeditiously, accurately, and cheaply produced by means of photography, as almost indefinitely to have increased its resources, and to have made it an invaluable auxiliary to the teacher and public lecturer. The substitution also of the oxyhydrogen or calcium light, or, better still, of the electric light, for the oil lamp, as a source of illumination, has added immensely to the power and brilliancy of its displays. Both the mechanical and the optical arrangements have, moreover, been carried to a high degree of perfection. Fig. 3 presents a very usual form of the modern improved instrument. The object is held in place by the spring clamps shown in the figure, and the magnifying apparatus is sustained by a single upright which slides along a projecting bar.

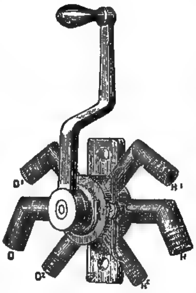
Fig. 3.



Improved Magic Lantern.

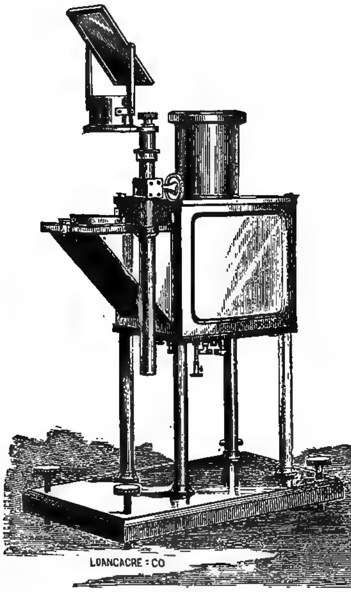
A very popular use of the magic lantern is for the production of the optical illusions called "dissolving views." For these, two lanterns are necessary, placed either side by side, or one above the other. They must be adjusted in position so as to have a common luminous field upon the screen. Each has a different object, and the two images when superposed to a great extent obliterate each other. A sliding or rotating stop placed before the lanterns is so constructed as, on being moved to left or right, to close the aperture of the one while it opens that of the other. At the mean position, both are half open and half closed; at either extreme position, one is wholly open and the other wholly closed. The movement of this stop, therefore, causes the images alternately to come out distinctly and to melt away. Advantage is taken of the moments when the lanterns are successively closed to change the objects, so that each dissolution is followed by the presentation of a new picture. When the calcium light is used, a stop is not necessary for the dissolving effect; but this is produced more simply by gradually and alternately shutting off and turning on the gases which feed the light in the lanterns severally. For this purpose, a six-way cock is employed, originally introduced by B. G. Malden, Esq., of the Royal Polytechnic Institution, London, called the "Malden tap." It is represented in Fig. 4. The gases enter from the reservoirs through H and O; they pass to one of the lanterns through H^1 and O^1, and to the other through H^2 and O^2. When the lever is upright, as in the figure, the gas flows to both lanterns freely; when it is turned down to the right the supply to the left-hand lantern is cut off; when to the left, the supply to the right is cut off. A small cock at C allows a small quantity of hydrogen to flow constantly into either lantern, serving to prevent extinction when the light is cut off.

Fig. 4.



The Malden Tap.

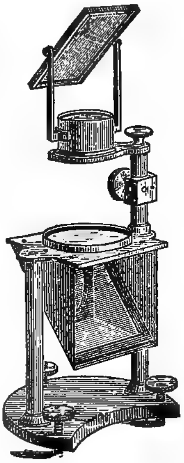
Fig. 5.



Vertical Lantern.

In the illustration of scientific subjects by means of lantern views, it is frequently desirable to present objects which cannot be secured in a vertical position, as, for instance, objects immersed in a liquid. This case may be provided for by removing the magnifying apparatus from the lantern, Fig. 3, and placing before the condensing lenses a diagonal mirror mounted as in Fig. 6, by which the illuminating beam is thrown vertically upward, passing through a horizontal ~~stage~~ of glass, intended to receive the objects. Immediately above this is fixed the magnifying apparatus, as represented; and above this still is a second diagonal mirror which restores the beam to the horizontal direction.

Fig. 6.



Prof. Henry Morton, of the Stevens Technological Institute, at Hoboken, N. J., constructed a lantern which admits of being used either as a horizontal or vertical lantern at pleasure, the transformation being effected very expeditiously and easily. This is shown in Fig. 5, arranged as a vertical lantern. Since the introduction of this improvement, most constructors have adopted it, and it has come into general use.

F. A. P. Barnard.

Magic Squares. *Repeating Cycles.*—In order to complete the discussion of the subject of repeating cycles in magic squares, considered in Vol. V. of this work, p. 172, something further needs to be added. It appears in that discussion that if the numerator of any one of the formulas for the values of Δ—that is to say, if any one of the increments a, b, a', b', or the sum or difference of either of these pairs of increments; viz. $a+b$, $a-b$, $a'+b'$, or $a'-b'$—contain a factor common with it and with n, the side of the square, a repeating cycle will occur, determined by that factor, and in the series and the direction corresponding to the particular value of Δ to which the factor belongs. It follows that, as there are two series, the elementary and the basic, and four directions of summation, the horizontal and vertical and the direct and transverse diagonals, there may by possibility be as many as eight cycles formed in the same square. It is shown, also, in the discussion referred to, that cycles in different series or directions may be formed on the same factor. It is now to be remarked that no more than two cycles can be formed in the same square upon the same factor, and that the two possible cycles thus formed cannot be formed in the same series, nor in the same direction, but that if one is in the elementary cycle the other must be in the basic, and that if the first is, for instance, horizontal, the other must be vertical or diagonal. They cannot be in the same series, because all the values of Δ for the elementary series are determined by the increments a' and b', which, as has been shown, must not have a common factor, which also makes it impossible that their sum or their difference should have a common factor with either or with each other. In like manner, all the values of Δ for the basic series are determined by the increments a and b, to which the same reasonings apply. Neither can the cycles dependent on the same factor have a common direction, for directions are common when the values of Δ are determined by homologous increments, as a and a', b and b', $a+b$ and $a'+b'$, $a-b$ and $a'-b'$; and it has been shown that homologous terms cannot have a common factor. The same may be shown of their sums or their differences, thus:

On supposition that $a+b$ and $a'+b'$, or $a-b$ and $a'-b'$, have a common factor, let this factor be represented by μ, and let $a+b=m\mu$ and $a'+b'=m'\mu$. Then, $a=m\mu-b$, and $a'=m'\mu-b'$. The denominator in every one of the formulæ for the value of Δ (formulæ (33) to (40), inclusive, Cycl., Vol. V. p. 171) is $ab'-a'b$; and this, it is there shown, must not be commensurable with n. In place of a and a' in this expression substitute the values of a and a' above given, and there results $mb'\mu-bb'-m'b\mu+bb'=(mb'-m'b)\mu$, which is not allowable if μ be a factor of n, as it must be in order that a cycle may be formed on μ.

The same result would have been reached had we taken the differences instead of the sums. But the sum of one of the pairs of increments may have a common factor with the difference of the other, as appears thus: Putting $m\mu=a+b$, as before, let $m'\mu$ be now put $=a'-b'$; then $a=m\mu-b$, and $a'=m'\mu+b'$. Substituting once more, we have $ab'-a'b=mb'\mu-bb'-m'b\mu-bb'=(mb'-m'b)\mu-2bb'$, a value not wholly divisible by μ, showing that $a+b$ and $a'-b'$ may have a common factor. But $a'-b'$ determines the value of Δ in the elementary series in the direction of the direct diagonal, and $a+b$ does the same for Δ in the basic series in the transverse diagonal; so that here again, as before, the cycles dependent on the common factor, μ, cannot be in a common direction.

Hence, in a square with the maximum number of cycles —eight—the minimum number of independent or prime factors will be four, and the smallest value of n which will give such a square will be the continued product of the four smallest prime numbers, which are 2, 3, 5, and 7, $=210$. Values of a, b, a' and b' which will produce the eight cycles are $a=7$, $b=2$, $a'=2$, $b'=5$, which will give $a+b=9$; $a-b=5$; $a'+b'=7$; $a'-b'=-3$. The corresponding values of Δ will be $\Delta p_x=95$; $\Delta p_y=88$; $\Delta p_{xy}=27$; $\Delta p_{-xy}=7$; $\Delta q_x=88$; $\Delta q_y=7$; $\Delta q_{xy}=95$; $\Delta q_{-xy}=81$.

It would be impossible by any permutation of the series to equalize the cycles thus produced. The squares formed would therefore be without the magic character. If, however, all the values of Δ were odd, or if none of them contained any power of 2 as a factor above the first, the magic character could be restored by making n twice as large, or $210\times 2=420=2^2\times 105$. By reversing the second half of each series the square on 420 would then be perfect. (See Vol. V. p. 174.) But, as one of the values of Δ is $88=2^3\times 11$, a new cycle will be formed on 2^2 or 4, and it will be necessary to take n four times the last value proposed, or $420\times 4=1680=2^4\times 105$. Reversing the last half of each series will then make the square formed on 1680 perfect.

In order that a square may be formed with the maximum number of eight cycles, each one being formed on a different factor, it is necessary that n, the side of the square, should be a common multiple of eight different prime numbers; and the smallest such multiple will be the continued product of the eight smallest prime numbers, which are 2, 3, 5, 7, 11, 13, 17, and 19. This product is 9,699,690. Values of the increments a, b, a', b', must then be taken such that every one of the above-specified factors may be found in some one of them or in their sums or their differences, and such that $ab'-a'b$ may not be commensurable with n nor be zero. Such values are $a=15$, $b=2$, $a'=38$, $b'=11$; which gives $ab'-a'b=89$. The square formed under these conditions will have eight cycles, each upon a different factor. It will be observed, however, of the factors 2 and 3, that they not only form cycles of their own, but enter also into cycles formed on other factors. In this case, for example, 2 enters into the cycle of 19, making the real determining factor of the cycle the composite number 38 instead of 19 simply. Similarly, 3 enters into the cycle of 5.

In order, therefore, to form a square of eight cycles, each cycle being determined by a factor rigorously prime, we must discard 2 and 3 and adopt instead of them the two prime numbers next above 19, which are 23 and 29. The continued product of 5, 7, 11, 13, 17, 19, 23, and 29 is 1,078,282,205. The values of increments which will give all these factors directly or in their sums or differences are $a=39$, $b=10$, $a'=34$, $b'=23$. With such values, $ab'-a'b=557$. It would, of course, be quite impossible to equalize all these cycles by permutation; but if we find the integral values of the several differences represented by Δ in the formulas (33) to (40), and if no one of these is even, a square formed on $4n$ would be made perfect by reversing, as before mentioned, the latter halves of the basic and elementary series in filling the cells of the square. These values of Δ in this case are the following:

$$
\begin{aligned}
\Delta p_x &= 387{,}174{,}939 = 23 \times 16{,}833{,}693.\\
\Delta p_y &= 646{,}582{,}148 = 17 \times 38{,}034{,}244.\\
\Delta p_{xy} &= 1{,}033{,}757{,}087 = 11 \times 93{,}977{,}917.\\
\Delta p_{-xy} &= 818{,}874{,}996 = 19 \times 43{,}098{,}684.\\
\Delta q_x &= 233{,}599{,}585 = 5 \times 46{,}719{,}917.\\
\Delta q_y &= 844{,}041{,}367 = 13 \times 64{,}926{,}259.\\
\Delta q_{xy} &= 19{,}358{,}747 = 29 \times 667{,}543.\\
\Delta q_{-xy} &= 487{,}840{,}423 = 7 \times 69{,}691{,}489.
\end{aligned}
$$

We see here that the second and fourth of these values are divisible by $4=2^2$. Hence, in order to obtain a square in which the cycles can be equalized by reversing the terms of the last half of each series, we must multiply n by 2^3, $=8$. It follows that the smallest perfect magic square in which there shall be the largest possible number of repeating cycles, each one formed on a prime factor different from all the others, is the square whose side is 8,626,257,640. This conclusion has, of course, only a theoretic interest.

Bordered Squares.—The following methods of constructing bordered squares are more simple and easy in practice than those given on p. 179, Vol. V., of the CYCLOPÆDIA.

Let it be first considered that, inasmuch as the bordered square must continue to be magical after the border is removed, therefore the sum of every two border terms standing directly opposite to each other, whether directly or diagonally, must be the same, and must be equal to the sum of the two terms of every couplet in what is called, on p. 176, Vol. V., an equalized band formed by the inversion of half the terms of the general series upon the other half. This constant sum is therefore $=n^2+1$.

If n is the side of the square, there will be n cells on each of the four sides, but, as the corner cells will be counted with both the horizontal and the vertical rows, they will be counted twice; so that the entire number of cells in the border is $4n-4$. The border, therefore, requires $4n-4$ terms, or $2n-2$ couplets, to fill it. Of these, if a number equal to n be placed in the upper and lower horizontal rows, including the corners, there will remain $n-2$ couplets to fill the remaining cells at the sides between the corners. The n couplets in the horizontal rows contain n antecedents and n consequents. Supposing n to be even, if we put half the antecedents into the upper row and the other half into the lower, and so select them that the sum of those in the upper row shall be equal to the sum of those in the lower row, we may be sure that the sums of the consequents corresponding to these antecedents, if entered opposite to them, will balance each other also; so that the border will be complete so far as these two rows are concerned. To this extent, therefore, the whole problem consists in forming from the n given antecedents two sets of terms consisting of $\frac{1}{2}n$ terms each, such that their sums may be equal. Now, the border may be formed of any $2n-2$ couplets, chosen anywhere in the general series 1 to n^2, provided that the terms of the general series remaining are capable of being formed into a magic square to occupy the interior space within the border. For the sake of simplicity, we will suppose the antecedents to be the terms of the natural series of numbers, 1, 2, 3, etc., up to $2n-2$. Now, of the natural numbers 1 to n we may form two groups, consisting each of $\frac{1}{2}n$ numbers, equal in their sums, by any method of proceeding which will accomplish the object. We may even form such groups empirically or by trial. To illustrate by example, let n, for instance, be $=16$. The sum of all the terms is 136; the half sum, 68.

$$
\begin{aligned}
&\text{Then } 1+4+5+8+10+11+13+16=68,\\
&\text{And } \ 2+3+6+7+\ 9+12+14+15=68.
\end{aligned}
$$

The first of these series entered in the upper row of the border, and the second entered in the lower row, will satisfy the conditions. But exact rules for making these arrangements are to be preferred, and these may be devised as follows: If n is evenly even, $\frac{1}{4}n$, $\frac{1}{2}n$, and $\frac{3}{4}n$ are whole numbers; and, from the laws of arithmetical progression, it is necessarily true that the first $\frac{1}{4}n$ terms added to the last $\frac{1}{4}n$ terms will be equal to the sum of the second and third $\frac{1}{4}n$ terms.

This, in the case of $n=16$, would give the arrangement:

$$
\begin{aligned}
&\text{Upper row, } 1+2+3+4+13+14+15+16=68.\\
&\text{Lower row, } 5+6+7+8+\ 9+10+11+12=68.
\end{aligned}
$$

Another process of almost equal simplicity for accomplishing the same object is this: Divide the whole series of n terms into successive groups of four terms each, forming what are called, in Vol. V. p. 176, "current groups," thus (taking the same example as before):

$$
\begin{array}{cccc}
1\ 3 & 5\ 7 & 9\ 11 & 13\ 15\\
2\ 4 & 6\ 8 & 10\ 12 & 14\ 16
\end{array}
$$

Then invert the second couplet of each of these groups, and the sum of the upper numbers in the whole arrangement thus produced will be equal to the sum of the lower, thus:

$$
\begin{aligned}
&\text{Upper row, } 1+4+5+8+\ 9+12+13+16=68.\\
&\text{Lower row, } 2+3+6+7+10+11+14+15=68.
\end{aligned}
$$

A third method is the following: Form a row of the odd numbers in n, and another row of the even numbers, thus:

Odd numbers, 1, 3, 5, 7, 9, 11 .... $n-3$, $n-1$.
Even " 2, 4, 6, 8, 10, 12 .... $n-2$, n.

Each term of the even series exceeds the corresponding term of the odd series by unity. It follows that the first half of the odd series added to the second half of the even series will be equal to the first half of the even series added to the second half of the odd series. On this principle are formed the following arrangements:

$$
\begin{aligned}
&\text{Upper row, } 1+3+5+7+10+12+14+16=68.\\
&\text{Lower row, } 2+4+6+8+\ 9+11+13+15=68.
\end{aligned}
$$

In entering these terms in the border, the corner cells of the upper row should be kept vacant, and the corner cells of the lower row should be filled, for reasons which will presently appear.

The upper and lower rows of the square being thus provided for, it remains to place properly the remaining $n-2$ antecedents in the lateral columns. If n is evenly even, $n-2$ is unevenly even. The first two terms of the series now under consideration will be $n+1$ and $n+2$. To begin with, then, place these two terms, the first on the left, and the second on the right. These being disposed of, there will remain $n-4$ terms; and, the number of these being evenly even, they may be arranged, by either of the methods above given for evenly even numbers, in two groups equal in number and equivalent in sum, which, being entered into the cells of the lateral border and united with the two terms previously entered, will make the total on the right a unit greater than that on the left. The balance is to be restored by means of the terms in the lower-corner cells, which in the previous arrangement of the horizontal rows should be filled by terms differing only a unit, the larger term being on the left; when all the terms in the lateral columns, therefore, are added up, the two inequalities will balance each other, and the total sums will be equal. It remains only to complete the border by entering the consequents of the several terms already used in the cells opposite them—those of the corners in the cells diagonally opposite, and all the others in those directly opposite, their respective antecedents.

In case n is unevenly even, enter the first two terms, 1 and 2, independently, the term 1 in the upper row of the border, and the term 2 in the lower row. The remaining terms, from 3 to n inclusive, will then be evenly even in number, and so may be arranged and entered in equivalent sets according to either of the methods given above. In entering these terms in the border the two upper-corner cells should be kept vacant, and the two lower-corner cells should be filled with terms differing by a unit, the larger being placed in the left corner. The series containing the term n should, moreover, be entered in the upper row. Owing to the inequality of the two terms first entered, the sum of the lower row will be a unit in excess of that of the upper. This will presently be attended to. The remaining antecedents from $n+1$ upward destined to form the lateral columns will be $n-2$ in number and evenly even. They are therefore easily arranged in equivalent groups in the side cells. The first term, $n+1$, should be on the left side. Then, owing to the inequality of the terms in the corner cells, the total sum of the left-side column will exceed that of the right-side column by a unit. We have thus a deficiency in the top row of a unit, and an excess in the left-side column also of a unit. Let the terms n in the upper row, and $n+1$ in the left-side column, interchange their places, and both these inequalities will be corrected at once. The antecedents being now all entered, it only remains to place opposite to them their corresponding consequents, and the border is complete.

All these methods are illustrated in Fig. 1, following. In this case $n=16$ and is evenly even. The last method above described—that of forming separate series of the odd and even numbers—lends itself most easily to practice, and is employed in the outer border. The first term, 1, is entered in the upper row in the cell next the axis on the right, and the succeeding odd numbers are placed in alternate cells farther toward the right (leaving the intermediate cells vacant) up to the term $\frac{1}{2}n-1$, which in this case is 7, and which falls into the cell next to the upper right-hand corner. The remaining odd numbers are placed in the lower row, beginning with $\frac{1}{2}n+1$ in the left-hand lower corner and proceeding in alternate cells up to $n-1$.

Fig. 1.

249	10	246	12	244	14	242	16	1	255	3	253	5	251	7	248
17	223	36	218	40	214	45	31	225	41	215	37	219	33	222	240
239	44	197	57	194	58	192	59	66	193	67	195	68	196	213	18
19	211	69	173	86	170	89	79	177	81	175	83	172	188	46	238
237	48	187	88	157	102	154	104	97	159	99	156	169	70	209	20
21	210	71	167	105	143	117	111	145	113	142	152	90	186	47	236
235	49	184	91	151	116	124	135	121	134	141	106	166	73	208	22
23	207	72	165	107	139	125	130	128	131	118	150	92	185	50	234
233	52	183	94	149	138	136	123	133	122	119	108	163	74	205	24
26	206	77	164	148	120	129	126	132	127	137	109	93	180	51	231
232	53	182	96	110	115	140	146	112	144	114	147	161	75	204	25
28	203	78	162	101	155	103	153	160	98	158	100	95	179	54	229
230	56	181	85	171	87	168	178	80	176	82	174	84	76	201	27
30	202	61	200	63	199	65	198	191	64	190	62	189	60	55	227
228	35	221	39	217	43	212	226	32	216	42	220	38	224	34	29
9	247	11	245	13	243	15	241	256	2	254	4	252	6	250	8

The even numbers are then entered, beginning with 2, in the right half of the lower row, in the second cell from the axis and proceeding toward the right up to $\frac{1}{2}n$, which will fall into the right-hand corner cell. Thus the condition that the left-hand corner term shall exceed the right-hand corner term by a unit is fulfilled. The remaining $n-2$ terms, from 17 to 30 inclusive, are fourteen—a number which is unevenly even. The first of these, 17, is placed in the cell next under the left-hand corner, and the second, 18, in a cell one place lower down on the right. There remain twelve terms, from 19 to 30, inclusive, which, being evenly even, are disposed of by placing the first half of the odd terms, 19, 21, 23, on the left, and the second half, 25, 27, 29, on the right; while the first half of the even terms, 20, 22, 24, is entered on the right, and the second half, 26, 28, 30, on the left. The consequents are then placed opposite the antecedents, and the border is completed.

The outer border being removed, the square becomes a square of 14—an unevenly even number. The antecedents for forming the border of this are the twenty-six numbers next following 30—viz. 31 to 56, inclusive. The first of these, 31, is placed in the upper row, in the cell next left of the axis, and the second, 32, in the lower row, in the cell next right of the axis. The next twelve terms, 33 to 44, inclusive, suffice to complete the horizontal rows, and, being evenly even, may be treated as in the case preceding; but they have been actually disposed in this example according to the second of the methods described above—that is, by forming of them three current groups and equalizing the upper and lower row by the inversion of the second couplet of each group, which gives:

For upper row, 33, 36, 37, 40, 41, 44 = 231.
For lower row, 34, 35, 38, 39, 42, 43 = 231.

In entering these no particular order need be observed, only the upper-corner cells should be kept vacant and the lower corners filled with terms of which the left must exceed the right by a unit. The terms used for this purpose in this example are 34 and 35. Also it will be remembered that when n is unevenly even, the last antecedent in the horizontal rows (in this case, 44) must change places with the first in the lateral system (in this case, 45).

The second border being removed, the square becomes a square of 12, which is evenly even. The antecedents required to form the border of this are the twenty-two following 56—viz. 57 to 78, inclusive, of which the first twelve, from 57 to 68, are required for the horizontal rows. The method employed in this case is the first of those above described—*i. e.* putting the first quarter part of the number, 57, 58, 59, and the last quarter part, 66, 67, 68, together in the upper row, as equal to the second and third quarter parts, 60, 61, 62, 63, 64, 65, which are placed in the lower row. The first two of this last series, 60 and 61, are placed in the corner cells; the rest are entered without regard to order. In the remaining borders—viz. of the smaller squares of 10, 8, and 6—the method used is that employed with the border of 16 in the beginning, in which the antecedents are resolved into two series of odd terms and even terms respectively.

The case in which n is an odd number requires a different treatment. In this case the number of antecedents on two opposite sides cannot be equal, but in the nearest possible approach to equality there will be a number of terms equal to $\frac{1}{2}(n+1)$ on one side, and a number equal to $\frac{1}{2}(n-1)$ on the other. The question first to be solved is, What must be the relation of these in order that when the consequents are supplied the sums of the completed rows may be equal? Let A represent generally an antecedent of the larger group, and B similarly an antecedent of the smaller. Then $\Sigma(A)$ will represent the sum of all the antecedents of the first class, and $\Sigma(B)$ the sum of all those of the second. Also, if s represents the sum of the two terms of a couplet, or $=n^2+1$, the sum of the consequents of $\Sigma(A)$ will be $\frac{1}{2}(n+1)s-\Sigma(A)$, and the sum of the consequents of $\Sigma(B)$ will be $\frac{1}{2}(n-1)s-\Sigma(B)$. The following must then be true:

$$\Sigma(A)+\tfrac{1}{2}(n-1)s-\Sigma(B)=\Sigma(B)+\tfrac{1}{2}(n+1)s-\Sigma(A).$$

Whence, $\Sigma(A)-\Sigma(B)=\frac{1}{2}s-\frac{1}{2}(n^2+1)$.

This condition will be found to be fulfilled by the following arrangement of terms in the border: Enter first the series of odd numbers among the antecedents from 1 to $2n-3$, beginning with the cell next adjacent to the left-hand upper corner and proceeding toward the right, occupying only the alternate cells and leaving the intermediate cells vacant, until the term $n-2$ is reached, which will fall into the cell next adjacent to the right-hand upper corner. Place the term n, which comes next in order, immediately under and next to this right-hand upper corner. Then proceed with the following terms, $n+2$, $n+4$, etc., up to $2n-3$, placing these in the bottom row, in cells opposite the vacant cells at the top. The odd series being exhausted, begin with the even numbers, placing 2, the first of them, in the lower left-hand corner, and proceeding upward with the numbers 4, 6 . . . $n-1$ in alternate cells. Then pass to the right and place the remaining even numbers, $n+1$, $n+3$, $n+5$ . . . $2n-4$, etc., in cells opposite the left-hand vacant cells. The last term of this series, $2n-2$, will fall into the right-hand corner cell. That this arrangement of the antecedents fulfils the required condition may be shown as follows: The number of terms in the upper row is easily seen to be $=\frac{1}{2}(n-1)$. The number in the lower row, including the corner terms, is similarly seen to be $=\frac{1}{2}(n+1)$; but, as these two corner terms are 2 and $2n-2$, they may be united into one, $=2n$, reducing the number to $\frac{1}{2}(n-1)$, like the upper. Place then the terms of this lower series in a row side by side, and write those of the upper series beneath them. Take the differences thus:

Fig. 2.

198	1	209	3	207	5	205	7	203	9	201	11	199	13	224
211	174	29	183	31	181	33	179	35	177	37	175	39	196	15
14	185	154	53	161	55	159	57	157	59	155	61	172	41	212
210	40	163	138	73	143	75	141	77	139	79	152	63	186	16
12	184	62	145	126	89	129	91	127	93	136	81	164	42	214
208	38	162	80	131	118	101	119	103	124	95	146	64	188	18
10	182	60	144	94	121	114	109	116	105	132	82	166	44	216
206	36	160	78	130	104	115	113	111	122	96	148	66	190	20
8	180	58	142	92	120	110	117	112	106	134	84	168	46	218
204	34	158	76	128	102	125	107	123	108	98	150	68	192	22
6	178	56	140	90	137	97	135	99	133	100	86	170	48	220
202	32	156	74	153	83	151	85	149	87	147	88	70	194	24
4	176	54	173	65	171	67	169	69	167	71	165	72	50	222
200	30	197	43	195	45	193	47	191	49	189	51	187	52	26
2	225	17	223	19	221	21	219	23	217	25	215	27	213	28

$$\begin{array}{ccccccc} n+2, & n+4, & n+6, & n+8, & \ldots\ldots\ldots & 2n-3, & 2n \\ 1 & 3 & 5 & 7 & & n-4 & n-2 \\ \hline n+1, & n+1, & n+1, & n+1, & & n+1, & n+1+1. \end{array}$$

We have here $n+1$ taken $\frac{1}{2}(n-1)$ times, and a unit over, or $\Sigma(A)-\Sigma(B)=\frac{1}{2}(n-1)(n+1)+1=\frac{1}{2}(n^2+1)$; so that in the horizontal rows the condition is fulfilled.

As to the sides, we have $\frac{1}{2}(n-1)$ terms on the left and $\frac{1}{2}(n+1)$ on the right, one of these last being n and the others $n+1, n+3, n+5 \ldots 2n-4, 2n-2$. Under these place the left-hand terms, and take the differences as before, thus:

$$\begin{array}{ccccccc} n, & n+1, & n+3, & n+5 & \ldots & 2n-4, & 2n-2. \\ 0 & 2 & 4 & 6 & & n-3, & n-1 \\ \hline n, & n-1, & n-1, & n-1 & \ldots & n-1, & n-1 \end{array}$$

Here we have $n-1$ taken $\frac{1}{2}(n-1)$ times, together with the term n in excess; or,

$$\Sigma(A)-\Sigma(B)=\tfrac{1}{2}(n-1)(n-1)+n=\tfrac{1}{2}(n^2+1);$$

from which it appears that the condition is also fulfilled in the side columns. Enter the consequents opposite their proper antecedents, for the corner terms diagonally and for all the others directly, and the border is complete.

Fig. 2 illustrates the method here described. In this case $n=15$. The odd series, 1, 3, 5, etc., is entered in the upper row, beginning next the left-hand corner cell and proceeding by alternate spaces toward the right up to $n-2$, or 13. Then $n=15$ is placed next under the corner cell on the right, and the remaining odd terms, 17, 19, 21, 23, 25, and 27, are entered in alternate cells farther toward the right. The even terms begin with 2, in the left-hand corner cell, and increase upward in alternate cells up to $n-1=14$. Then, passing to the right, the remaining even terms are entered in alternate cells successively down to $2n-4=26$, which is next to the right-hand corner; and in the right-hand corner cell itself is placed the last even term, $2n-2=28$. All the borders of the successive interior squares are constructed on the same principle.

F. A. P. BARNARD.

Magne'to-Electric'ity. Magneto-electricity is electricity which is produced by means of magnets, the electricity itself being identically the same from whatsoever source it comes. Magneto-electricity is the correlate of electro-magnetism; and precisely as magnetism is developed in an iron bar when an electric current flows through a coil surrounding it, on the one hand, so does the disappearance of the magnetism in the bar give rise to an electrical current in the coil, on the other. This, obviously, is a magneto-electric current.

The conditions under which magneto-electric currents are produced are simple. A magnetic field is commonly defined as the space surrounding a magnet; but since magnetic fields exist where there is no magnet, it is better defined as a space where a freely-suspended magnet will take up a definite direction. This directive tendency of the field is clearly due to the magnetic force pervading it; and since a force is known when its direction and magnitude are known, the properties of the field are due to the direction and intensity of the magnetic force which it contains. To facilitate reference, the direction is generally replaced by a number of parallel or non-parallel lines called lines of force. A magnet free to move will, when placed in a magnetic field, place itself parallel to a line of force. Now, the only condition necessary for the generation of a magneto-electric current is that a conductor should move through a magnetic field in such a way as to cut the lines of force. It matters not whether the field be produced by a magnet or by an electric current: if a metallic wire move through it so as to cross its lines of force, a current will flow through the wire. Of course, if the conductor be at rest and the lines of force move across it, the effect will be the same. This latter result takes place whenever the strength of the magnetic field is varied; because, since the strength of the field is proportional to the number of lines in it per unit of area, any change in this strength must cause a variation in the position of the lines, they either separating or closing up as the field is weakened or strengthened.

The strength of the current generated, it is evident, depends in the first place on the number of lines of force which are cut by the conductor in a unit of time. Hence, for a given field it is increased by increasing the velocity with which the conductor or the field itself moves; and for a given velocity of motion it is increased by increasing the strength of the field—*i. e.* the closeness of the lines of force. If E represent the electro-motive force, H the strength of the magnetic field, L the distance moved, and T the time occupied by the motion, the relations of these quantities show that $E=H\frac{L}{T}$. But since $\frac{L}{T}$ represents the velocity with which the conductor moves, we may say that the electro-motive force per unit of length is equal to the strength of the field, multiplied by the velocity of the motion. (*Jenkin.*) If the resistance of the circuit be constant, as in the case of a given machine, this increase of electro-motive force with the velocity necessarily increases the strength of the current in the same ratio. In the second place, the strength of the current generated is proportional to the sine of the angle which the line of force cut makes with the axis of the conductor, and hence has its maximum value when the one is perpendicular to the other. From this relation it also follows that no current at all is produced when a conductor moves parallel to a line of force.

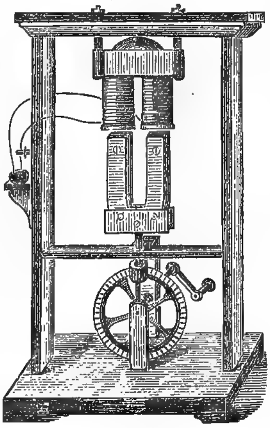
The direction of the current is a joint function of the direction of the motion and the direction of the lines of force, and may be readily deduced from the law of Ampère or from the law of Lenz. Ampère's law, which has reference primarily to the production of electro-magnetic phenomena, asserts that if a person places himself parallel to and facing a magnetic needle, and supposes the electric current to flow from his feet toward his head, the motion of the north-seeking end of the needle will be toward the left hand. As a wire conveying a current experiences, when placed in a magnetic field, a force which is at the same time perpendicular to its length and to the lines of force, it follows that if the current is from foot to head, and the lines of force —the pole being north-seeking—run from before backward, the force experienced by the wire will be a force to the right. So, on the other hand, if, under the same circumstances, a wire be placed in a magnetic field the direction of whose lines of force is from before backward, then a motion of this wire to the right generates a current in it passing from head to foot, and motion to the left an opposite current. If the conductor be at rest, and the lines of force—whose direction is from front to back—move from right to left, the current in the conductor will be from head to foot. It also follows from Ampère's law that if a watch be laid face upward upon the upper end of a vertical bar of iron surrounded by a coil, this upper end will be a south-seeking pole if the current flows through the coil in the direction in which the hands move, and a north-seeking one if the reverse. So, also, if a north-seeking magnetic pole be introduced into the upper end of a coil of wire whose axis is vertical, a current will be generated in the coil instantaneous in character, whose direction will be opposite to that of the hands of the watch; or in the inverse direction to that in which it would be necessary to send a current through the coil to produce a pole of the same name. Lenz's law states that the currents induced by the relative movement of a wire and a magnet are always in such directions as to produce mechanical forces tending to oppose the movement. If, for example, a bar of iron surrounded by a coil be approached to a north-seeking pole, the current flowing through the coil under the influence of magnetic induction will be in the direction required by the law of Ampère to make the forward end of the iron bar also a north-seeking pole; since the two north-seeking poles, being similar, will repel each other, and will in this way tend to oppose the movement.

The discovery of electro-magnetism by Oersted in 1819, and its rapid development during the next decade by Arago, Henry, and Ampère, prepared the way very naturally for the converse discovery of magneto-electric induction by Faraday in 1831. The experiment which led to the discovery is thus described: "A welded ring was made of soft round bar iron, the metal being seven-eighths of an inch in thickness and the ring 6 inches in external diameter. Three helices were put round one part of this ring, each containing about 24 feet of copper wire one-twentieth of an inch thick; they were insulated from the iron and each other, and superposed in the manner before described, occupying about 9 inches in length upon the ring. They could be used separately or conjointly; the group may be distinguished by the letter A. On the other part of the ring about 60 feet of similar copper wire in two pieces were applied in the same manner, forming a helix B, which had the same common direction with the helices of A, but being separated from it at each extremity by about half an inch of the uncovered iron. The helix B was connected by copper wires with a galvanometer 3 feet from the ring. The helices of A were connected end to end, so as to form one common helix, the extremities of which were connected with a battery of ten pairs of plates 4 inches square. The galvanometer was immediately affected, and to a degree far beyond what has been described when with a battery of tenfold power helices *without iron* were used; but, though the contact was continued, the effect was not permanent, for the needle soon came to rest in its natural position, as if quite indifferent to the attached electro-magnetic arrangement. Upon breaking the contact with the battery, the needle was again powerfully deflected, but in the contrary direction to that induced in the first instance." The experiment was then varied by introducing into a helix formed of 220 feet of copper wire, first, an iron bar with which magnets were brought in contact; and second, the magnets themselves. In both cases currents were generated, flowing in the inverse direction to those which by Ampère's law would be required to produce a magnet of the same name. The cause of these phenomena is thus clearly stated in a subsequent paper, read Jan. 12, 1832: "If a terminated wire move so as to cut a magnetic curve, a power is called into action which tends to urge an electric current through it; but this current cannot be brought into existence unless provision be made at the ends of the wire for its discharge and renewal;" the "one simple condition" of the production of a current being "that all parts of the mass shall not move in the same direction across the curves and with the same angular velocity."

Early in the year 1832, and entirely without knowledge of Faraday's discovery, Joseph Henry, then at Princeton, performed the following experiment: "A piece of copper wire about 30 feet long and covered with elastic varnish was closely coiled around the middle of the soft-iron armature of a galvanic magnet, which, when excited, would readily sustain between 600 and 700 pounds. The wire was wound upon itself, so as to occupy only about 1 inch of the length of the armature, which is 7 inches in all. The armature thus furnished with the wire was placed in its proper position across the ends of the galvanic magnet, and there fastened, so that no motion could take place. The two projecting ends of the helix were dipped into two cups of mercury, and there connected with a distant galvanometer by means of two copper wires each about 40 feet long. The arrangement being completed, I stationed myself near the galvanometer, and directed an assistant at a given word to immerse suddenly in a vessel of dilute acid the galvanic battery attached to the magnet. At the instant of immersion the N. end of the needle was deflected 30° to the W., indicating a current of electricity from the helix surrounding the armature. The effect, however, appeared only as a single impulse, for the needle, after a few oscillations, resumed its former undisturbed position in the magnetic meridian, although the galvanic action of the battery, and consequently the magnetic power, was still continued. I was, however. much surprised to see the needle suddenly deflected from a state of rest to about 20° to the E., or in a contrary direction, when the battery was withdrawn from the acid, and again deflected to the W. when it was reimmersed." During the year 1832 these experiments were repeated and varied by other observers, and the strength of the current was so much increased by Faraday, Nobili and Antinori, J. D. Forbes, Henry, and Saxton, that sparks were obtained from permanent steel magnets.

This step having been taken, and electric sparks produced at the ends of a wire coil surrounding an iron armature whenever this was rapidly removed from or brought near to the poles of the magnet, it was an easy matter to contrive a mechanical method of making the motion continuous, and so to produce a continuous current. In Sept., 1832, Pixii, an instrument-maker of Paris, mounted a steel horseshoe magnet upon the end of the arbor of a lathe, and caused it to revolve with its ends opposite to those of a piece of soft iron bent into the form of a U and wound with 400 mètres of silk-covered copper wire. When the ends of this wire were placed in a vessel of water, oxygen and hydrogen gases were evolved from them during the rotation of the magnet, and the more rapidly the quicker this rotation. Subsequently, a larger machine was constructed by Pixii for Ampère's lectures at the Sorbonne. (Fig. 1.) In this machine the magnet — which was powerful enough to lift 100 kilogrammes—was supported on a vertical axis and revolved by bevel gear. Above it a fixed electro-magnet was placed, wound with 1000 mètres of covered wire. The machine when in action gave vivid sparks and strong shocks, diverged gold-leaves, and decomposed water rapidly. The currents produced by it, however, were alternately direct and inverse, and hence when water was decomposed the collecting tubes contained both gases. To remedy this defect, the maker added Ampère's bascule or rocker, working automatically, by which the current, reversed every half revolution of the magnet, was re-reversed at the same intervals, thus making the current uniform in direction.

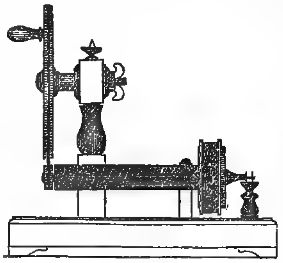
FIG. 1.



Pixii's Machine.

In June, 1833, Joseph Saxton of Philadelphia, then residing in London, constructed a magneto-electric machine having marked improvements. (Fig. 2.) In place of a rotating magnet and a fixed armature, he used a fixed magnet and a rotating armature, since the armature was lighter than the magnet. The plane of the magnet was horizontal, and contained the axis of rotation of the armature. In this machine there was used for the first time the principle discovered by Henry, that for currents of high tension a fine wire must be used on the armature, and for currents of low tension a coarse wire was necessary. This machine was provided, therefore, with a double armature, one pair of coils being wound with fine wire, the other pair with coarse wire. The two coils of each pair were wound in opposite directions, their ends terminating, the one in a copper disk on the axis of rotation, and beyond the armature, the other in an acute rhomb, also of copper, placed beyond the disk, and insulated from it and from the axis. A mercury cup placed below received the disk and the rhomb, the former continuously, the latter intermittently; the rhomb being so adjusted that its points left the mercury at the instant of maximum current, thus producing a strong spark. By means of a switch on the axis either pair of coils could be brought into action at pleasure, and by using the fine coils, in connection with a mercury cup divided into two parts by a vertical partition, in one of which the disk ran, and in the other the rhomb, the two portions of mercury being made the terminals of the external circuit, strong shocks could be obtained every time that contact was broken by the rhomb. If the rhomb were replaced by a disk, the current was uniform, though alternating in direction, and could be used for the decomposition of water, for the production of magnetic phenomena, and other similar experiments.

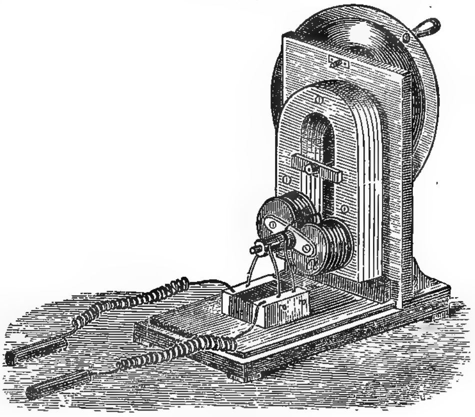
FIG. 2.



Saxton's Machine.

In 1836, Clarke, an instrument-maker of London, described a machine essentially similar to that of Saxton, but with some variations of detail. (Fig. 3.) The magnet in this machine was placed vertically, with its poles downward. The armature with its coils was placed in front of these poles, and revolved about a horizontal axis passing between them, being driven, as in the machine of Saxton, by a multiplying-wheel. One end of the wire constituting the armature coil was connected with one of two brass rings or ferules upon the prolongation of the axis in front, the other end with the other ferule. Both ferules were insulated from the axis, and they were arranged to give at will the various modifications of the current desired. Two armatures were provided, one wound with coarse, the other with fine, wire.

FIG. 3.

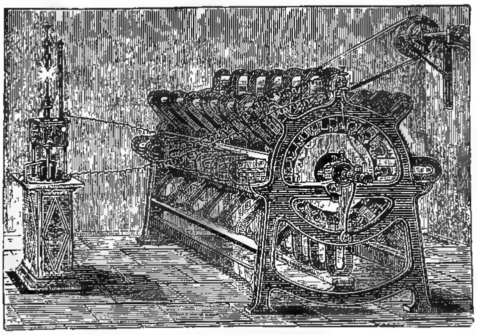


Clarke's Machine.

In 1845, C. G. Page of Washington contrived an improved form of Saxton's machine, in which he used two large compound U-magnets, placed horizontally, instead of one, their poles being reversed in direction. Two separate coils of covered copper wire, with cores of iron wire, revolved between these magnets about a vertical axis, the speed being increased by means of a multiplying-wheel. The currents from these coils were made uniform in direction by means of a commutator or pole-changer of the following simple construction: Upon opposite sides of the axis of rotation, and just above the coils, two semi-cylindrical segments of sheet silver were placed, insulated from the axis and from each other, the vertical spaces separating the two segments being perpendicular to the line joining the centres of the coils. Two springs, also of silver, pressed upon these segments, so placed that at the instant when the coils began to leave a pole to go to the next the springs changed from one segment to the other. In this way, although the current flows in opposite directions through the coils at each half revolution, the springs through which it issues are also changed to the opposite segments every half revolution. Hence, the current through the springs, and through the wires connected with them, is always in the same direction, though it is intermittent, having two maxima and two minima every revolution.

In 1849, Nollet, professor of physics in the Military School of Brussels, proposed to construct a magneto-electric machine on a large scale, the general details being the same as in Clarke's machine, but very greatly improved. His death prevented him from realizing all his expectations, but the machine he had devised, extended and perfected by Berlioz and Van Malderen, constitutes what is known to-day as the "Alliance machine," because it is constructed by the Alliance Co. of Paris. This machine, which has been for some years employed in several of the lighthouses on the French coast, is the only one in use on the large scale for the production of the electric light, in which the field of force is generated by permanent magnets. (Fig. 4.)

FIG. 4.

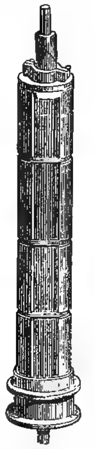


Alliance Machine.

It consists of 48 compound U-magnets of steel, arranged in 6 rows of 8 each. The 8 magnets are arranged radially in a circle, their poles facing inward and alternating, thus forming a circle of 16 alternate poles, and in all a cylinder of 96 alternate poles. On a horizontal axis passing through this cylinder 6 bronze disks are placed, upon the periphery of each of which are 16 coils of copper wire, each having a tubular core of iron slit lengthwise, the axes of the coils being horizontal and parallel to the axis of rotation. The length of a coil is such that it will just pass between the poles of two successive circles of magnets. The coils upon a single disk are united alternately right and left, the first end of one coil being joined to the last end of the preceding one. When the disks are rotated the coils are brought alternately between opposite magnetic poles at both ends, the current generated being reversed by each successive pair of poles. These alternating currents are re-reversed and given a uniform direction by means of a commutator devised by Serrin, which is simply a multiple pole-changer of Page's. Experiments made by Jamin and Roger with a four-disk machine carrying 96 coils showed that when the coils were connected consecutively, or for tension—in which case the resistance was equal to that of 655 Bunsen cells—the electro-motive force of the current produced by a speed of 200 revolutions per minute was equal to that of 226 Bunsen cells. When the coils were connected in parallel series, or for quantity, the resistance then being that of only 18 Bunsen cells, the electro-motive force was equal to that of 38 such cells. Used to produce the electric light, this machine gave a light equal to that of 230 Carcel burners, equivalent to 1610 candles, the cost of the light in motive-power being 1.1 francs per hour. This is less than one-tenth the cost of the same amount of light obtained from the battery, and about one-seventh the cost of this amount of light obtained from oil.

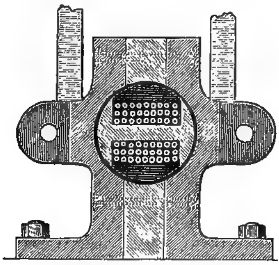
Up to this time the magneto-electric machines had all been constructed on one general plan, this being that of the original Saxton machine. In 1857, Werner Siemens of Berlin made an important advance by devising a new form of armature, since known as the "Siemens armature." To construct it, a cylinder of soft iron whose length is five or six times its diameter is deeply grooved on opposite sides longitudinally, so as to make its cross-section nearly the shape of an I. Covered copper wire is then wound lengthwise in the grooves, and the two ends of the cylinder are furnished with bearings on which the armature can rotate. The ends of the wire coil communicate with a commutator placed on the axis at one end. (Figs. 5 and 6.) The advantages of this form of armature, which are decided, consist chiefly in its compactness, the magnetic surface being large, and at the same time capable of complete action within a very intense and uniform magnetic field. Moreover, from its construction the coils cut the lines of magnetic force nearly at right angles. In Siemens's machine a series of from 12 to 30 steel U-magnets were fastened together in a row, but not in contact, their planes being parallel. A cylindrical space was made between the poles of these magnets, and in this space the armature revolved, being driven by a belt running to a pulley on one end of the axis. One of the forms of the Siemens machine is shown in Fig. 7.

FIG. 5.



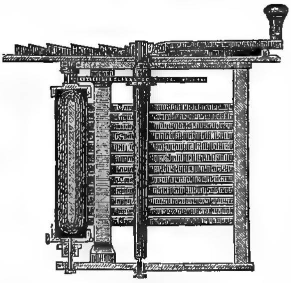
Siemens's Armature (longitudinal).

FIG. 6.



Siemens's Armature (transverse.)

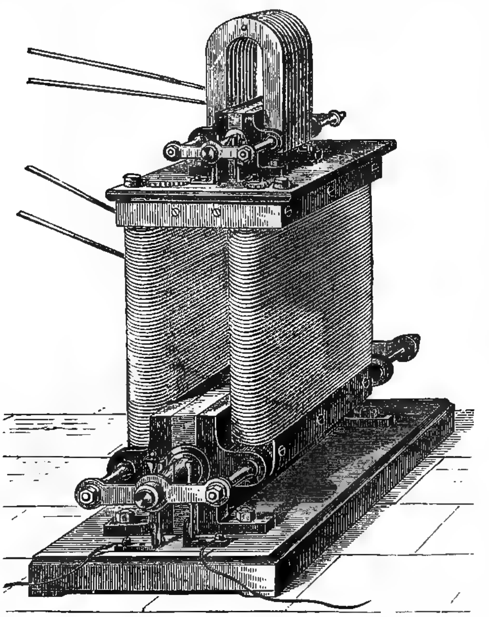
FIG. 7.



Siemens's Machine.

In 1866, Wilde of Manchester produced the first magneto-electric machine in which permanent steel magnets were replaced by the vastly more powerful electro-magnets. To charge these magnets the current from a small Siemens permanent-magnet machine was used. The machine represented in Fig. 8, which is the size adopted for the Scotch lighthouses, consists of the Siemens machine, slightly altered in its details, placed above, and of the electro-magnet machine placed below. The former, or Siemens machine, contains from 12 to 16 U-steel plates, each weighing 1.5 kilogrammes, with their poles downward, attached to two cheeks or poles of iron, separated by a thick brass plate, and bored through from end to end for the reception of the armature. This armature was covered with 50 mètres of copper wire three millimètres in diameter, wound lengthwise and forming an elongated coil 6 centimètres thick, the ends of which passed to a commutator on the axis. The latter, or electro-magnet machine, is made of two vertical wrought-iron plates, 91 by 66 centimètres in area and 2.5 centimètres thick, bolted above to a horizontal iron plate, and each wound with 500 mètres of covered copper wire, No. 10, arranged in seven parallel strands, the ends being connected to the springs, which press upon the commutator of the upper machine. The lower ends of these iron plates, like the magnets above, are extended by two massive cheeks or poles of iron, separated by a thick plate of brass, and having a hollow cylinder through them lengthwise. In this cylindrical space revolves a Siemens armature of proportionate size, being 1 mètre long and 18 centimètres in diameter, wound with 30 mètres of copper wire 6 millimètres thick. The entire weight of the machine is 1500 kilogrammes. To drive it at full speed, which is 1700 revolutions per minute for the smaller armature and 1500 for the larger, requires about three horse-powers. The energy developed by this machine was astonishing; pieces of iron rod 6 millimètres in diameter and nearly 40 centimètres long were at once melted by it. By carrying the principle involved in this machine one step further, and causing the second current to magnetize a third and still larger electro-magnet similarly arranged, Wilde succeeded in vastly increasing the effect. The machine which he constructed on this plan consumed fifteen horse-powers of force, and gave a current which melted a bar of platinum 60 centimètres long and 6 millimètres in diameter. The principle seemed capable of an indefinite extension in this direction until Wilde showed that it was limited.

Fig. 8.

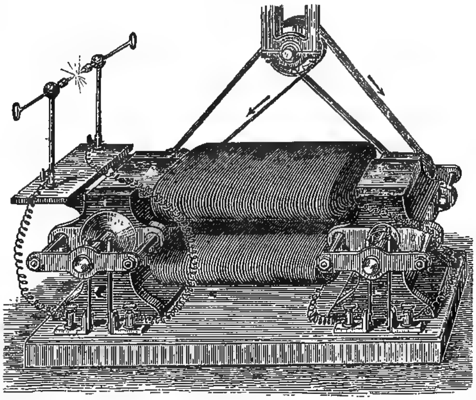


Wilde's Machine.

In February, 1867, C. W. Siemens of London read to the Royal Society a paper received from his brother, Werner Siemens of Berlin, in which he proposed a very important but obvious modification in these machines.* He proposed to do away with the permanent magnet machine, and to place the terminals of the coils surrounding the electro-magnet which produced the field of force in direct communication with the springs which pressed upon its own commutator. To start the current, Siemens at first proposed to introduce momentarily into the circuit a small battery. On revolving the armature the small amount of magnetism developed by the battery-current would react on the armature coil to produce a magneto-current in it. This passing round the electro-magnet would in its turn increase its magnetism, which again would react on the revolving coil, the current increasing in a geometric ratio until the iron reaches its maximum of saturation and the power applied is balanced by the resistance. The battery being removed, the machine itself will continue to furnish the current necessary for its own magnetization. He also suggested, to start the machine, the momentary placing of a steel magnet against the iron of the electro-magnet while the armature was revolved. The small amount of magnetism thus produced becomes the starting-point of a series of actions and reactions similar to those above mentioned, until the full power of the machine is reached. It was soon found in practice, however, that this auxiliary assistance, whether battery or magnet, was entirely unnecessary. The purest commercial iron after magnetization always retains residual magnetism, which is sufficient to start the current. Moreover, the position of the iron cores of the magnet with reference to the lines of dip always causes their magnetism by induction from the earth. But a new difficulty now arose. The field of force being in the main circuit of the machine, whenever the external circuit was broken the magnetism at once disappeared from the magnets and the machine lost its power. In some cases—as, for example, in heating wire for blasting, where the external circuit is always complete—no difficulty is experienced from the above cause. The magneto-electric or dynamo-electric machines of Farmer, which have been for several years in use in the U. S. navy for firing torpedoes by the ignition of fine platinum wire, have precisely the construction above given. Siemens, however, remedied the defect by placing upon his blasting-machines an automatic arrangement by which the current was diverted into the external circuit at regular intervals. The same result, practically, was attained by Wheatstone by dividing the current, and sending one portion around the magnets, while the other part was utilized for the performance of external work.

In March, 1867, Ladd, an instrument-maker of London, described a new form of machine, in which the difficulty arising from having the field of force in the main circuit was very ingeniously obviated. In this machine only one electro-magnet was used, but its peculiarity consisted in its having two Siemens armatures upon it, one at each end, both being simultaneously driven. (Fig. 9.) This machine, the first large machine in which residual magnetism was used as the starting-point, was called a dynamo-electric machine, the name magneto-electric machine being restricted to machines with permanent magnets. In the Ladd machine the current produced in the smaller of the two armatures charged, through its commutator, the electro-magnets of the field of force. The current from the larger armature was utilized externally. This machine was exhibited by its inventor at the Paris Exposition of 1867, and excited much attention. Although the plates composing the cores of the magnets were only 60 centimètres long, 30 wide, and 1.5 thick, the machine developed a current equivalent to that from 25 or 30 Bunsen cells, and maintained in a state of incandescence a platinum wire more than a mètre long and half a millimètre in diameter. Ruhmkorff, into whose hands the French patent for this machine passed, improved its construction by placing the magnets vertical instead of horizontal, and by using only one armature. This armature, however, was divided into two sections of unequal length, each having its own coil and commutator, the two coils being in planes at right angles to each other. The current from the smaller coil excited the field of force, as in Ladd's machine. The larger coil furnished the useful current. Schellen and Gaiffe appear to have suggested a similar improvement about the same time, though in their plan the same armature-core carried two separate and distinct coils wound over its whole length, and of course parallel. Since one-third more wire can be carried by an armature wound in this way, the results obtained with this armature are proportionally greater than with the one devised by Ruhmkorff.

Fig. 9.



Ladd's Machine.

The machines which have now been described, and which use the Siemens armature for the production of the current, have all of them a serious defect which has prevented their coming into general use. Since the polarity of the armature is reversed twice every revolution, there are several thousand magnetizations and demagnetizations effected every minute. But as the magnetizing and reversing of polarity develops heat in the iron, as Joule has shown, the result is an enormous development of heat in the armature. This is not only so much actual loss of power, but it actually endangers the safety of the machine, the cotton covering of the wire in one of Siemens's machines having been completely charred from this cause. In the machines both of Wilde and Ladd the portion surrounding the armature is of necessity made hollow, so that a stream of water can

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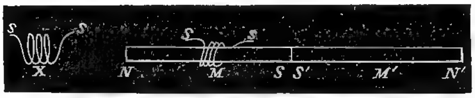
* Wheatstone also communicated a paper to the Royal Society on the same day upon the same subject. But as Werner Siemens's paper had been read to the Berlin Academy as early as the middle of January, and the machine had been exhibited in that city in Dec., 1866, there can be no more doubt of Siemens's priority of publication than there is of Wheatstone's independence of discovery. Farmer of Salem, Mass., in a letter to Wilde received in Nov., 1866, states that the same idea had occurred to him, and that he had constructed a machine in which a thermo-battery furnished the current to start it, and then a branch of the main current sustained the magnetism.

be passed through it to keep it cool. Moreover, the currents produced in the armature-coil are alternately positive and negative in direction. For the electric light this is of no practical importance, provided the lamp is constructed accordingly. But for many purposes, as in electro-plating, this alternating current is inadmissible; then it becomes necessary to use a commutator to render the direction of the currents uniform. Under these circumstances there is produced, whenever the spring passes from one segment to the other, a long vivid spark or flame which heats and burns the surfaces in côntact, thus lessening the conductivity at these points, and consequently the current-strength. But even then the current is not uniform in strength, but is intermittent—a defect fatal to its use for many purposes, as in telegraphy.

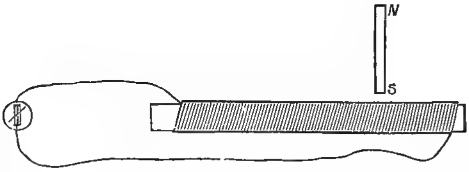
In July, 1871, Z. T. Gramme, an artisan of Paris, presented to the French Academy of Sciences a description of a new form of magneto-electric machine, in which an entirely novel principle appeared. Like all other similar machines, an iron armature surrounded with coils was caused to revolve in the vicinity of a magnet; but, unlike all others, this armature was shaped like a ring, its plane coinciding with that of the U-magnet to which it was attached, and its rotation in that plane being continuous in one direction. The principle involved in the Gramme machine may be illustrated by means of the annexed cut. (Fig. 10.) Let N S represent a bar magnet, and X a coil of copper wire, if the coil be made to approach the end of the magnet marked N, a current of electricity will be developed in it which will continue in the same direction until the coil reaches M, the neutral point; then it will change, continuing inverse until the coil passes off the bar at S. If the current produced when the coil moves from N to M be called positive, it will become negative as the coil moves from M to S. If the coil move from right to left, the current will be positive from S to M, and negative from M to N. To this magnet let a second one be now added, S′ N′, the two similar poles S and S′ being placed together. If now the coil move over this double bar as before, the current developed from N to M will be positive, from M to S negative, from S′ to M′ negative, and from M′ to N′ positive; all these currents being reversed when the coil moves back again. Substitute now in place of the magnet an iron bar surrounded with a permanent coil (Fig. 11), and place at a little distance from it a steel magnet with its axis perpendicular to that of the bar. Whenever the magnet is moved to or fro along the bar, being kept parallel to itself, a current of electricity will flow through the coil, which under the circumstances given is due to three separate causes acting together—first, to the magnetization and demagnetization of the bar due to the approach and the recession of the magnet; second, to the constant change in polarity in the bar as the magnet moves along, while preserving constantly the same distance from it; and third, to the current which is generated in the coil itself when it cuts the lines of force of the moving magnet. The first of these currents may be demonstrated by moving the magnet to and from the bar in the direction of its own axis; the second, by keeping the magnet and the coil at rest, and moving the bar through the coil only; the third, by removing the bar entirely, and then moving the coil alone before the magnet, or the magnet before the coil. If the bar be annular, however—if it be in the form of a ring instead of a straight rod—the currents first named will, as Gaugain has shown, disappear entirely. Suppose now such a ring of iron be caused to rotate in its own plane between the poles of a U-magnet, the plane containing these poles coinciding with that of the ring, and the axis of rotation being of course perpendicular to this plane. (Fig. 12.) It is evident that upon the ring at the points A and C, opposite to the poles of the magnet, there will be double poles or consequent points; the S. pole of the magnet developing a double N. pole at the point C, and the N. pole developing a double S. pole at the point A. The ring may therefore be considered as made up of two semicircular magnets reversed in direction, so that the two N. poles are together and the two S. poles together, the neutral points being halfway between the poles, or on a line perpendicular to that joining the two poles. If now we suppose this ring to be covered with a series of coils of copper wire all wound in the same direction, it is obvious that as the coils move from B to A in the quadrant B A, a current will be generated in them, at first feeble, but gradually increasing in strength as the pole is approached. As above stated, this current will be due to two causes—first, to the fact that the spires of wire cut the lines of force of the magnet as they rotate; and second, to the fact that the iron nucleus is changing the distribution of its polarity constantly. Since these two currents flow in the same direction, they will of course reinforce each other. In the second quadrant A D the former of the two currents will remain unchanged in direction, since the lines of force are cut in the same way; the latter will, because the direction of motion of the ring with reference to the polarity of the magnet remains unchanged. The four currents thus developed in the two quadrants will therefore unite to produce a single current, the direction of which will depend on the polarity of the magnet, the direction in which the coils are wound, and the direction of rotation, following the laws of Lenz and Ampère. In the case assumed above the coil in moving from B to A approaches a N. pole. By Lenz's law the direction in it of the current will be such that the advancing end will be a N. pole, and thus oppose the rotation. In moving from A to D the coil is moving away from a N. pole. By the same law there will be developed S. polarity at the end of the coil nearest N, since this, by its attraction, will resist the motion. But the direction of the current which makes one end of a coil N. necessarily makes the other S.; hence the current is the same in both quadrants—*i. e.* from B to D. The same phenomena go on, of course, in the lower half of the ring, but the currents here flow in the opposite direction. It is clear, therefore, that corresponding to the two neutral magnetic points of the ring there are two neutral electrical points where no current flows, situated one on each side of the ring and halfway between the poles of the magnet; on the one side of the line joining these points a current flows through the coils in one direction, and on the other in the opposite. If no arrangement is adopted for removing these currents, they simply flow into and neutralize each other. But if to each wire between two consecutive coils—representing, therefore, the end of the previous coil and the beginning of the succeeding one—a piece of metal be attached, R, R_1, R_2, R_3, placed radially to the ring, and upon these two metallic springs F and E, placed on a line normal to that joining the poles, be allowed to press, it is evident that metallic contact will take place at the neutral points, and that these springs will represent the electrodes. The positive current will flow in one direction from all the coils on that half ring, and will accumulate at the one spring; the negative current will flow in the other direction from all the coils on the other half ring, and will accumulate at the other spring. The minimum number of coils which could act at all is therefore two; but, since the radial arms from them would make contact with the brushes only near the neutral line, the current from them would be weak, and of course intermittent. The best effect is obtained when the number of coils, and therefore the number of radial arms, is such as to allow contact of the springs with the succeeding arm before their contact with the preceding one is broken. Increasing the coils beyond this number increases the effect only by increasing the electro-motive force, which follows the same law as in the battery, where it increases directly as the number of cells.

Fig. 10.



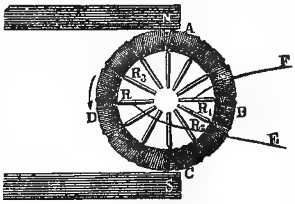
Coil and Bar Magnet.

Fig. 11.



Magnet, Coil, and Iron Bar.

Fig. 12.

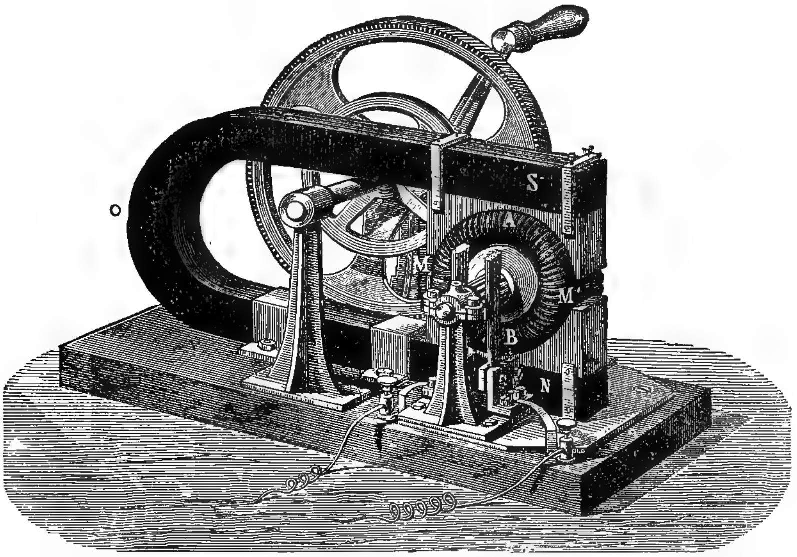


Gramme Ring.

The Gramme machine as first constructed is represented in the annexed wood-cut. (Fig. 13.) The field of force was produced by permanent steel magnets N O S. The armature was an iron ring A B, wound with coils as above described. Its construction is shown in detail in Fig. 14, where A represents the iron wires composing the ring, and B the coils of copper wire. A loop of wire is taken out between each coil and attached to a strip of copper R, which passes first radially, then turns at right angles, and passes through the ring parallel to the axis of rotation, each strip being insulated from the next and from the axis.

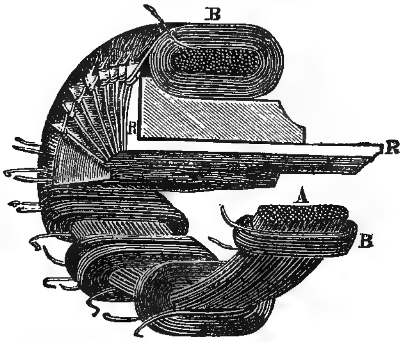
A cylinder of copper strips is formed in this way around the axis, each representing the end of one coil and the beginning of the next. Upon opposite sides of this cylinder two brushes formed of moderately fine copper wire press at the neutral points, thus constituting the electrodes. It was not long, however, before Gramme adopted the dynamo-principle of Siemens, and used electro-magnets in place of steel ones. The form of machine exhibited at the Vienna Exposition of 1873 (Fig. 15) involved the principle which Ladd had devised—*i. e.* that of two separate rings or bobbins, one to magnetize the field, the other for external work. The largest of these machines had twelve electro-magnets—six above and six below—arranged in sets of three. It had also two separate rings or bobbins, as above mentioned. It weighed 700 kilogrammes, was 90 centimètres high by 65 centimètres square, had 180 kilogrammes of copper wire on the magnets and 40 kilogrammes on the bobbins, and gave from 3500 to 7000 candlelights, according to the speed. It consumed six horse-powers.

Fig. 13.



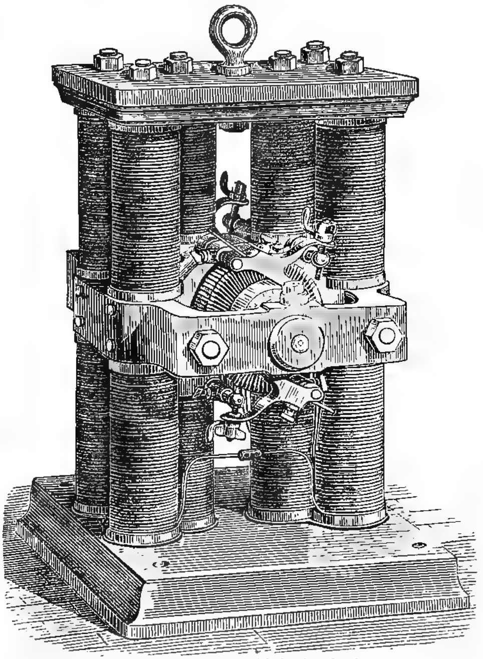
Small Gramme Machine.

Fig. 14.



Bobbin of Gramme Machine.

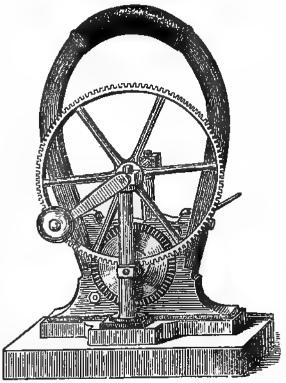
Fig. 15.



Gramme Machine for Light (early form).

In 1874, Gramme communicated a paper to the French Academy in which he described several important improvements in his machines. In the smaller or magneto-electric machines he substituted Jamin's laminated magnet, formed of a large number of thin plates, for the thick-plate compound magnets before used, and otherwise improved their construction. (Fig. 16.) In the larger or dynamo-electric machines the bobbin for generating the current to charge the magnets was suppressed, and the electro-magnets were included in the main circuit of the machine; Gramme believing, and justly, apparently, that when the magnetic equilibrium was once obtained, its maintenance would not require the expenditure of work. According to the purpose for which the machine is to be used the number of coils on the bobbin is small or large (of course never falling below the minimum number determined as above), and the wire with which they are wound is coarse or fine. As in all rheomotors, so here; the maximum current strength is obtained when the external and internal resistances are equal, when the resistance of the machine itself is equal to that of the circuit outside of it. Hence it follows that for low external resistance the number of coils on the bobbin must be a minimum, and these, as well as the field of force-coils, must be wound with very coarse wire. Where the external resistance is high the number of coils must be increased (to increase the electro-motive force), and the wire used on them and on the field of force must be proportionally fine. In the plating-machines of Gramme, for example (Fig. 17), the magnet is wound with broad strips of sheet copper, as wide as the core of the magnet is long, and the bobbin consists of twenty coils wound with narrow flat copper strips. In the lighting-machines, the resistance of the electric arc being considerable, the electro-motive force is increased by increasing three or four fold the number of coils on the bobbin, and the internal resistance is increased by winding both the bobbin and the field of force with wire. An excellent machine of the newer construction, imported by the writer in Feb., 1875, for the University of Pennsylvania, and which continues still to be the largest light-machine on Gramme's principle in the country, is represented in Fig. 18. It is 55 centimètres square at the base and 60

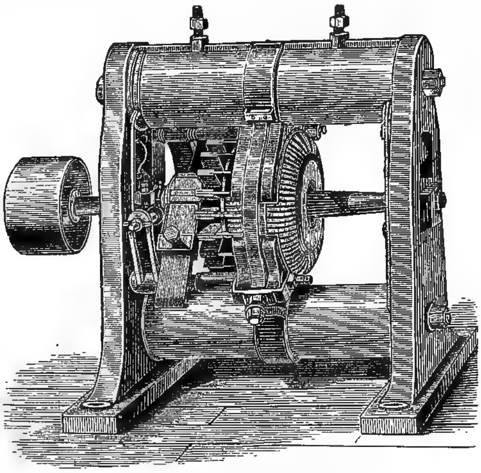
FIG. 16.



Gramme Machine, with Jamin magnet.

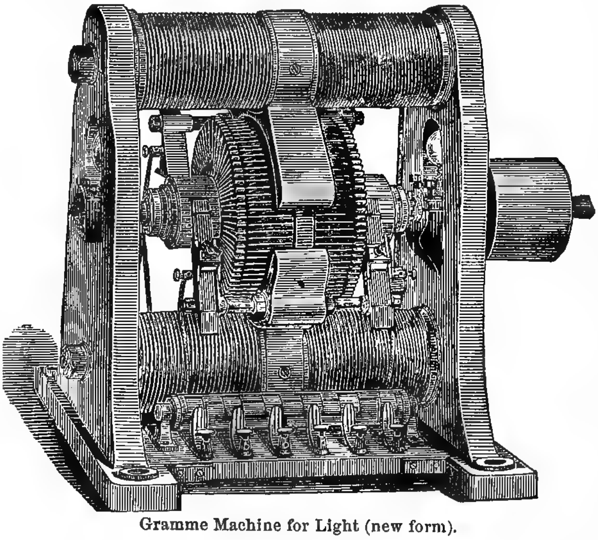
centimètres high. It weighs in all 183 kilogrammes, has 47 kilogrammes of copper wire on the magnets, and 4.7 kilogrammes on the ring. The peculiarity of the instrument lies in the construction of the bobbin. Upon the ring of iron wires ordinarily used two distinct sets of coils are wound, the entire number on the ring being 80. The loops of wire between these coils come out alternately upon the right and the left side of the ring, and are attached to two separate break-pieces on the axis, one on either side of the bobbin. The total resistance of the machine at rest is 1.57 ohms, that of the field of force being 1 ohm, and that of the bobbin 0.57 ohm. The electro-motive force developed at a speed of 600 rotations is about 50 volts. From the above description it will be seen that this machine is really two machines in one; it is therefore capable of various modifications. If the field of force be connected with two alternate brushes, and the external circuit with the other two, the current from both coils traverses the entire circuit, external and internal, and the maximum electro-motive force is developed, producing an electric light of from 1400 to 2000 candles, according to the speed. If one-half the field of force be connected with one set of coils, and the other half with the other, both being independent, two separate currents are generated, and two electric lights can be simultaneously produced. If the entire field of force be connected with one set of coils, the other set furnishes a strong continuous current, admirably adapted for working an induction coil or for telegraphy. If the two sets of coils be connected in parallel circuit—technically, in multiple arc—with the field of force and the external circuit, the electro-motive force lessens, but so also does the resistance, and to a greater degree; so that when the external resistance is small a considerably stronger current is obtained. Finally, if the bobbin-coils be connected together in the way just stated, a portion of the current may be sent through the field of force and a portion be diverted to external use. By means of these various combinations a double machine of the sort mentioned may be made to produce five quite different results. Since there are no rapid magnetizations and demagnetizations in the armature, the machine does not develop appreciable heat in the bobbin. Moreover, the sparks at the break-pieces are insignificant.

FIG. 17.



Gramme Plating-Machine (new form).

FIG. 18.



Gramme Machine for Light (new form).

The question of the absolute efficiency of the Gramme machines has been pretty thoroughly investigated. Tresca has made a series of experiments with the machines for light, in which he used two machines of different sizes. The larger machine had eight electro-magnets, each wound with 24 kilogrammes of wire 3.3 millimètres in diameter. The bobbin was double, and was wound with 140 kilogrammes of wire 2.6 millimètres thick. The smaller machine had four magnets, each wound with 14.32 kilogrammes of copper wire 3.8 millimètres thick, and a single bobbin having on it 4.65 kilogrammes of wire 2 millimètres in diameter. The large machine gave a light of 1850 Carcel burners, of seven candles each, and consumed 7.68 horse-powers; the small machine gave a light of 302.4 burners, and consumed 2.81 horse-powers. The former machine, therefore, required an expenditure of 0.31 kilogrammètre per burner per second, the latter of 0.69 kilogrammètre, showing a large economy in favor of the larger machines. To produce the amount of light given by the larger machine by means of coal-gas would cost 50 times, and by means of oil 100 times, as much. Hagenbach, using a still smaller machine, and measuring not only the light produced and the power consumed, but also the current-strength developed, obtained the following results:

Number of rotations per minute.	Luminous intensity in standard candles.	Current strength in c. c. of gas per minute.	Electro-motive force in Deleuil cells.
1700	506	119	40.8
1800	567	126	43.2
1900	628	133	45.6
2000	689	140	48.0

The Deleuil cell here used as a unit is a Bunsen cell equivalent to 1.6 Daniell cells. Moreover, he found that to give 1800 revolutions per minute, and therefore to produce 567 candlelights, equivalent to 80 Carcel burners, a force of 90 kilogrammètres (1.2 horse-powers) was required, or 1.1 kilogrammètres per Carcel burner—a result agreeing well with those of Tresca when the size of the machine is taken into the account. The power used in these experiments was water-power, the cost of the light being only 3 francs 40 centimes per hour. To give the same amount of light with Deleuil cells which the machine gave with 1700 rotations would require 72 cells; with 2000 rotations, 86 cells.

The plating-machines in their most recent form have a weight of 117.5 kilogrammes, are 60 centimètres high and 55 centimètres wide, and have upon them 47 kilogrammes of copper wire. Driven with a force of 50 kilogrammètres per second—two-thirds of a horse-power—they have deposited 600 grammes of silver per hour.

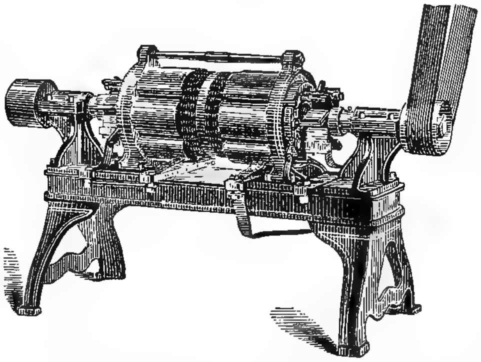
The exhibit of the Gramme Magneto-electric Machine Co. of Paris at the International Exposition at Philadelphia in 1876 consisted of five large machines for light, ranging in power from 500 to 20,000 candles, one large low-resistance machine for electro-plating, and two smaller hand machines, constructed with the Jamin laminated magnet. One of the large light-machines was put in operation almost daily, the Serrin regulator being used with it.

In 1873, Siemens and Halske exhibited at the Vienna Exposition a powerful dynamo-electric machine for light, in which the iron armature was at rest, the coil being supported upon a frame of brass, and revolving in the annular space between the armature and the magnets.

In April, 1873, Wilde proposed a new form of dynamo-electric machine, in which he sought to obviate the inconveniences arising from the high speed at which the Siemens armature requires to be driven. The field of force consists of two sets of cylindrical electro-magnets, 16 in each set, their axes being horizontal and their poles facing each other, firmly bolted to a circular framing placed vertically. In the cylindrical space enclosed by these magnets runs, on suitable bearings, a horizontal shaft carrying an iron disk at its centre, near the periphery of which, and opposite to the poles of the electro-magnets, are 16 iron cores with their axes perpendicular to the disk, and extending through it about two inches on each side. These cores are wound with wire, and constitute the bobbin. When driven at 1000 revolutions per minute the machine consumes about ten indicated horse-powers, and produces a current which fuses 12 feet of No. 15 B. W. G. iron wire (.075 inch diam.), and gives a light of 9600 candle-powers, thus yielding twice the power with one-quarter the weight of materials of the earlier Wilde machine. Though the machine did not produce serious heating of the armature, yet the commutator difficulties were not altogether overcome in it.

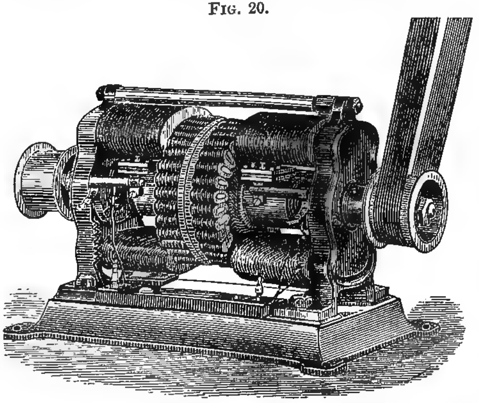
In April, 1875, a patent was taken out in the U. S. by Farmer, then of Newport, for a machine essentially similar in mechanical construction to that of Wilde, just described. The form of the plating-machine is shown in Fig. 19. It had two sets of electro-magnets of 6 each, facing inward for the field of force, and 17 coils on each face of the disk for the bobbin. The machine was 61 inches long, 12 wide, and 16 high, and stood on a table 2 feet from the ground. These machines have undergone considerable modifications and improvements in the hands of the manufacturers, Wallace & Sons of Ansonia, Conn., and have come into very general use, especially for electro-deposition of metals. In the newer forms of the Wallace machine eight of the field-of-force coils are dispensed with, and the machine is made duplex by placing a break-piece upon each side of the bobbin. One of these machines, 39 inches long, 14 inches wide, and 19½ inches high, at 425 revolutions per minute has deposited 64 ounces of copper per hour, working day and night with but little attention. A very large machine of this description was completed Nov., 1876, which is 60 inches long, 48 inches high, and 33 inches wide, weighs nearly three tons, and at a speed of only 230 rotations per minute, gained with the expenditure of ten horse-powers, it deposits 15 pounds of copper per hour, and heats to incandescence 17 feet 3 inches of copper wire, 0.226 inch in diameter, and 2½ feet of ¾-inch iron gas-pipe; and this for months together without producing any heat in the bobbin or coils, and without giving sparks at the break-piece. The magnetic field of this machine is so intense that a 5-inch iron spike held 7 feet distant is so strongly magnetized as to sustain an ordinary tenpenny nail.

FIG. 19.



Farmer-Wallace Plating-Machine.

FIG. 20.



Farmer-Wallace Machine for Light.

The machines for lighting have also been similarly modified. In place of 12 magnets in the field of force, only 4 are used, though these are somewhat larger than formerly. Fig. 20 represents one of the four machines employed in lighting the grounds of the Philadelphia Exhibition of 1876. It had 25 armature coils on each side, wound with wire 0.045 inch in diameter, the wire on the field-of-force coils being 0.188 inch in diameter, and the total resistance of the machine being 4.62 ohms. The total weight of this machine is about 1500 pounds (680 kilogrammes), and with a speed of 800 revolutions it consumes five horse-powers and gives a light of 5000 candles. The sparks at the break-piece were not serious, and the heating was inconsiderable. Wallace has also built a machine for light in which the armature has 200 coils, and which with 800 rotations gave a light of 15,900 candles, being 85 candles per pound of copper wire used in its construction.

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Malthe'idæ [from the genus *Malthæa* and the suffix *-idæ*], a family of fishes of the order Pediculati, distinguished by the large depressed, heart-shaped (pointed forward) or orbicular anterior part and slender subcylindrical but tapering posterior part of the body, which is naked or covered with scattered spinous disks or tubercles; no lateral line is developed; the head is covered by the integument in common with the shoulder-girdle, and this combination forms the anterior disk, which is abruptly distinguished from the small posterior region; the mouth is inferior, and the cleft mostly transverse; the teeth are villiform, and at least on both jaws; the branchial apertures are small dorsal slits, and in the upper axillæ of the pectoral limbs; there are five branchiostegal rays; the dorsal fins are peculiarly developed—(1) the first being represented by a tentacle on or under the snout, and (2) the second is a small but true fin (with four rays) on the slender body; the anal is like the dorsal; the pectorals are at the end of the long arms, which appear to have elbows, and are flexed outward and to some extent forward; the ventrals are small, but perfect (with a spine and five rays), and far forward on the throat; the skeleton is fibro-cartilaginous, and has seven or eight abdominal and ten or eleven caudal vertebræ; no air-bladder or pyloric appendages are developed. The very singular and grotesque fishes belonging to this family are found chiefly in warm waters. Only three genera are known, which represent, however, two very distinct types of structure or sub-families—viz. (1) Maltheinæ, with the genus *Malthe*, whose several species inhabit the Atlantic coast waters and the Gulf of Mexico; and (2) Halieutæinæ, with the Japanese and Chinese genus *Halieutæa* and the rare Caribbean genus *Halieutichthys*. They are able to progress on the ground by clumsy leaps by means of the arms, which are *far behind* the ventrals or representatives of the hind legs of land vertebrates. The *Malthe*, or bat-fish, is sometimes caught from the wharves of New York, and the *Halieutæa* often comes in boxes of Chinese insects and other "curiosities." THEODORE GILL.

Manid'idæ [from *Manis*, the typical genus, and the suffix *-idæ*], a family of mammals of the order Bruta or Edentata and the sub-order Squamata. These animals are at once distinguished from all other mammals by the peculiar modification of the integumentary appendages, which are developed as large leaf-like scales arranged in regular rows and simulating the appearance of a pineapple or pine-nut: the body is elongated, with a long flattened tail, and the scales extend on the tail as well as the head, and sometimes the feet; so much do they mimic lizards that the older authors confounded them with the latter under the name *Lacertus*; the feet are normal in form, and the digits are developed in full number—*i. e.* five to each foot —but the external are much shortened; the animals, however, are club-footed, and walk on the *outer side* of the feet. The skull is quite peculiar, depressed conic in outline, with small intermaxillaries; maxillaries short, and with the malar processes declivous; the palatines expanded in front; no malars or lachrymals; a large lachrymal opening; and the zygoma deep, thin, and "pushed downward to the anterior and inferior angle of the squamous portion" (*Turner*); teeth are entirely wanting. The family has about eight species, which differ among themselves in the size, form, and extension of the scales, the length of the tail, the size of the digits, etc. They have been by some combined in a single genus, and by Gray divided among five—viz. (1) *Manis*, (2) *Phatagin*, (3) *Pholidotus*, (4) *Pangolin*, and (5) *Smutsia*; the representatives of the first and second (genus *Manis*), as well as fifth groups (genus *Smutsia*), inhabit Africa, and those of the third and fourth (genus *Pholidotus*), India. They feed upon termites, ants, and other insects. THEODORE GILL.

Man'ning (DANIEL), b. at Albany, N. Y., in Aug., 1831, entered the office of the Albany *Argus* as an apprentice in 1842, and rose through all the various stages of the service till he in 1865 became associate editor and in 1873 controlling proprietor. At the same time, he took a very active part in politics, became a member of the Democratic State Committee in 1876, and was appointed secretary of treasury in 1885 by President Cleveland.

Man'son, Calhoun co., Ia. (see map of Iowa, ref. 4–F, for location of county), on Iowa division of Illinois Central R. R., 18 miles W. of Fort Dodge. P. in 1880, 377.

Manumis'sio, in Roman law, the form by which slaves were made free, took place in three different ways—namely, by *vindicta*, a word signifying the liberating rod or staff, by *census*, and by *testamentum*. In the first case the master brought his slave before the magistratus and stated the grounds of the intended manumission. After certain ceremonies the master pronounced the words, "*Hunc hominem liberum volo,*" turned the slave around, and let him go, *emisit e manu*. Manumissio by census took place by the slave enrolling his name as a citizen of the *census lustralis* with the consent of his master.

Ma'pleton, Monona co., Ia. (see map of Iowa, ref. 5–C, for location of county), on Maple River R. R. branch of Chicago and N. W. R. R., about 40 miles S. E. of Sioux City. P. in 1880, 379.

Marks, Quitman co., Miss. (see map of Mississippi, ref. 4–F, for location of county). P. not in census of 1880.

Mar'shall (WILLIAM R.), b. in Boone co., Mo., Oct. 17, 1825; was educated at Quincy, Ill.; went to Minnesota (then Wisconsin Territory) in 1847; was a member of the first legislature of Minnesota in 1849; founded the St. Paul *Daily Press* in 1861, together with J. A. Wheelock; entered the army in 1862 as lieutenant-colonel of 7th Minnesota Vols.; commanded a brigade in the battles of Nashville (Dec. 15 and 16, 1864); was governor of Minnesota 1866–70.

Marsh'field, Wood co., Wis. (see map of Wisconsin, ref. 5–D, for location of county), on Wisconsin Central R. R., 32 miles N. W. of Stevens Point. P. in 1880, 669.

Martin (JOHN A.), b. at Brownsville, Pa., Mar. 10, 1839, learned the printer's trade in the office of the Brownsville *Clipper*, where he became foreman and local editor; removed in 1857 to Atchison, Kan., bought the *Squatter Sovereign*, changed its name to the *Daily Champion*, and made it one of the leading papers of the State; served in the late civil war, and returned in 1865 as brigadier-general to again assume control of his paper; took a very active part in the political development of Kansas, and was elected mayor of Atchison in 1865, and governor of the State in 1884. PHILIP KROBER.

Mastacembel'idæ [from *Mastacembelus*, the typical genus, and the suffix *-idæ*], a family of fishes of the order Opisthomi. The body is eel-like (but comparatively much less elongated than in the eels), the tail being stout and tapering gradually; it is covered with very small cycloid scales; the lateral line is distinct; the head is elongate-conic and declivous, and the snout produced into a flexible appendage; the mouth is inferior, the cleft narrow, and the jaws little movable; the teeth are minute and pointed; the branchial apertures limited to the inferior portion of the head; branchiostegal rays six: the rayed portions of dorsal and anal fins are equal, and limited to the posterior half or third of the body; there are also numerous free dorsal spines and three anal ones; the caudal is either separately developed (in *Rhynchobdella*) or united, as in the eel, with the dorsal and anal (in *Mastacembelus*): the pectoral fins are normally developed; ventrals wanting. The vertebræ are in large number (in *Rhynchobdella* 32 + 40); there are two pyloric cæca. The family has two genera, *Mastacembelus* and *Rhynchobdella*, confined to Asia and West Africa, and best represented in the fresh waters of the East Indies. Under the name of "eels" they are esteemed by the English residents of India. THEODORE GILL.

Masticu'ra [from Gr. μάστιξ, "whip," and οὐρά, "tail"], a sub-order of Raiæ, distinguished by the attenuated caudal region or quasi whip-like tail, and the absence of a rayed terminal fin, thus contrasting strongly with all other fishes, in which that region is more or less fleshy and forms a considerable portion of the body. All the systems (osseous, muscular, etc.) are atrophied in this region in the Masticura. The sub-order is represented by three families—viz. Trygonidæ, "sting-rays;" Cephalopteridæ, comprising the "devil-fish" of our southern coast; and Myliobatidæ, or eagle and cow-nose rays. (See also PACHYURA and RAIÆ, in CYCLOPÆDIA.) THEODORE GILL.

Matile' (GEORGE AUGUSTE), b. at La Chaux-de-Fonds, canton of Neufchâtel, Switzerland, May 30, 1807; was educated in the colleges of Neufchâtel and Berne; studied law in Berlin, Heidelberg, and Paris, and was admitted to the bar in Neufchâtel in 1830. He served several terms in the legislature of his canton, and was appointed professor of law at the University of Neufchâtel in 1838, and one of the judges of the supreme court; emigrated in 1849 to the U. S.; was naturalized as an American citizen in 1856, and was appointed professor of history at Princeton, N. J., in the same year, and professor of French literature at the University of Pennsylvania in 1858. From 1863 he held various positions in the State department in Washington. The principal of his works are *Points de Coutume* (1838), *Autorité du Droit romain de la Coutume de Borgogne et de la Caroline dans la Principauté de Neufchâtel* (1838), *Musée historique de Neufchâtel* (3 vols., 1841–59), *Monuments de l'Histoire de Neufchâtel* (2 vols. fol., 1844–48), *Histoire de la Seigneurie de Valangin* (1852), *La Loi Gombette, Collégiale de Neufchâtel*, *Political Economy* (translated from List), etc. D. Feb. 6, 1881. A. GUYOT.

May'ville, Traill co., Dak. (see map of Dakota, ref. 2–F, for location of county), a thriving town about 50 miles N. W. of Fargo, is on Breckenridge extension of Chicago and North-western R. R. P. in 1885, 453.

Mechan'icsburg, Champaign co., O. (see map of Ohio, ref. 5–D, for location of county), on Cleveland Columbus Cincinnati and Indianapolis R. R., 17 miles N. W. of Springfield. Principal business, farming, dairying, and stock-raising. P. in 1870, 940; in 1880, 1522.

Mechan'icsville, R. R. junction, Saratoga co., N. Y. (see map of New York, ref. 4–J, for location of county), 18 miles N. E. of Schenectady, has manufactures of linen thread. P. in 1870, 1075; in 1880, 1265.

Meek (FIELDING BRADFORD), M. N. A. S., b. at Madison, Ia., Dec. 10, 1817; educated in the city school of that place, and became at an early age interested in the study of the Silurian fossils, which are very abundant there. At majority, by advice of friends, but against natural inclinations, he engaged in commercial pursuits, continuing, however, his scientific studies. In 1848 and 1849 he was employed as an assistant in the U. S. geological survey of the upper Mississippi country, under D. D. Owen. From about 1852 to 1858 he worked as an assistant of Prof. Hall at Albany on the palæontology of New York, but meanwhile engaged two summers with the State geological survey of Missouri. In 1853, assisted by Dr. F. V. Hayden, he brought a valuable collection of vertebrate and other fossils from the *Mauvaises Terres* or "Bad Lands" of Dakota for Prof. Hall. In 1858 he took up his residence at Washington, D. C., and devoted most of the time while living there to investigating and reporting on organic remains brought in by government exploring expeditions. His labors have been largely published jointly with others; his minor papers on palæontology and geology were successively given in *Trans. Albany Inst.*, *Am. Jour. Sci. and Arts*, *Proceed. Acad. Nat. Sci.* (Philadelphia, 1856–74), *Smithsonian Contr. to Knowledge*, *Proceed. and Trans. Chicago Acad. Sci.*, *Proceed. Am. Philos. Soc.*, etc.; his most important are in *Palæont. California* (vol. i., 1864), *Reports Ill. State Geol. Survey* (vols. ii., 1866, iii., 1868, and v., 1873), *Palæont. State Geol. Survey of Ohio* (vols. i., 1873, and ii., 1875); and, last and above all, *A Report on the Invertebrate Cretaceous and Tertiary Fossils of the Upper Missouri Country* (Washington, 1876, liv. 629 pp., 45 pl.). On the completion of this last great work he rested from his labors, and was on the eve of starting for Florida to spend the winter there, when he was attacked by a hæmorrhage of the lungs, and shortly afterward died on Dec. 28, 1876, at the Smithsonian Institution. THEODORE GILL.

Megalosau′ridæ [from the generic name, *Megalosaurus*], a family of the extinct order of dinosaurian reptiles, established by Huxley in 1869 for those gigantic reptiles of the Triassic epoch characterized by the want of dermal armor or scales; the deep and thick mandibular rami which meet by rounded ends in the symphysis; the sharp-pointed maxillary teeth, whose crowns have severally a longitudinal serrated ridge, either on the middle of the posterior face only or on the middle of its anterior face as well, its serratures being directed at right angles to the long axis of the tooth; the teeth not worn by mastication; the ilium with its anterior prolongation about as large as the posterior; the femur with its proximal end flattened, curved, and twisted in such a manner that its plane is oblique to that of a flat surface on which the condyles rest. By Huxley the genera *Teratosaurus*, *Palæosaurus*, *Poikilopleuron*, *Lælaps*, and provisionally *Euskelosaurus*, are referred to the family. (See also MEGALOSAURUS, in CYCLOPÆDIA.) THEODORE GILL.

Melani′idæ [from *Melania*—μέλας, "black"—the typical genus], a family, or rather a group of families, of gasteropod mollusks of the order Diœca, characterized, in common with the Cerithiidæ, Vermetidæ, etc., by the absence of a distinct copulatory organ (penis or verge), and comprising an immense number of fresh-water shells found in all parts of the globe. These have been united together with the following common characters by the Adams Brothers: Lingual membrane long and linear; teeth in seven series (3.1.3), the lateral teeth uncinate, multicuspid. Rostrum broad, annulated. Tentacles subulate, with the eyes on bulgings at their outer sides. Mantle margin produced into a rudimentary siphonal fold in front. Gill simple and pectiniform. Foot broad and short, angulated in front. Operculum horny, ovate, subspiral. Shell spiral, turreted, covered with a thick, dark-colored epidermis; aperture often channelled or emarginate in front; outer lip simple. These characters, however, are not strictly applicable to all, or diagnostic; the group, indeed, is rather a heterogeneous one, which has been differentiated into several groups equivalent to families by Troschel, and named (1) Ancyloti, (2) Thiaræ, (3) Melaniæ, and (4) Pachychili, and have been chiefly distinguished by differences in the lingual dentition.

I. The Ancyloti of Troschel (Ceraphasiidæ) are oviparous animals, with a plain or unfringed mantle, and with the snout projecting beyond the foot; they have the median or rhachidian tooth broader than high, round behind, and swollen out before; the laterals have a rhombic form, with the outer posterior angle somewhat drawn out; the uncini are narrow, but dilated at their apices and multidentate, the outer having more numerous teeth than the inner; the shell has generally a more or less canaliculated aperture; the operculum is paucispiral. This group includes all the species that have been confounded under the name Melania, distributed so abundantly in the streams of the U. S. Nearly 500 species have been admitted by Mr. Tryon in a recent monograph of the family, but this number will undoubtedly have to be reduced. The species have been arranged under nine genera by Tryon—viz. *Pleurocera*, *Angitrema*, *Lithasia*, *Strephobasis*, *Eurycælon*, *Goniobasis*, *Schizostoma*, *Meseschiza*, and *Anculosa*. These, however, are not natural sections. *Anculosa præsora*, *Mudalia dissimilis*, *Schizostoma ovoidea*, *Goniobasis depygis*, and *Io fluvialis* seem to be the most differentiated (but not the only) types, around which the various species of our waters can respectively be grouped.

II.–III. The Thiaræ and Melaniæ of Troschel (Melaniidæ proper) are viviparous animals, with a fringed border to the mantle, and with the snout also projecting beyond the foot. They have the median tooth broader than high, and angulated behind; the laterals are long and cleaver-like, or sigmoidal, with the bases extended far sidewise; the uncini are elongated, triangular, and crenulate or dentate. To this group belong most of the species of the rivers of the Old World, and which are especially abundant in Southern Asia.

IV. The Pachychili of Troschel (at least embracing the Melanopidæ) are animals with a plain margined mantle, and with the foot in progression normally projecting beyond the snout; the median teeth of the radula are in general quadrangular, and broader than high, and with rounded angles; toward the base in the middle are four characteristic lines of insertions, etc., more or less concave toward the base of the tooth; the lateral teeth are rhombic; the uncini moderately developed in length and width. The group as distinguished by Troschel includes the tropical and sub-tropical American genus *Pachychilus* and the Old World genera *Melanopsis*, *Vibex*, etc. THEODORE GILL.

Men′don, St. Joseph co., Mich. (see map of Michigan, ref. 8–H, for location of county), on R. R. and St. Joseph River, 21 miles S. S. E. of Kalamazoo, has water-power and manufactures. P. in 1870, 660; in 1880, 854.

Mer′rimac, on R. R., Essex co., Mass. (see map of Massachusetts, ref. 1–I, for location of county), 46 miles by rail N. by E. of Boston. P. of tp. in 1880, 2237; in 1885, 2378.

Michel′ (Sir JOHN), b. in 1804; entered the British army as ensign 1823; served in the Kaffir wars of 1846–47 and 1852–53, and nominated a C. B. in the latter year for his distinguished services; for service with the Turkish contingent was nominated to the second class of the Medjidie, and for the Indian campaign of 1858–59, when he defeated the rebels at Beorora, pursuing and dispersing them and capturing twenty-seven guns, he was created a K. C. B. In the China campaign of 1860 he commanded a division. He became a colonel in 1854, major-general in 1858, lieutenant-general 1866, general 1874; colonel of the 86th Foot 1862; in command of Her Majesty's forces in Ireland 1875–80; retired 1880.

Mi′lan, on R. R., cap. of Sullivan co., Mo. (see map of Missouri, ref. 1–F, for location of county), 250 miles N. W. of St. Louis. Principal business, farming. P. in 1870, 319; in 1880, 1117.

Miles (JAMES BROWNING), D. D., b. in Rutland, Mass., in 1823; graduated at Yale College 1849; studied theology at Andover and New Haven; tutor in Yale College two years; ordained and installed pastor of the First Congregational church in Charlestown, Mass., in 1855; chaplain of the senate of Massachusetts 1866–67; in 1872 resigned his pastorate to take the office of secretary of the American Peace Society. In this position he became identified with the Association for the Reform and Codification of the Laws of Nations, and was made its general secretary. D. in Worcester, Mass., Nov. 13, 1875.

Mil′ford, on R. R., Oakland co., Mich. (see map of Michigan, ref. 7–K, for location of county), 35 miles N. W. of Detroit. P. in 1880, 1251.

Mil′ler (JOAQUIN). See MILLER (CINCINNATUS HEINE), in CYCLOPÆDIA.

Mil′lington, on R. R., Morris co., N. J. (see map of New Jersey, ref. 2–D, for location of county), about 8 miles S. of Morristown. P. in 1880, 112.

Min′den, cap. of Webster parish, La. (see map of Louisiana, ref. 6–B, for location of parish). P. in 1880, 1113.

Mi′nor (VIRGINIA L.), better known as Mrs. FRANCIS MINOR, b. in Virginia. She started the woman suffrage movement in Missouri 1866; organized the Woman Suffrage Association in 1867; presided over the convention of woman suffragists in St. Louis, 1869; and brought in 1872 the proper suit for woman suffrage which finally reached the Supreme Court of the U. S., and was decided adversely. SUSAN B. ANTHONY.

Mitch′ell, R. R. junction, Lawrence co., Ind. (see map of Indiana, ref. 9–D, for location of county), 62 miles N. W. of New Albany, is engaged in the produce trade. P. in 1870, 1087; in 1880, 1439.

Mitchell (ISIDORE HYACINTHE MARIE LOUIS ROBERT), b. at Bayonne May 21, 1839; his father was an Englishman, his mother Spanish; his godfather was Don Carlos, and at his baptism he was made a captain in the Carlist army. He devoted himself to journalism; was a firm adherent of the second empire, of the party of Emile Ollivier; bought, in 1874, *Le Soir;* was elected a member of chamber of deputies in 1876, and re-elected, and is one of the most prominent leaders of Bonapartist party in France.

Mitsukuri Rinsho, b. in Tokio, Japan, about the year 1844; was of the Samuari class; when only fifteen years of age had acquired considerable reputation as a scholar, and was not long in acquiring a knowledge of the Japanese, Chinese, Dutch, French, and English languages, and before ever leaving his native land was considered a better English scholar than any of his fellow-countrymen who had studied abroad. Just before the abdication of the late tycoon he visited Europe, and with the Japanese minister was present at the French Exposition. Both before and after that date he had translated many foreign books into Japanese, among which was the *Code Napoléon.* By the mikado's government he was appointed a professor in the European college of Tokio: was also secretary to the council of state; and of late years has been a tutor of foreign languages in the imperial household. He belongs to what is called the fourth rank in the judicial department. F. A. P. BARNARD.

Monroe' City, R. R. junction, Monroe co., Mo. (see map of Missouri, ref. 3–H, for location of county), 30 miles S. W. of Quincy, Ill. P. in 1870, 353; in 1880, 640.

Mon'ument, the general term for any architectural structure, from a complete building to a simple heap of stones, erected or arranged in commemoration of some person or event, will be found treated under the headings ARCH, ARCH TRIUMPHAL, COLUMN, CROMLECH, MAUSOLEUM, OBELISK, PYRAMIDS, in CYCLOPÆDIA.

Moores'town, on R. R., Burlington co., N. J. (see map of New Jersey, ref. 5–D, for location of county), 10 miles E. of Philadelphia, Pa. P. in 1880, 1497.

Moran (M. NIMMO), wife of Thomas Moran, was b. at Strathaven, Scotland. She came to the U. S. in childhood, and was educated in Philadelphia, Pa.; is a distinguished etcher, and member of London Society of Painter-Etchers, and of New York Etching Club. M. P. JANES.

Morell (GEORGE W.), b. at Cooperstown, N. Y., Jan. 8, 1815; graduated at the U. S. Military Academy 1835; resigned 1837; began practising law in New York in 1842; served with the N. Y. State militia in the civil war, and became major-general in 1862. D. Feb. 11, 1883.

Morrillton, cap. of Conway co., Ark. (see map of Arkansas, ref. 3–C, for location of county), is on Little Rock and Fort Smith R. R. and Arkansas River, 50 miles N. W. of Little Rock. Pop. in 1880, 770.

Mor'rison, watering-place, Jefferson co., Col. (see map of Colorado, ref. 3–E, for location of county), 16 miles S. W. of Denver, on the Morrison branch of the Colorado division of the Union Pacific R. R., is noted for its sulphur and chalybeate springs and its quarries. P. in 1880, 186.

Mor'tars, short cannon for throwing shells, usually fired at angles from 35° to 45° elevation, called "vertical fire," in contradistinction to the fire of long cannon, usually made at low angles. *Mortars*—so called from their similarity of form to the mortar for pulverizing, which has retained its familiar shape from the earliest ages—are believed to have been the first guns used, and, though changed from age to age frequently in form of chamber, size, and projectile, all ages have found them too useful in their special way to suppress or to essentially alter them. The "Coehorn" mortar—so called from the famous Dutch engineer, Gen. Coehorn, who first proposed them in 1674—is to-day in use, of the same pattern and for the like service then suggested. Monster mortars have been constructed from time to time, in the hope of producing immense destruction in bombardments with single shells containing a large quantity of powder. (See BOMBARDMENT.) The monster mortar made by Mallet for the British government, weighing 114,000 pounds, with a bore of 36 inches and a shell of 2912 pounds, failed to be of any service: 13-inch sea-coast mortars and 8-inch and 10-inch siege mortars are the calibres now in use in our own and some other services. Mortars to the present time have been made with smooth bores to fire spherical projectiles, but it has been proposed, here and elsewhere, of late years, to rifle the bore and to fire elongated projectiles. P. V. HAGNER.

Mott (LYDIA), b. at Manhasset, Long Island, in 1807, of Quaker parentage; moved to Albany, N. Y., in 1823; taught school for a few years; opened, with her two sisters, a furnishing store for gentlemen's clothing, and kept a boarding-house during the sessions of the legislature. Being an abolitionist and an advocate of temperance and woman suffrage, she planned and secured many hearings before the legislature for woman's civil and political rights. D. Aug. 20, 1875. SUSAN B. ANTHONY.

Mound City, on R. R., Holt co., Mo. (see map of Missouri, ref. 2–C, for location of county). P. in 1880, 678.

Mount Car'mel, R. R. junction, Northumberland co., Pa. (see map of Pennsylvania, ref. 4–G, for location of county), has important coal-mines. P. in 1870, 1289; in 1880, 2378.

Mount Mor'ris, on R. R., Ogle co., Ill. (see map of Illinois, ref. 2–E, for location of county), 109 miles W. by N. of Chicago, is the seat of a M. E. seminary and collegiate institution. P. of tp. in 1870, 1455; in 1880, 1959, including 855 in village.

Mount Pleas'ant, cap. of Berkeley co., S. C. (see map of South Carolina, ref. 6–F, for location of county). P. in 1880, 783.

Mouton (ALEXANDER), b. in Lafayette parish, La., Dec., 1803; his father was one of the Acadian emigrants of 1753 from Nova Scotia. Alexander Mouton was elected to Louisiana legislature when barely of age, and was speaker of the house at twenty-six; he was elected U. S. senator in 1837; before he had served out his term he was elected governor of the State by the Young Democracy, and served four years. He was chosen a Presidential elector for Jackson in 1829, and again in 1833; for Van Buren in 1837, and Polk in 1845. In 1861 he was president of the secession convention. D. Feb. 12, 1885.

Mun'dy (Sir GEORGE RODNEY), b. 1800; entered British navy in 1818, and served in various grades of his profession in every quarter of the globe; promoted to flag rank in 1857, and as second in command in the Mediterranean was stationed with his division in Italian waters during the revolution of 1860, and off the coast of Syria in 1861 after the Lebanon massacres; was appointed vice-admiral in 1863, and in Jan., 1867, commander-in-chief in North America and the West Indies, which command he held until 1869, when promoted to be admiral, and in 1872 became commander-in-chief at Portsmouth. He was created a C. B. at the close of the Russian war, and K. C. B. in 1862. In May, 1875, he was placed on the retired list.

Mur'phy (JOHN MCLEOD), b. at Northcastle, Westchester co., N. Y., Feb. 14, 1827; entered the U. S. navy as midshipman in 1841; served in the war with Mexico; as hydrographic assistant on Maj. (now Gen.) Barnard's survey of the Isthmus of Tehuantepec 1851; resigned from the navy 1852; was on mission to Mexico 1853; city surveyor of New York 1855; constructing engineer New York navy-yard 1856–57; member of State senate of New York 1860–61; colonel 15th New York (Engineers) Vols. 1861–63, and in the campaigns of the Army of the Potomac; acting lieutenant U. S. navy 1863, and in command of the Carondelet during Vicksburg campaign. Resigned Aug., 1864. D. at New York June 1, 1871.

Murphy (WILLIAM MITCHELL), b. in Granville co., N. C., in 1806; was educated in the schools of Tuscaloosa and at the University of Virginia; read law at Tuscaloosa; commenced practice at Erie, Greene co., Ala., about 1828; represented his county in the legislature 1840; was defeated as a Whig candidate for Congress 1847; served in the State senate 1849–51, and removed in 1852 to Austin, Tex., but soon returned and settled at Selma, where he d. in 1855.

Mur'ray (DAVID), PH. D., LL.D., Oct. 15, 1829, at Delhi, N. Y.; graduated at Union College in 1852; was successively a professor and principal of the Albany Academy from 1853 to 1863, and from 1863 to 1873 professor of mathematics and physics in Rutgers College. In 1873 he entered the service of the Japanese government as foreign adviser to the department of education. He is the author of a *Manual of Land Surveying* (New York, 1872), a contributor to Mori's *Education in Japan* (New York, 1872), and the editor of an *Outline History of Japanese Education* (New York, 1876), prepared for the Philadelphia exhibition, to which he contributed the introductory chapter. He returned from Japan in 1878, and became connected with the department of education of N. Y.

Müt'ter (THOMAS DENT), M. D., b. in Richmond, Va., Apr., 1811; graduated at Hampden-Sidney College; studied medicine under Dr. Semmes of Alexandria, Va.; became a pupil of Dr. Samuel Jackson of Philadelphia, and took his degree from the University of Pennsylvania in 1830. He then went to Paris, where he became an *interne* under Dupuytren. On his return home he settled in Philadelphia, and in 1841 was elected professor of surgery in the Jefferson Medical College. He wrote an essay on club-foot, and issued an American edition of Liston's *Surgery.* D. Mar. 16, 1859. His pathological collection he bequeathed to found the Mütter Museum in the Philadelphia College, which he endowed with $30,000, and left $20,000 more to provide a ward for the incurable.

N.

Naph'thalene Colors. Under this head are included a variety of artificial dye-stuffs which in many respects resemble the aniline and the phenol colors, and, like them, are derived from coal-tar. The most important are *Martius' yellow*, *Victoria yellow*, and *Magdalla red*, which are described in NAPHTHALENE, in CYCLOPÆDIA. Derivatives of naphthalene are used in the preparation of some of the most important AZO-COLORS (which see). C. F. CHANDLER.

National Cemeteries, U. S.

ALABAMA, Mobile (P. O., Mobile).

ARKANSAS, Fayetteville (P. O., Fayetteville), Fort Smith (P. O., Fort Smith), Little Rock (P. O., Little Rock).

DISTRICT OF COLUMBIA, Battle Ground (P. O., Bright wood), Soldiers' Home (P. O., Washington).

FLORIDA, Barrancas (P. O., Warrington), St. Augustine (P. O., St. Augustine).

GEORGIA, Andersonville (P. O., Andersonville), Marietta (P. O., Marietta).

ILLINOIS, Camp Butler (P. O., Riverton), Mound City (P. O., Mound City), Quincy (P. O., Quincy), Rock Island (P. O., Rock Island).

INDIANA, Crown Hill (P. O., Indianapolis), New Albany (P. O., New Albany).

INDIAN TERRITORY, Fort Gibson (P. O., Fort Gibson).

IOWA, Keokuk (P. O., Keokuk).

KANSAS, Fort Leavenworth (P. O., Fort Leavenworth), Fort Scott (P. O., Fort Scott).

KENTUCKY, Camp Nelson (P. O., Hanly), Cave Hill (P. O., Louisville), Danville (P. O., Danville), Lebanon (P. O., Lebanon), Lexington (P. O., Lexington), Mill Springs (P. O., Somerset).

LOUISIANA, Alexandria (P. O., Pineville), Baton Rouge (P. O., Baton Rouge), Chalmette (P. O., Arabi), Port Hudson (P. O., Port Hudson).

MARYLAND, Annapolis (P. O., Annapolis), Antietam (P. O., Sharpsburgh), Loudon Park (P. O., Carroll).

MISSISSIPPI, Corinth (P. O., Corinth), Natchez (P. O., Natchez), Vicksburg (P. O., Vicksburg).

MISSOURI, Jefferson Barracks (P. O., Jefferson Barracks), Jefferson City (P. O., Jefferson City), Springfield (P. O., Springfield).

MONTANA, Custer Battlefield (P. O., Fort Custer).

NEBRASKA, Fort McPherson (P. O., Fort McPherson).

NEW JERSEY, Beverly (P. O., Beverly), Finn's Point (P. O., Salem).

NEW YORK, Cypress Hills (P. O., E. New York), Woodlawn (P. O., Elmira).

NORTH CAROLINA, New Berne (P. O., New Berne), Raleigh (P. O., Raleigh), Salisbury (P. O., Salisbury), Wilmington (P. O., Wilmington).

PENNSYLVANIA, Germantown (P. O., Germantown), Gettysburg (P. O., Gettysburg), Philadelphia (P. O., Philadelphia).

SOUTH CAROLINA, Beaufort (P. O., Beaufort), Florence (P. O., Florence).

TENNESSEE, Chattanooga (P. O., Chattanooga), Fort Donelson (P. O., Dover), Knoxville (P. O., Knoxville), Memphis (P. O., Cemetery Station), Nashville (P. O., Madison), Pittsburg Landing (P. O., Hamburgh), Stone's River (P. O., Murfreesborough).

VIRGINIA, Alexandria (P. O., Alexandria), Arlington (P. O., Georgetown, D. C.), Ball's Bluff (P. O., Leesburg), City Point (P. O., City Point), Cold Harbor (P. O., Richmond), Culpeper (P. O., Culpeper), Danville (P. O., Danville), Fort Harrison (P. O., Richmond), Fredericksburg (P. O., Fredericksburg), Glendale (P. O., Glendale), Hampton (P. O., Hampton), Poplar Grove (P. O., Petersburg), Richmond (P. O., Richmond), Seven Pines (P. O., Richmond), Staunton (P. O., Staunton), Winchester (P. O., Winchester), Yorktown (P. O., Yorktown).

WEST VIRGINIA, Grafton (P. O., West Grafton).

MEXICO, Mex. (P. O., City of Mexico, Mex.).

National Stock-Yards, St. Clair co., Ill. (see map of Illinois, ref. 9–D, for location of county), on R. R. and Mississippi River, about 4 miles N. E. of St. Louis.

Ne'ligh, cap. of Antelope co., Neb. (see map of Nebraska, ref. 9–F, for location of county), on Sioux City and Pacific R. R., 33 miles W. by N. of Norfolk. P. in 1880, 326; in 1885, 760.

Nematisti'idæ[from *Nematistius*—νῆμα,-ατος, "thread," and ἱστίον, "standard"—*i. e.* dorsal fin], a family of teleocephalous fishes, related to the mackerels and dolphins, with the body oblong and compressed, covered with cycloid scales; the lateral line simple and unarmed; the head compressed; the opercula unarmed; the nostrils double, in front of the eyes; the mouth with an oblique cleft; the jaws little protractile; the teeth villiform on the jaws as well as palate; branchiostegal apertures extensive; branchiostegal rays six; dorsal fins two, folding in a deep sheath, the first short (with eight filamentous spines), the second elongated; anal shorter than the second dorsal; caudal forked; pectorals with branched rays; ventrals thoracic, each with a long spine and six rays, the internal of which is wide and composed of several branches. The family thus distinguished is represented by a single species, *Nematistius pectoralis*, an inhabitant of the Pacific coast of Mexico. It is especially distinguished as the type of a family by the composition of the ventral, as well as structure of the other fins. THEODORE GILL.

Nematoi'dea [Gr. νῆμα, "thread," and εἶδος, "like"], an order of helminths whose species are also known under the name of "thread-worms," distinguished by their simple thread-like form. The body is not segmented, and usually tapers toward each end; the integument is non-ciliated and dense; under it are the muscles, which vary in several groups; the mouth is at one extremity, and the anus at or near the other; the alimentary canal is differentiated into a thick-walled pharynx, and the intestinal canal a simple tube, there being no differentiation into stomach and intestine, a narrow œsophagal portion connecting the pharnyx and the canal; (in some entozoic forms the intestinal canal is entirely atrophied;) the nervous system is developed in the form of a ring of fibres and nerve-cells encircling the gullet, but no certain organs of sense have been detected; the sexes are generally differentiated in different individuals, but occasionally united in the same; in the females the genital aperture is near the centre of the body, but in the males at or near the posterior extremity; the spermatozoa are cell-like and amœboid in their movements. The order has been separated by Prof. Huxley into three primary groups, distinguished by their muscular system—viz. (1) Polymyarii, (2) Meromyarii, and (3) Holomyarii. In the first "the muscles of the parietes of the body are divided into many series, each made up of many muscle-cells." In the second "there are only eight longitudinal series of such muscle-cells, two between each lateral area and the dorsal and ventral lines." In the third "the muscles are not divided into series of muscle-cells." The representatives of the order are quite numerous; some of them live in a free state, and others, at least during a part of their life, in the interior of other animals. About a dozen species are the guests of man, the most injurious being the TRICHINA SPIRALIS (see in CYCLOPÆDIA). THEODORE GILL.

Nerit'idæ [from *Nerita*], a family of gasteropod mollusks of the order Rhipidoglossa, whose shells are generally readily distinguished by their form as well as by the shape of their apertures. The animal has its visceral part stout, and coiled almost in a plane upon itself; the mantle is little developed; the head ends in a broad and short muzzle; the tentacles are elongated and slender; the eyes situated at the extremities of rather long peduncles arising at the outer base of the tentacles; the teeth of the radula are in numerous rows, and in each transverse series are (1) a small central tooth varying in form according to the genera; (2) a transverse inner lateral tooth expanded obliquely outward; (3) two very small outer lateral teeth; (4) a wide plate with an adze-like apex; and (5) numerous approximated slender and elongated pectiniform teeth, incurved at their tips; the foot is oblong and quite broad. The shell is more or less thick, semiglobose, with a depressed spire and a semi-lunate aperture, the columellar lip being expanded, flattened, and nearly rectilinear; the interior is always more or less absorbed as the animal increases in age. The operculum has a process on its inner side arising near the nucleus and interlocking with the columella. The family is rich in species, containing over 200 generally-recognized species. Most of these are found in the tropical seas, but many also in fresh or brackish waters. They are generally distributed among the genera *Nerita*, *Neritina* or *Neritella*, *Navicella* or *Catillus*, and these severally into a number of sub-genera, several of which, however (*e. g. Dostia*, *Alima*, *Clithon*, etc.), are rather of generic rank. The family was early introduced into the ancient fauna, species apparently belonging to it being found in rocks of the Carboniferous epoch, and typical species occur in the Jurassic period. THEODORE GILL.

Neritop′sidæ [from the generic name, *Neritopsis*], a family of gasteropods, chiefly represented by extinct species and of long-disputed affinity, but which has very recently been shown to be related to the Neritidæ. The animal resembles the Nerita in form, the visceral sac being an incurved cone; the mantle moderate (with a fimbriated free edge); the head very broad and slightly emarginated in front; the tentacles tapering, and the eyes on short peduncles at the outer base of the tentacles; the lingual ribbon has numerous rows, but is especially distinguished from that of the Neritidæ by the want of (1) the median or rhachidian tooth, as well as of (2) the inner lateral; (3) the two outer laterals are larger than those generally developed in Neritidæ, and the inner margin is broad, with an expanded recurved apex; (4) the uncini are (as in the Neritidæ) very numerous and closely approximated, pectiniform and incurved at their extremities. The shell is ovate, like that of the Neritidæ, with a short spire and semicircular aperture, but the columellar lip is flattened and emarginated or broadly notched toward the middle. The family is represented by but a single known living species—the *Neritopsis radula*—but has more extinct representatives. In former geological epochs species flourished in seas which covered what now forms Europe. THEODORE GILL.

Nesodon′tidæ [Gr. *νῆσος*, "island," and *ὀδούς*, "tooth," in allusion to the insular folds of enamel in the teeth], a family of mammals of the order Toxodontia, distinguished by the dentition. The teeth are 44 in number (M. $\frac{3}{3}$, P. M. $\frac{4}{4}$, C. $\frac{1}{1}$, I. $\frac{3}{3} \times 2$); those of the opposite jaws are quite dissimilar; in the upper jaw the molars are for the most part (P. M. 3, 4, M. 1) oblong, moderately narrowed backward, with two folds (the anterior of which is divided) re-entering from the inner side; the incisors have simple fangs; those of the first pair are largest, compressed, and widely separated; the second molar and trihedral: the third lateral, behind the second, and rudimentary: in the lower jaw the molars are comparatively broad and complex; the canines moderate; the incisors implanted in a curved row. The family includes but a single known genus (*Nesodon*), which flourished in the later Tertiary epoch in South America. The species attained a moderate size, being at least larger than the ass. THEODORE GILL.

Neu′rine, or **Cho′line,** is the tri-methyl-oxethyl-ammonium-hydrate; $(CH_3)_3\,(C_2H_4OH)NOH$. It is obtained from the bile, from the brain, from LECITHIN (which see), from PROTAGON (see in CYC.), and is prepared synthetically. (See Watt's *Dict.*, 1st Supplement, p. 448.) Lecithin, which occurs in the brain, nerves, yolk of eggs, blood-corpuscles, etc., is now known to be the di-stearyl-glycerin-phosphate of neurine. C. F. CHANDLER.

New′burgh, cap. of Lewis co., Tenn. (see map of Tennessee, ref. 7–F, for location of county). P. not in census of 1880.

New Ca′naan, on R. R., Fairfield co., Conn. (see map of Connecticut, ref. 6–C, for location of county). P. of tp. in 1870, 2497; in 1880, 2673.

New Hart′ford, on R. R., Litchfield co., Conn. (see map of Connecticut, ref. 4–C, for location of county), 29 miles N. W. of Hartford. P. in 1880, 1670.

New Market, on R. R., Rockingham co., N. H. (see map of New Hampshire, ref. 10–G, for location of county), 38 miles S. E. of Concord, has a public library, several cotton-mills, etc. P. of tp. in 1870, 1987; in 1880, 2368.

New′port, Jackson co., Ark. (see map of Arkansas, ref. 2–E, for location of county), 83 miles N. E. of Little Rock; is on St. Louis Iron Mountain and Southern R. R., at junction of White River Branch R. R. to Batesville. P. in 1880, 683.

New′ton (ISAAC), b. in New York in 1838; educated at New York University, where he studied civil engineering; subsequently studied practical mechanical engineering; commissioned engineer U. S. navy in 1861, and at Mr. Ericsson's request assigned as chief engineer of the original Monitor, which position he held during her combat with the Merrimack, and commended for coolness, skill, and energy; shortly after was ordered on duty as superintendent of construction of iron-clads and principal assistant New York office, where drawings, specifications, etc., were prepared for iron-clads building on Atlantic seaboard; resigned from navy at close of war, and entered the employ of a large coal and iron company; was principal assistant engineer department of docks of New York 1871–72, and as such planned and built the 100-ton floating derrick and superintended the construction of the masonry pier near the Battery; member of board to examine the condition of the navy 1869. D. Sept. 25, 1884.

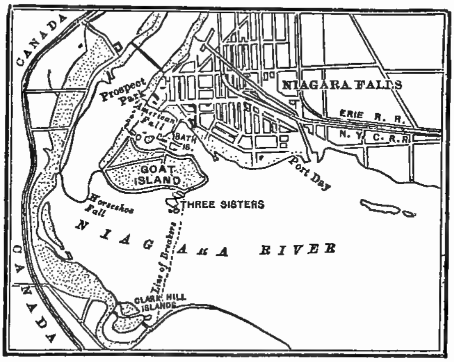
Newton (ROBERT SAFFORD), b. in Gallia co., O., Dec. 12, 1818; was educated at the academy of Lewisburg, Va.; studied medicine under Dr. Navet, Gallipolis, O., and at the Medical University of Louisville, Ky., whence he graduated in 1841; commenced immediately to practise at Gallipolis; removed in 1844 to Cincinnati; joined the American Eclectic School of Medicine founded by Dr. Morrow; devoted much attention to the subject of cancer, and laid the results of his researches before the National Eclectic Medical Convention in 1848, and before the public in the *Eclectic Medical Journal* of 1849; was appointed professor of surgery at the Eclectic Medical College of Cincinnati in 1851; removed in 1863 to New York, where he established in 1866 the Eclectic Medical College and the Eclectic Medical Dispensary, and started, in connection with H. L. Stuart, the *American Eclectic Medical Review.* D. Oct. 9, 1881. WILLIAM P. STRICKLAND.

New′town, on R. R., Bucks co., Pa. (see map of Pennsylvania, ref. 5–J, for location of county), 22 miles N. E. of Philadelphia, has a boarding-school, manufactures of agricultural tools, etc. P. in 1870, 859; in 1880, 1001.

New′ville, on R. R., Cumberland co., Pa. (see map of Pennsylvania, ref. 6–F, for location of county), 30 miles W. of Harrisburg, has several flour-mills and a paper-mill. P. in 1870, 907; in 1880, 1547.

New York College of Physicians and Surgeons was chartered March 12, 1807, by the regents of the University of the State of New York, pursuant to an act of the legislature which was passed March 24, 1719. The officers were elected May 5, 1807, and the first course of lectures, commencing Nov. 7 of the same year, was delivered in a small two-story building in Robinson street. About the close of the session, however, the college, having received from the legislature an endowment of $20,000, was enabled to purchase an edifice in Pearl street better adapted for its purposes, which was formally opened for the reception of students in Nov., 1808. The medical department of Columbia College having been discontinued in Nov., 1813, the union of the two schools, as recommended by the regents of the university as far back as April 1, 1811, was at length consummated Mar. 7, 1814, and a commodiously-arranged brick building on the north side of Barclay street, near Broadway, secured for the new organization. This alliance, however, proved to be but of short duration, since some of the faculty withdrew, and, under the authority of Queens College, N. J., established the "New Medical Institution" in a large building in Duane street. The latter school was suspended in 1816. At this crisis in its affairs the regents of the university reorganized the college under an entirely new charter, which gave its management to a board of twenty-five trustees, whose tenure of office was subject to the will of the regents themselves. In Feb., 1821, to the dissensions between the college and the Medical Society of the county of New York, which began some time during 1819, there succeeded new causes of discord between the trustees and the faculty. These culminated in the resignation of the entire faculty in April, 1826, and the appointment of a new corps of professors a few months afterward. The original faculty, soon after their resignation, revived the medical institution under the auspices of Rutgers (formerly Queens) College, New Brunswick, N. J., but by legislative enactment the diplomas were afterward rendered so manifestly illegal that the faculty abandoned the contest, and this school ceased to exist. By a new provision in the constitution the faculty were henceforth excluded from seats in the board of trustees, which was now to contain a majority of gentlemen who did not belong to the medical profession. As a result, both bodies have since worked in unison for the common good. The college removed from Barclay to Crosby street in Nov., 1837, where its sessions were held up to the inauguration of the present edifice, Jan. 22, 1856. Thereafter nothing noteworthy in its history occurred until the legislature, by an amendment to the charter, Mar. 24, 1860, delegated the authority of the regents to the trustees, and in June of this year also the institution was constituted the medical department of Columbia College, and now bears the title of "The College of Physicians and Surgeons in the City of New York: Medical Department of Columbia College." Since this last change in its charter the college has enjoyed uninterrupted and increasing prosperity. At present, under the presidency of John C. Dalton, M. D., it bears upon its rolls the names of 44 professors and instructors, and of 490 students. The last graduating class numbered 134. The present notice of this institution may fitly conclude with the fact that in the autumn of 1884 it received from William H. Vanderbilt, Esq., of New York, the magnificent gift of a plot of ground which cost $200,000 and comprises twenty-nine contiguous city lots, and of $300,000 in money wherewith to erect thereupon a new suitable college-building. The site is immediately opposite the Roosevelt Hospital, which will thus give unsurpassed opportunities for practical teaching; and at this writing the authorities of the college are perfecting plans for the new building, which it is expected will afford facilities for medical education far in advance of what have been attainable hitherto in New York. John G. Curtis.

Niag′ara Falls Reserva′tion. The Niagara Falls reservation—sometimes loosely denominated the Niagara Falls Park, and improperly so, as it is in no sense a park in the usual acceptation of that term—is the outcome of a prolonged and laborious agitation. The neglected condition of the shores of the great cataract, and the annoyances and extortions to which travellers were subjected, have for many years been the occasion of severe criticism. The first public step toward a reclamation was the message of Gov. Lucius Robinson to the N. Y. legislature in 1879. Referring to a conference between Lord Dufferin, then governor-general of Canada, and himself in the previous summer, the governor urged the enclosure "of a suitable space on each side of the river from which annoyances and exactions should be excluded." He recommended the appointment of a commission to consider and report upon the subject. The legislature by joint-resolution referred the matter to the commissioners of the State survey, by whom a very thorough examination was made, the results of which were presented with much clearness and force in an admirable report prepared by the director of the survey, Prof. James T. Gardiner, and laid before the succeeding legislature. They recommended the acquisition by the State of a limited area about the Falls. Memorials to the legislature bearing the endorsement of a host of distinguished men, both here and abroad, urged immediate action. An association of the most prominent men in the country was formed to enlist the sympathy of the people and rouse them to an adequate sense of the importance of speedy action in order to save Niagara. Apart from a very general and natural shrinking from the large outlay which it was believed such a purchase would necessarily involve—and which the event showed was overestimated—a considerable opposition was developed on the part of many who doubted the propriety of the State intervening for a work of sentimental, as it was termed, rather than of practical, utility. The reply was that the possession of this great natural wonder imposed a trust upon the people of the State, and that, its proper administration being inconsistent with private ownership, the higher title of the State must be invoked to furnish the relief. Analogies were drawn from the various educational endowments of the State. After three years of unsuccessful effort these arguments prevailed to secure the passage of the first Niagara bill, on Apr. 30, 1883. It provided for the appointment of a commission by the governor to locate, survey, and appraise the lands necessary for such a reservation. Gov. Grover Cleveland appointed Hon. William Dorsheimer, formerly lieutenant-governor of the State, Dr. Martin B. Anderson, president of Rochester University, Hon. Andrew H. Green, formerly comptroller of the city of New York, Hon. Sherman S. Rogers, and Hon. J. Hampden Robb as commissioners. The commission proceeded at once to fix upon an area sufficient to secure the free enjoyment and proper protection of the Falls. This area, which coincided substantially with the recommendation of the State survey, included Goat Island, Bath Island, The Three Sisters, Bird Island, Luna Island, Chapin Island, and the small islands adjacent to them in the Niagara River, and also a strip of land on the shore, beginning near Port Day and running to and including Prospect Park. This latter strip is from 100 to 200 feet wide through the greater portion of its length. The whole area includes $106\frac{97}{100}$ acres. It was carefully surveyed, under the direction of the State engineer and surveyor, by Mr. Thomas Evershed, engineer of the Western division, and a detailed map prepared, which is filed in the office of the secretary of state. Legal proceedings, in which the commissioners were represented by Messrs. Allen Movius & Wilcox of Buffalo, were commenced to secure an appraisal of the lands included in this area. Messrs. Luther R. Marsh, Matthew Hale, and Pascal P. Pratt were appointed by Judge Daniels as appraisers Jan. 26, 1884. On Sept. 22 the appraisers made their report, which was subsequently confirmed. Setting aside the vast claims of the land-owners for alleged water-rights in the stream, they awarded a total sum for the entire area of $1,433,429.50. On the presentation of the commissioners' report (Senate Document No. 35), the acquisition of the reservation was authorized by the legislature. An act was passed appropriating a sum sufficient to pay the awards and authorizing an issue of bonds for the purpose. On July 15, 1885, the reservation was declared open with impressive and appropriate ceremonies. The governor of the State, David B. Hill, with many distinguished guests, was present. Speeches were made by Gov. Hill, Hon. William Dorsheimer, president of the commission, Hon. Erastus Brooks, the lieutenant-governor of Ontario, and others, and an oration of unusual grace and dignity was delivered by James C. Carter, Esq., of New York. The administration of the reservation is under the charge of the commissioners before named, who hold office till Apr. 30, 1888. Hon. Thomas V. Welch of Niagara Falls is the resident superintendent, and Mr. Leighton Williams is the secretary and treasurer. By a recent act the legislature of Ontario has authorized a similar reservation on the Canadian side of the Falls. A commission has been appointed consisting of Col. C. S. Gzowsky of Toronto, Mr. Grant Macdonald, and Mr. Langmuir, and a survey has been made to determine the area required to be taken.



Niagara Falls Reservation.

It is not necessary to enlarge on the importance of the work now happily inaugurated by two great nations. As to the ancient world the Pillars of Hercules, the portal through which the waters of the Mediterranean mingled themselves with the outer ocean, were invested with an awful grandeur, so from the time when Father Louis Hennepin two hundred years ago described the "vast and prodigious Cadence of Water which falls down after a surprising and astonishing manner, insomuch that the Universe does not afford its Parallel," the Falls of Niagara, the outgate of a chain of mightier inland seas, have been possessed of a transcendent interest for the world. "The State of New York," said Mr. Carter in the speech above alluded to, "has done many memorable things which illumine her annals—she has erected great structures dedicated to charity; she has established a great system of universal education; she has raised and sent into the field vast armies to defend liberty and perpetuate the great nation of which she forms a part—but in no single act has she shown herself more worthy of her renown or of the place she fills in the nation and in the world than by avowing, as she does to-day, her intention to for ever guard and secure this spot against all profanation for the delight, the elevation, and the improvement of mankind." Leighton Williams.

Nich′ols (Clarinda Howard), b. in Townshend, Windham co., Vt., Jan. 25, 1810; for ten years edited the *Windham County Democrat*, published by her husband at Brattleboro', Vt.; in 1847 began to speak on the laws of that State in regard to the property disabilities of married women, and was influential in securing the first bill that passed the Vermont legislature (1848) recognizing the civil existence of wives. In 1854, with her two eldest sons, she joined a company of 225 men, women, and children, emigrants from the East to Kansas. Helping her two sons to locate and prepare a home, she remained in Kansas one year, and then returned for her husband and younger children, and in company with another party of 250 emigrants went back to Kansas in 1855 and took claims in the vicinity of Baldwin City. She afterward resided with a son in Pomo, Cal., and became actively engaged in farm-life.

Ninet (Jean), the only European in Arabi Pasha's camp during the Egyptian war of 1882, b. about 1810. He managed the state-farm at Tantah, on the Delta of the Nile, where Arabi was born, and through his influence Arabi was promoted to the rank of lieutenant. Ninet was dismissed by the late khedive, Ismail Pasha, because he was known to favor Halim Pasha, the only surviving son of Mehemet Ali, and from whom Ismail had practically usurped the throne. Ninet had protested against the wrong done to Halim, and actually went to Constantinople in the hope of persuading the sultan to reinstate him, but to no effect. He then returned to Egypt and acted as Halim Pasha's secret agent, and the eventful period through which Egypt soon passed is due very largely to his intrigues. He saw that if anything was to be done it could only be done through the army, and the only way of getting at the army was through Arabi. He therefore not only persuaded Arabi to espouse Halim Pasha's cause, but used him also as an intermediary in getting other officers to do the same. As, on the advice of the foreign consuls, the khedive arrested Arabi Pasha, Ninet surrounded the palace with a mob, who threatened to murder the khedive and every European in Cairo if their leader was not liberated. Ninet is known and respected by the majority of the natives, over whom he has an enormous influence, and he was, after Arabi Pasha, the most noteworthy man of the revolutionary party.

North Bend, Dodge co., Neb. (see map of Nebraska, ref. 10–G, for location of county), on Union Pacific R. R., 62 miles W. by N. of Omaha. P. in 1880, 415; in 1885, 1108.

North Clar′endon, Warren co., Pa. (see map of Pennsylvania, ref. 2–C, for location of county), about 6 miles S. E. of Warren. P. not in census of 1880.

North Man′chester, Hartford co., Conn. (see map of Connecticut, ref. 4–D, for location of county), on Hockanum River, 8 miles E. by N. of Hartford, is a village in the very important manufacturing tp. of Manchester. P. not in census of 1880.

Nov′el, in the English language, means any fictitious prose narrative which pretends to describe real life, past or present, while "romance" is generally applied only to narratives of a more or less fantastic character. In the other European languages the distinction between the two terms is another, "novel" meaning simply a small romance, a short, light tale of an every-day character, not much different from what we might call "news;" whence its name. Here, however, where we simply propose to give a supplement to the main article on the subject, and mention some of the most prominent novel-writers of continental Europe, we use, of course, the term in its special English signification.

The novel originated in Italy in the fourteenth century with *Il Novellino*, a collection of stories by unknown authors, and *Il Decamerone*, by Boccaccio. Its success was immense, and hundreds of writers cultivated with eagerness this new branch of literature during the following two or three centuries. Also in Spain, whither it was transplanted very early, the novel produced excellent fruit in the works of Cervantes, but it has subsequently almost died out in both countries, or at least sunk very low, Manzoni's *I Promessi Sposi* being nearly the only Italian novel which in the last hundred years has found its way across the Alps.

At present it is France which takes the lead in this field of literature. Not that the French novels are much imitated in other countries, but almost every kind of novel has reached its highest perfection in French literature. In the historical novel Alfred de Vigny, Prosper Merimée, and Victor Hugo may be called disciples of Walter Scott, but they are all superior to him in that one point in which every pupil ought to surpass his master: they are nearer to us; their conception of history conforms better to ours; they have utilized the advance which the study of history has made since the days of Walter Scott. They have a firmer grasp on the spirit of the age they describe; they are more true. In the psychological novel—that is, in the analysis of human characters and destinies, such as they develop from certain natural dispositions and under certain social circumstances—Balzac has no equal, and *La Comédie humaine* no counterpart. In the tendency novel, which purports to propagate certain social views or moral ideas, Rousseau, Madame de Staël, George Sand, Émile Souvestre are the first names, and have remained the greatest. Finally, besides producing a great multitude of writers—Jules Sandeau, Henri Murger, Ernest Feydeau, Octave Feuillet, Edmond About, Erckmann-Chatrian—whose drawings after life, correct, elegant, and spirited, fulfil in a satisfactory and often in a noble manner the general object for which art exists, France has at one time—Eugène Sue, Alexandre Dumas, Maquet, Frédéric Soulié—furnished the whole civilized world with that kind of material which through the imagination exercises the same influence on the mind as alcohol exercises on the body through the stomach.

In Germany the novel flourished abundantly during the great literary period of which Goethe was the founder and the centre. His own novels, *Wilhelm Meister* and *Die Wahlverwandtschaften*, are solutions of speculative problems. What is it to live? what is it to love? has the author asked himself, and his novels are his answers. The novels of Tieck, and many other remarkable productions from the same time—Jacobi's *Waldemar*, Schlegel's *Lucinde*, etc.—bear the same character of having originated from some moral, æsthetic, or metaphysical problem. But besides this, the truly German novel, many excellent novels were written which pretended to be nothing more than true conceptions of real life—Heinrich von Kleist, Töpffer—or the free creations of an impassioned imagination—Hoffman, Richter. After the middle of this century, however, the novel degenerated rapidly. Minor sketches of great sweetness, of exquisite humor, of fine sense of character, are still written—Auerbach, Klaus Groth, Fritz Reuter, Hackländer, Paul Heyse—but the novel on a great scale, attempting to give a comprehensive view—Gutzkow, Freytag—has become overstrained, hollow, and pretentious; and the historical novel, which once occupied a very respectable place—Willibald Alexis, Zschokke—has sunk with Mügge and Louise Mühlbach into mere trash.

From the Scandinavian countries several novels by Fredrika Bremer, H. C. Andersen, M. A. Goldschmidt, F. H. Ewald, Björnstjerne Björnson, and Magdalene Thoresen, have of late attracted considerable attention.

Clemens Petersen.

Noyes (Edward Follansbee), b. at Haverhill, Mass., Oct. 3, 1832; graduated at Dartmouth College in 1857, and removed to Cincinnati, graduating a year later from the law school there. The outbreak of war in 1861 found him successfully engaged in the practice of his profession, but abandoning law, he turned his office into a recruiting head-quarters, and in July, 1861, the 39th Ohio Infantry was organized with Noyes as its major; a year later he was promoted lieutenant-colonel, and Oct. 1, 1862, succeeded to the colonelcy of his regiment, which he led until July, 1864, when he was incapacitated from further active field-service by the loss of a leg. Upon his convalescence he was assigned to the command of Camp Dennison, which position he held until Apr. 22, 1865, when he resigned. The brevet of brigadier-general was bestowed upon him for gallantry. While in the army he had been chosen city solicitor of Cincinnati, which office he accepted upon resigning from the army. In Oct., 1866, he was elected probate judge of Hamilton county, and in 1871 was chosen governor of Ohio on the Republican ticket. In 1873 he was renominated, but defeated by William Allen. Minister to France 1877–81.

O.

Ogi Takato, b. in the province of Hizen, Japan; was highly educated; at the commencement of the late revolution was appointed one of the Sanyo, which position was afterward called Sangi; in 1870 he became vice-minister of the home department, afterward minister of education, then a councillor of state or Sangi, and in 1873 was reappointed to that office, in conjunction with the position of minister of justice.

F. A. P. Barnard.

O′Kan′ogan, cap. of Douglas co., W. T. (see map of Washington Territory, ref. 3–D, for location of county). P. not in census of 1880.

Okolo′na, on R. R., Chickasaw co., Miss. (see map of Mississippi, ref. 5–H, for location of county). P. in 1870, 1410; in 1880, 1858.

Okuma Shigenobu, b. in the province of Hizen, Kiusiu, in 1837; was well educated in a local high school, and early noted for his superior talents; studied the Dutch language at Nagasaki, and also English, and became a good scholar in both, but held no public position before the revolution. In 1868 he was appointed chief assistant in the department of foreign affairs; in 1869 was made an assistant or secretary in the then joint departments of the interior and finance, in which he displayed ability; in 1870 was made a councillor of state or Sangi, still having charge of the finance department, the interior department having been organized separately. In 1871 he was superseded as head of the finance department, but still held the position of Sangi; was appointed president of the commission that attended the Vienna Exposition; took a leading part in the expedition to Formosa, and in the latter part of 1872 was again made minister of finance, and continued to be a member of the Japanese cabinet or privy council.

F. A. P. Barnard.

Olivet′, cap. of Hutchinson co., Dak. (see map of Dakota, ref. 7–F, for location of county), on Dakota River. Pop. not in census of 1880.

Onar′ga, on R. R., Iroquois co., Ill. (see map of Illinois, ref. 4–G, for location of county), 85 miles S. of Chicago, was incorporated in 1863. Pop. in 1880, 1061.